flyt

130 Wellington Street Mosman Park

TRANSPORT IMPACT ASSESSMENT

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PROJECT	81113-495-FLYT-TIA-0010			
Revision	**Description**	**Originator**	**Review**	**Date**
0	Draft	AJS	CAS/RDG	10/03/2020
1	Reviewed	AJS	CAS/RDG/Project	17/04/2021
2	Issued	AJS	CAS/Project/DPLH	30/04/2021
3	Submitted	AJS	CAS	22/06/2021

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1. SUMMARY

Item	Response
Local Government	Town of Mosman Park
SWALSC Region	Whadjuk
Site Lot(s)	130 Wellington Street Mosman Park
Street Frontage	Manning Street, Wellington Street, Samson Street, Turnbull Way
Development Type(s)	Mixed use being 83 apartments and townhouses, supermarket, retail and commercial
Relevant Planning Scheme	Local Planning Scheme No. 3
Nearest Station	1.65kms to Victoria Street Station
Nearest Bus Routes	107. Bus stop on Manning Street adjacent to site
Walk Score Ratings	Existing walkability – 62 out of 100. Transit Score 40 out of 100
Access Crossovers	Direct access from Wellington Street to Turnbull Way using existing lane way access
Parking Provision	On-site: 128 underground residential bays, 60 commercial visitor bays, 2 loading docks, 2 car share bays, 12 Motorcycle bays, 23 on-street bays on Manning and Samson Streets
Parking Management	To be undertaken as part of Parking Management Plan subsequent to DA process
ACROD Parking	On and off-street provision on site
Motorcycle Parking	12 residential motorcycle and scooter bays
Bike Parking	Bike bays: 62 residential, 22 employee, 60 commercial visitor (reciprocal use residential visitor), on-street convenience parking at four locations around site
Vehicle Trips Generated	Three forecasts examined using different rates, 220 AM and 240 PM peak hour vehicle trips used in assessment to reflect highest or most conservative approach

2. INTRODUCTION

2.1 Development Introduction

This Transport Impact Assessment (TIA) has been prepared by Flyt in support of the proposed mixed-use development at 130 Wellington Street, Mosman Park. The site is within the Town of Mosman Park and, as indicated by the South West Aboriginal Land and Sea Council website, sits within the Whadjuk Region.

The location of the proposed development is shown in Figure 1.

Figure 1 Development site (source: Nearmap)

2.2 Transport Impact Assessment

This Traffic Impact Assessment has been prepared in accordance with the WA Planning Commission's (WAPC) Transport Impact Assessment Guidelines (Volume 4 – Individual Developments). The Guidelines promote a three level assessment process, where the required level of assessment is dependent on the likely level of impact, as follows (and as shown in Figure 2):

- Low impact – less than 10 peak hour trips, no assessment required;
- Moderate impact – between 10 and 100 peak hour trips, Transport Impact Statement required; and
- High impact – more than 100 peak hour trips, full Transport Impact Assessment required.

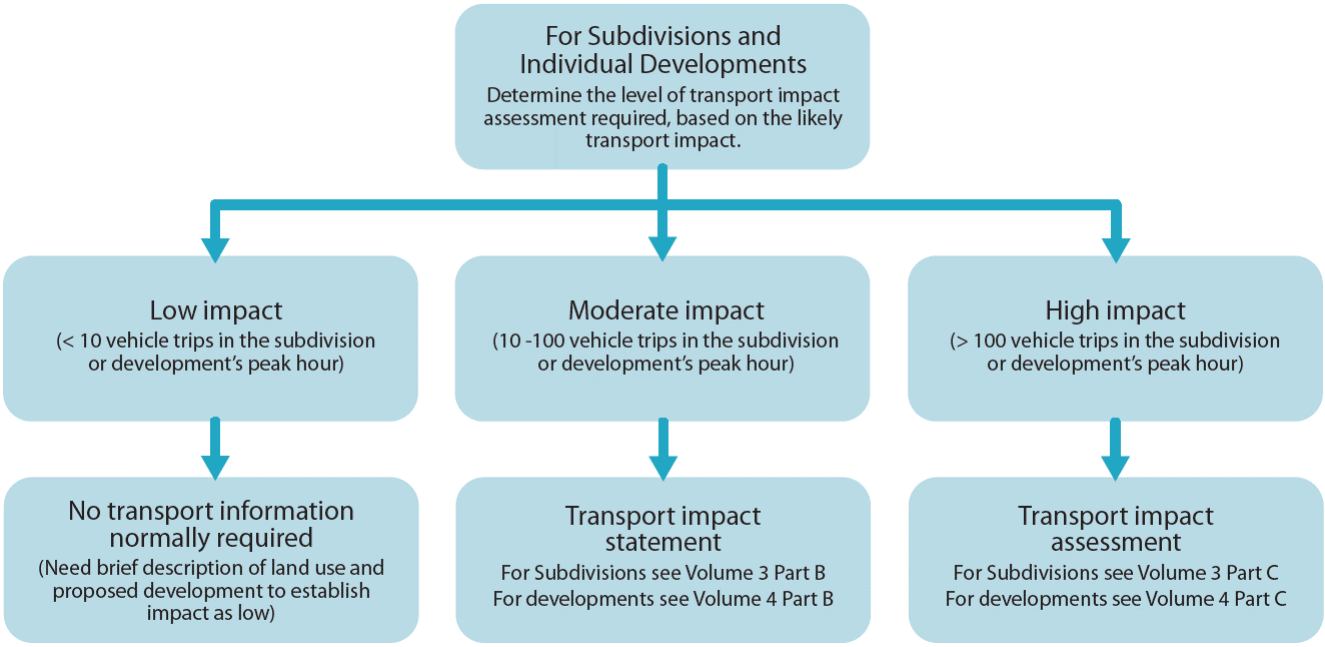


Figure 2 Level of transport impact assessment required (source: WAPC Transport Impact Assessment Guidelines, 2016)

As set out in section 6.1, the traffic attributable to the proposed development has been determined to be 220 and 240, therefore the required level of assessment is a TIA.

It should be noted however, that the site already generates a high volume of traffic through existing retail land uses – around 200 combined inbound and outbound trips in the AM or PM peaks as established through a number of surveys in 2019 and 2020. Therefore, the forecast impact on the overall network is limited to the increase in vehicle movements of around 40 additional trips in the peak periods.

2.3 Stage of Reporting

The proposed development has been subject to intensive assessment and review during the preceding stage of project development. Transport analysis and reporting was completed for the development of a Local Development Plan (LDP) that was developed for the site.

The transport reporting for the LDP included:

- Site visit and review of local conditions in September 2019
- Parking surveys undertaken in October 2019
- Traffic and access surveys undertaken in October 2019
- Review of use of on-street bays on Wellington Street, Mosman Park in October and November 2019
- Assessment of vehicle trip generation for land uses proposed for the site
- Refinement of access proposals associated with the site
- Review of baseline traffic and transport conditions, as prepared for the LDP (and included as part of that submission to Council for consideration)
- Presentation of traffic and transport elements to the Community Reference Group in November 2019
- Development of strategies to include within the site to cater for parking provision, improvements to the streetscape and surrounding area, traffic access and primacy of pedestrian movements around the site
- As a result of comments from the Town of Mosman Park Design Review Panel, preparation of a parking statement that included review of seven other local centres of similar size and nature around Perth
- Completion of a behavioural movements note for Council as a result of engagement with Officers during the lead up to LDP process
- Submission of the transport related reporting to Town of Mosman Park for an independent review of the outcomes by a Council appointed consultant

- Further site visit to assess localised movements and conditions
- Completion of a second set of traffic surveys in 2020 as a result of the independent review
- Development of this Transport Impact Assessment for submission with a Development Application.

This detailed review and assessment over the course of three calendar years indicates the volume of effort and technical inputs that have been considered in this project in response to a range of issues has ensured that there is an exceptionally high level of robustness to this assessment and confidence in its outcomes. The responses have been in relation to:

- Internal project team queries
- Community engagement outcomes
- Town of Mosman design review panel queries
- Independent expert review of transport outputs by consultants
- Direct queries from Council Officers
- Initial advice from the State Development Assessment Unit.

This is particularly true of both parking provision and volumes of traffic associated with the proposed redevelopment project which have undergone multiple site visits and survey data collection through SurveyTech and Flyt. Substantial effort has been put into capturing existing movement patterns and volumes of parking associated with the site to address all relevant issues. These details are threaded through this TIA.

2.4 Report Structure

The report is structured as required by the Transport Impact Assessment Guidelines, with the following sections:

- Proposed development
- Vehicle access and parking
- Provision for service vehicles
- Daily traffic volumes and vehicle types
- Public transport access
- Pedestrian access
- Cycle access
- Site specific issues
- Safe routes to school
- Safety issues.

3. PROPOSED DEVELOPMENT

3.1 Development Site

The site is within the Town of Mosman Park and has frontage to Wellington Street, Manning Street, Samson Street and Turnbull Way. Turnbull Way is a laneway which creates a loop behind the existing retail and commercial tenancies on Wellington Street and provides access to the proposed development. An aerial image of the site area is shown in Figure 3.

Figure 3 Aerial image of site (source: Nearmap)

The subject site is zoned 'Centre' under the Town of Mosman Park's Local Planning Scheme No. 3 with a residential density zoning of R60 (shown in Figure 4). The subject site is currently occupied by an IGA and a number of independent commercial and retail tenancies.

Figure 4 Location of proposed development site (source: Town of Mosman Park Zoning Map)

The proposed development has been designed to improve and enhance the pedestrian environment with a high-quality people focused built environment. This is achieved through walk-up style building street interface for residential properties on Samson Street, widened footpaths, new pedestrian only laneway connecting through the site from Manning Street, and enhanced green verges and plazas.

The proposed development includes the following:

- 76 apartments and 7 townhouses over five levels
- Various retail and commercial tenancies with a total NLA of 1,997m^2
- Parking over three levels with 128 residential bays, 54 commercial bays on basement level 1, 2 car share bays, 6 on-street bays on Turnbull Way and 23 marked on-street bays along Manning and Samson Streets. There are a further 18 existing on-street bays on Wellington Street
- Combined service and residential vehicle access from Turnbull Way
- Residential bike parking on basement level 2 comprised of 62 spaces
- Staff end of trip facilities and bike parking on basement level 1, as well as 60 spaces for retail uses
- On-street bike racks for short stay convenient trips with capacity for 18 bikes
- Substantially upgraded pedestrian environment around the site with removal of five separate existing crossovers on Wellington, Manning and Samson Streets.

A development site plan displaying the proposed development at Wellington Street, Manning Street, Samson Street and Turnbull Way is shown in Figure 5.

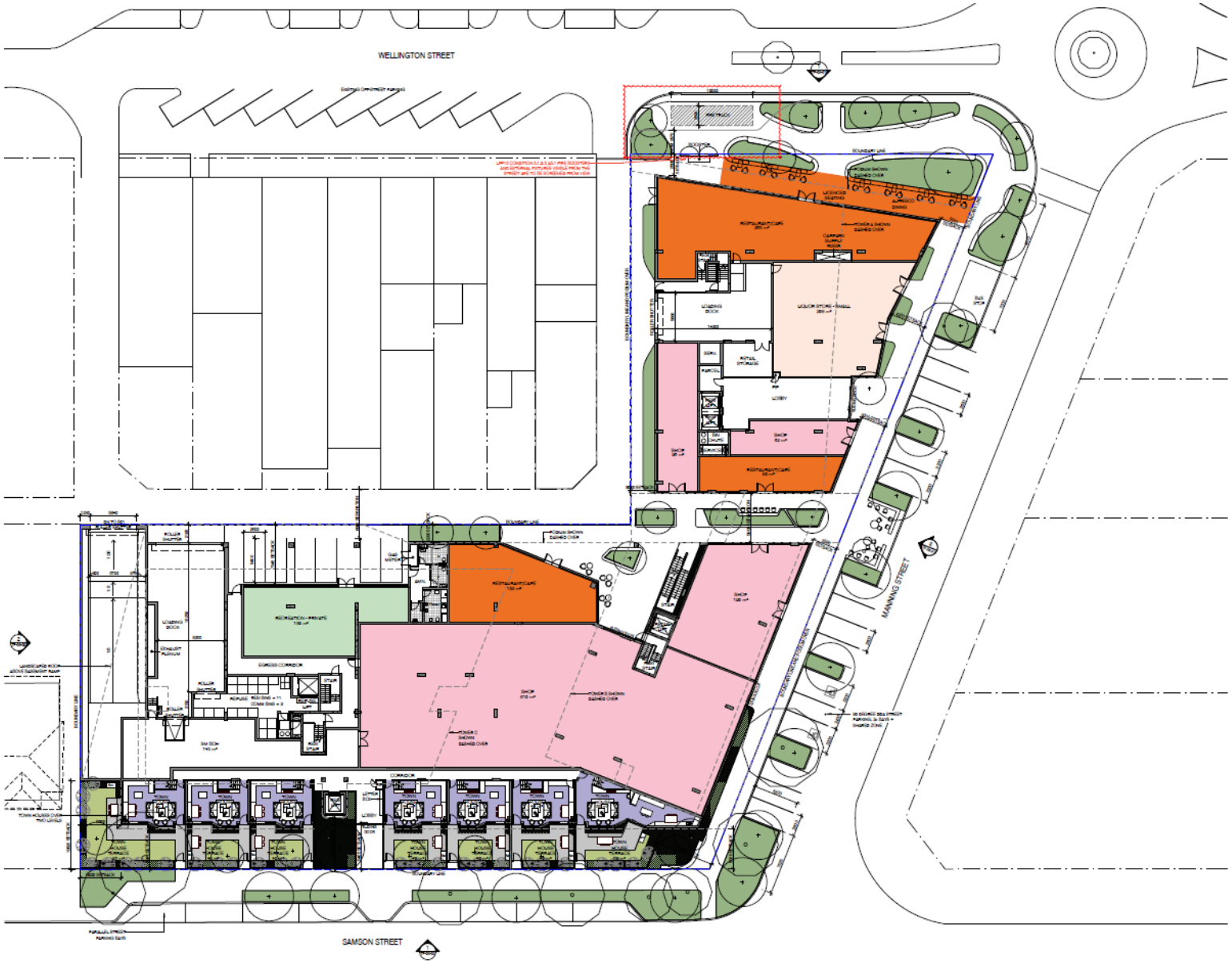


Figure 5 Site plan (source: NH Architecture)

4. VEHICLE ACCESS AND PARKING

4.1 Vehicle Access

Vehicle access into the subject site is proposed via an existing crossover from Wellington Street onto Turnbull Way, approximately 110m to the west of the intersection of Wellington Street and Manning Street. Turnbull Way is currently one way only and operates in a clockwise direction where entry is from the eastern crossover and exit is via the western crossover. This access arrangement will be reversed as part of the proposed development where entry will be from the western crossover and exit via the eastern crossover.

There is one proposed entry point from Turnbull Way to the two basement levels of parking for resident, visitor, and commercial parking. The Turnbull Way entry will also accommodate service vehicles for both residential and commercial tenancies including moving trucks, deliveries, and waste collection vehicles required.

The entry point from Turnbull Way to the basement levels of parking and the direction of vehicular travel along Turnbull Way is shown in Figure 6.

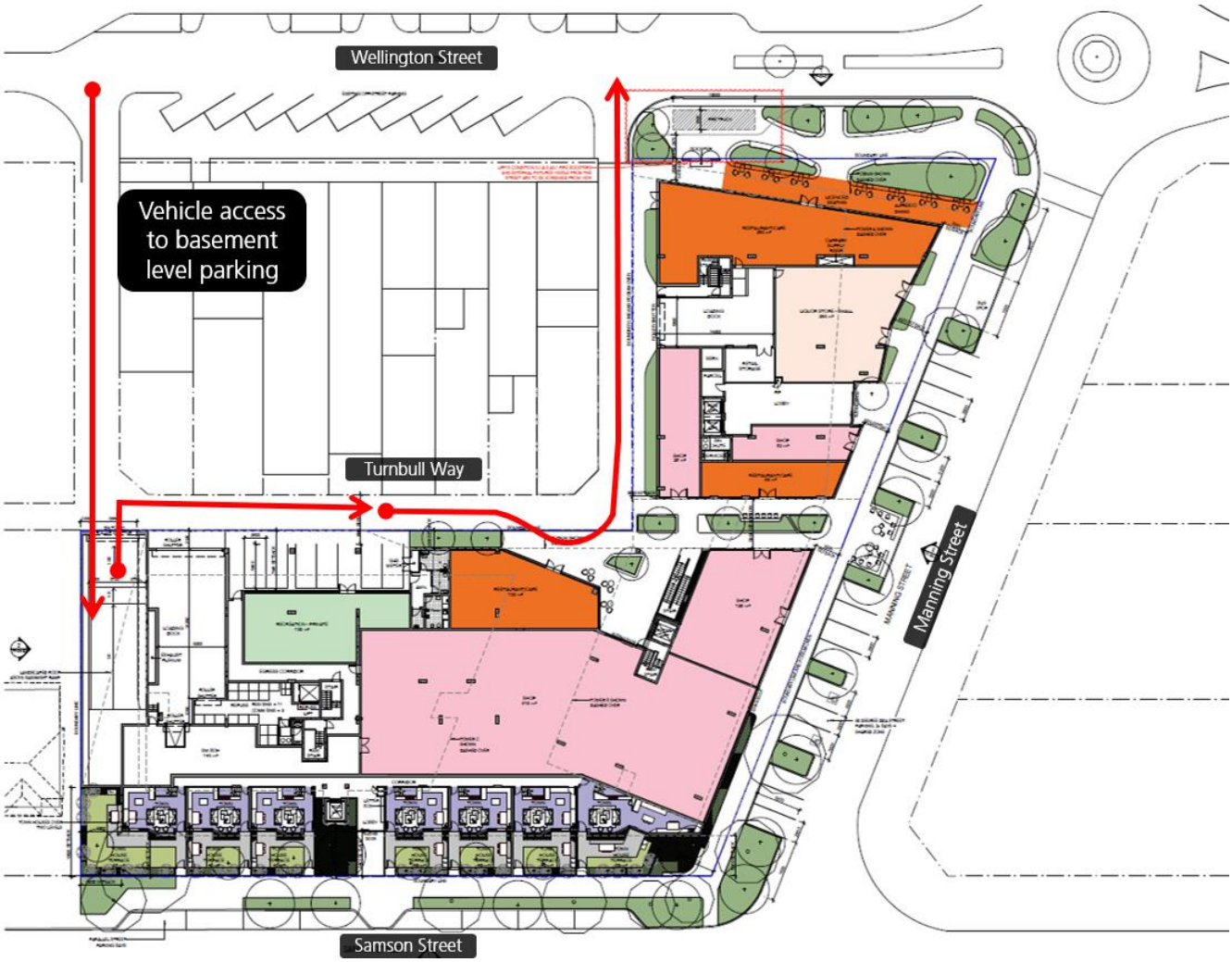


Figure 6 Proposed vehicle access (source: NH Architecture)

Four existing crossovers are proposed to be removed which will improve pedestrian movements and reduce vehicle impacts; one on Wellington Street near the intersection of Manning Street, one on Manning Street and two on Samson

Street. Closing these access points allows for the creation of on-street parking on Manning Street and Samson Street. The location of these crossovers is shown in Figure 7.

Figure 7 Location of crossovers to be closed along development frontage (source: Nearmap)

4.2 Existing Parking Profile

Substantial data collection and assessment of parking provision and occupancy has informed the proposed approach within the DA for this site. This has included specific observations and analysis of on and off-street parking associated with the existing commercial and retail land uses in the area and analysis of parking provision and patterns at similar locations around Perth.

The analysis of parking around the existing site included:

- Video surveys of entry and exit points of the existing retail complex
- Video and static surveys of parking along Wellington Street to understand the turnover patterns of on-street bays associated with the existing shop fronts along Wellington Street
- Examination of historical Nearmap imagery to understand if observed patterns were reflected at other times of the year or day
- Comparing ratios and occupancy of parking with other centres
- Understanding crash related implications for 90 degree on-street bay parking.

4.2.1 Parking Surveys

Some examples of the survey camera locations from October 2019 are shown in Figure 8.

Patterns of overall occupancy of on and off-street parking bays throughout the surveyed period are shown in Figure 9. The surveys indicated that the peak occupancy was around 64% on Fridays and Saturdays – when there was either convenience shopping or trips to food and beverage outlets in the area.

From observations undertaken and manual observations, it was clear that the key parking provision in the area is related to short term or short stay bays that are associated with quick trips into or out of retail premises.

This was particularly evident along Wellington Street where there was a consistent turnover of bays but there were periods when this parking was fully occupied, as shown in Figure 10. The existing controls along Wellington Street allow for this with timed management being a mix of three hour bays, one hour bays and 15 minute bays.

Figure 8 Survey camera location examples October 2019 (source: Surveytech)

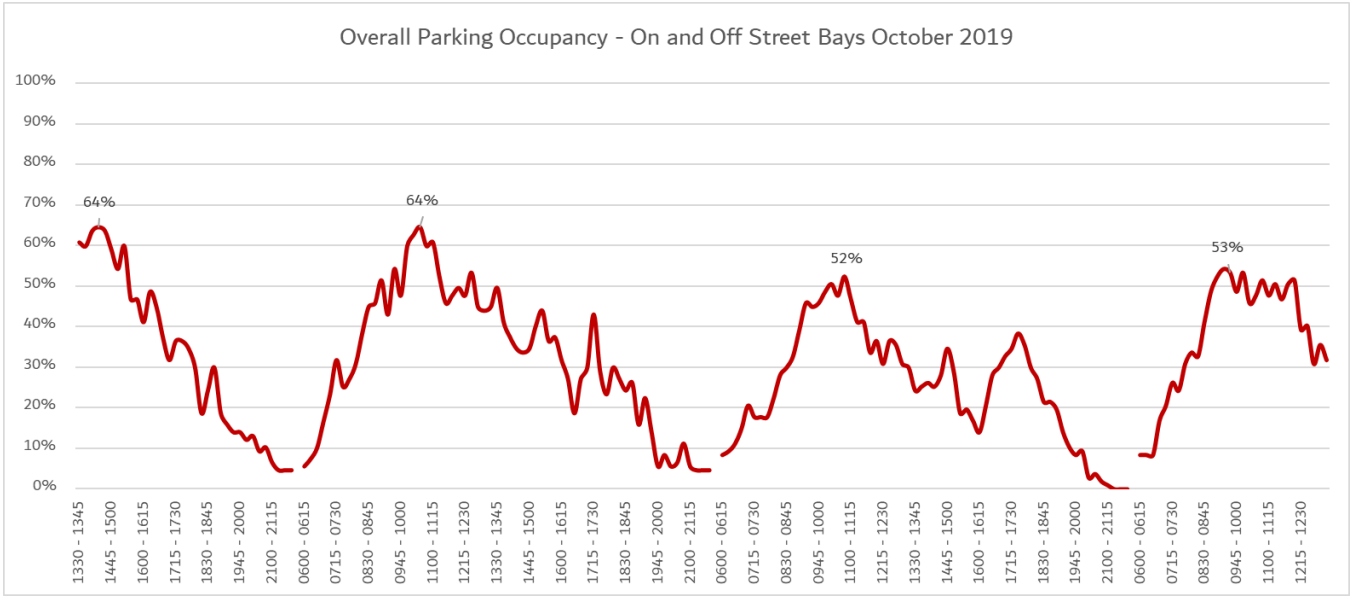


Figure 9 Overall parking occupancy - on and off street bays October 2019

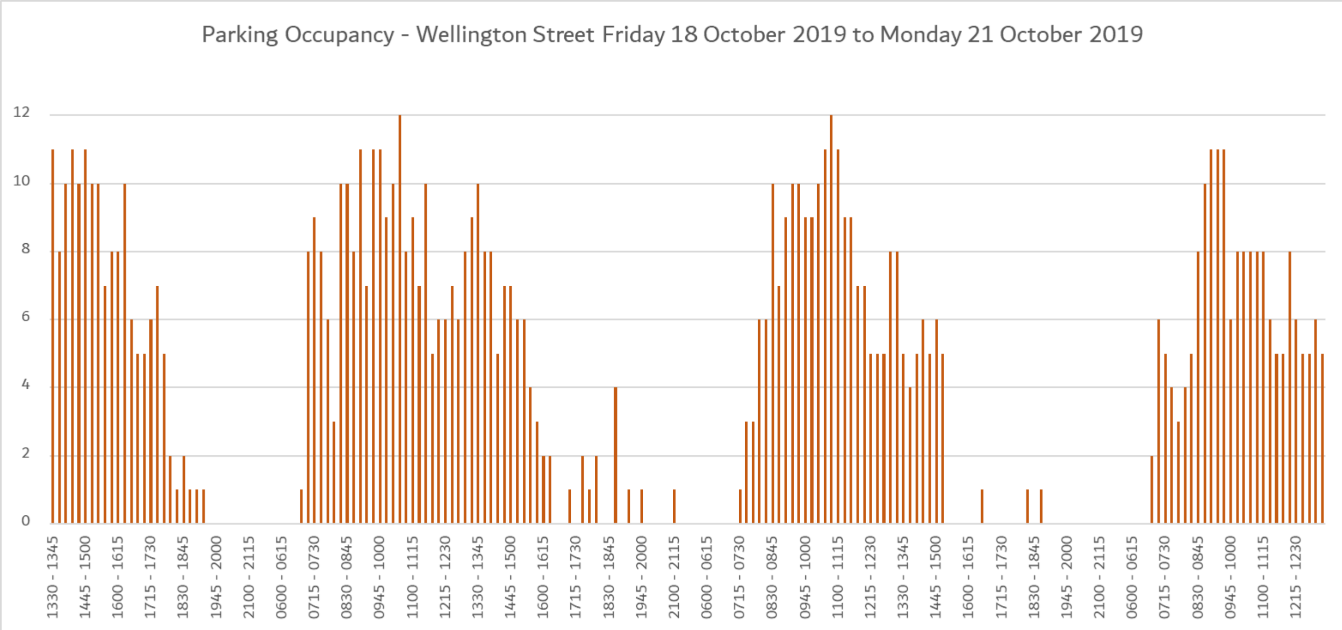


Figure 10 Parking occupancy by 15 minute period - on-street bays on Wellington Street

4.2.2 Nearmap Image Counts

Nineteen different aerial images from Nearmap were reviewed for occupancy, with the details of the visible vehicles set out in Table 1. These outcomes generally support the findings of the on-site parking survey however it should be remembered that these are a snapshot image at different times of the day. Examples of the images used for this part of the parking assessment are shown in Figure 11.

For the weekday images, there was an average of 42 bays occupied with a highest recording of 62. Sunday occupancy was lower on average than weekdays. Only one Saturday image was available. The on-street turnover bays were observed to be better utilised with 8 out of 12 angled bays occupied on average. This is the role of these bays, to be short stay bays that support the retail offerings on Wellington Street and within the existing retail centre.

Figure 11 Examples of Nearmap images (source: Nearmap)

Table 1 Nearmap parking occupancy results

Day	Date	Off-street	Occupancy	On-street	Occupancy
Wednesday	17/07/2019	55	59%	10	83%
Thursday	2/05/2019	48	51%	10	83%
Sunday	14/02/2019	21	22%	8	67%
Saturday	22/12/2018	41	44%	5	42%
Sunday	19/10/2018	51	54%	12	100%
Sunday	23/09/2018	22	23%	3	25%
Sunday	14/06/2018	50	53%	10	83%
Wednesday	25/04/2018	44	47%	11	92%
Monday	12/02/2018	40	43%	8	67%
Thursday	14/12/2017	62	66%	11	92%
Friday	10/10/2017	23	24%	5	42%
Friday	19/09/2017	56	60%	12	100%
Sunday	4/06/2017	14	15%	7	58%
Monday	24/04/2017	48	51%	9	75%
Tuesday	19/02/2017	38	40%	4	33%
Monday	16/01/2017	33	35%	3	25%
Monday	19/09/2016	41	44%	11	92%
Monday	10/10/2016	27	29%	7	58%
Tuesday	12/07/2016	39	41%	9	75%

4.2.3 Ratios of Other Locations

On the basis of feedback from the Design Review Panel of the Town of Mosman Park, a desktop analysis was undertaken of seven other comparable facilities in order to understand the range of provision of parking bays based on their estimated NLA. The overall outcomes are shown in Table 2.

The seven facilities were chosen as they had a 'centre' type function within the area and were co-located with other businesses such as a cafés (including alfresco areas), hairdressers, medical/pharmacy, and other uses. All onsite bays were counted including ACROD bays, as well as any on-street bays directly adjacent to the site. On-street bays located across the road were not included.

The seven centres chosen, within higher socio-economic locations to were:

- IGA, Marmion
- IGA South Fremantle
- The Herdsman, Wembley
- IGA, City Beach

- IGA, Wembley
- The Good Grocer, Shenton Park
- The Good Grocer, Applecross.

Table 2 Comparison of other centres and provision of total parking

Location	Estimated NLA	Ratio per NLA m^2	Off-street Bays?	On-street Bays?	Estimated Bays
Marmion	2,970	17	Yes	No	173
South Fremantle	2,544	19	Yes	Yes	131
Wembley (Herdsman)	2,710	22	Yes	No	122
City Beach	3,891	22	Yes	Yes	176
Wembley	2,154	30	Yes	Yes	122
Shenton Park	2,188	31	Yes	Yes	70
Applecross	4,114	29	Yes	Yes	140

This analysis showed an average of one bay per 24m^2 of floorspace to cater for the uses at these sites.

The outcomes from this assessment assisted in the development of the project layout and the submission of the DA, where there is additional provision of on-street bays along the Manning Street frontage to accommodate short term parking requirements related to retail premises. The management of these bays should be reflective of the number of short stay trips, with 15 minute controls being the primary form of control.

4.2.4 Crash implications

The proposed outcomes of the DA set out preference for 90 degree bays to be located on-street on Manning Street and parallel bays on Samson Street. This configuration is on the basis of an active retail frontage on Manning Street and the form of interface continuing around Wellington Street to Manning Street with parallel bays on Samson Street to attract fewer trips.

Safety in relation to the use of bays in the area was examined. Main Roads WA crash data was examined for a period of 5 years on Wellington Street. In this time (with Wellington Street carrying substantially more traffic than would be the case with Manning Street) there were two minor midblock crashes associated with parking – one at 8.45am and another at 4.05pm.

Other 90 and 60 degree parking locations for lower order or convenience centres around Perth were examined for any empirical crash data or patterns, including:

- Moresby Street, Kensington (90 degree) – 1 crash in five years involving parking, one for exiting a driveway
- Ardross Street, Applecross (60 degree) – 4 crashes in five years involving parking, mainly sideswipe minor
- Cowling Street, Attadale (90 degree) – 1 crash in five years involving parking, 1 exiting a laneway
- Stuart Street, Mosman Park (60 degree) – 2 crashes in five years involving parking
- Kirwan Street, Floreat (90 degree) – 1 crash in five years involving parking
- Second Avenue, Mount Lawley at IGA (90 degree) – 2 crashes in five years involving parking
- Fifth Avenue, Inglewood at Inglewood Hotel (90 degree) – 1 crash in five years involving parking.

None of these locations, supported by Main Roads WA empirical crash data, indicate that provision of on-street 90 degree parking will result in substantial safety issues for vehicle movements if 90 degree bays are installed.

For Manning Street, safety in design could be improved through tightening of kerb radii at intersections of Wellington Street and Samson Street, installation of entrance treatments such as pavement changes and deflection at the roundabout, improved signage and line markings, installation of landscaping treatments and use of other traffic management measures as required.

4.2.5 Overall outcomes of Parking Review

The overall outcomes from the occupancy survey for the area show for typical peak conditions that there is an overprovision of off-street bays for the site and that on-street bays are well used for short trips in and out of the area, specifically those on Wellington Street. This indicates that the ratio of bays per GFA or NLA for retail and commercial uses was not reflective of actual use.

To accommodate the retail and commercial uses proposed on site, a range of on-street short term bays for convenience shopping and off-street bays for longer stays associated with Food and Beverage and shopping retail would be effective in providing for demands.

4.3 On-site Parking

For residential land uses, there are a total of 76 apartments and 7 townhouses proposed to be developed. The development proposes 128 residential bays, 54 retail/commercial bays (including an ACROD bay), two bays for car share and two loading docks over three levels on-site. There are six at-grade short term bays for retail/commercial use located in Turnbull Way. 12 Motorcycle bays are provided for residential tenants.

The proposed distribution of parking bays over the three levels is summarised in Table 3, and displayed in Figure 12 (ground floor), Figure 13 (basement level 1) and Figure 14 (basement level 2). Residential visitor bays are proposed as a reciprocal use to the commercial bays given the volume of bays within the development site. Car share bays would be allocated on basement level 1 within a parking management plan.

Table 3 Distribution of bays throughout parking levels on site

Parking Level	Number of Parking Bays				
	Residential	Service	Motorcycle / Scooter	Retail / Commercial / Visitor	Car Share Bays
Ground	0	2	0	6	0
Basement 1	21	0	0	54	2
Basement 2	107	0	12	0	0
Total	128	2	12	60	2

All parking bays, aisles, ramps, and circulation roadways will be designed to comply with Australian Standards 2890 Parking Standards Part 1: Off-street car parking.

Figure 12 Proposed ground parking (source: NH Architecture)

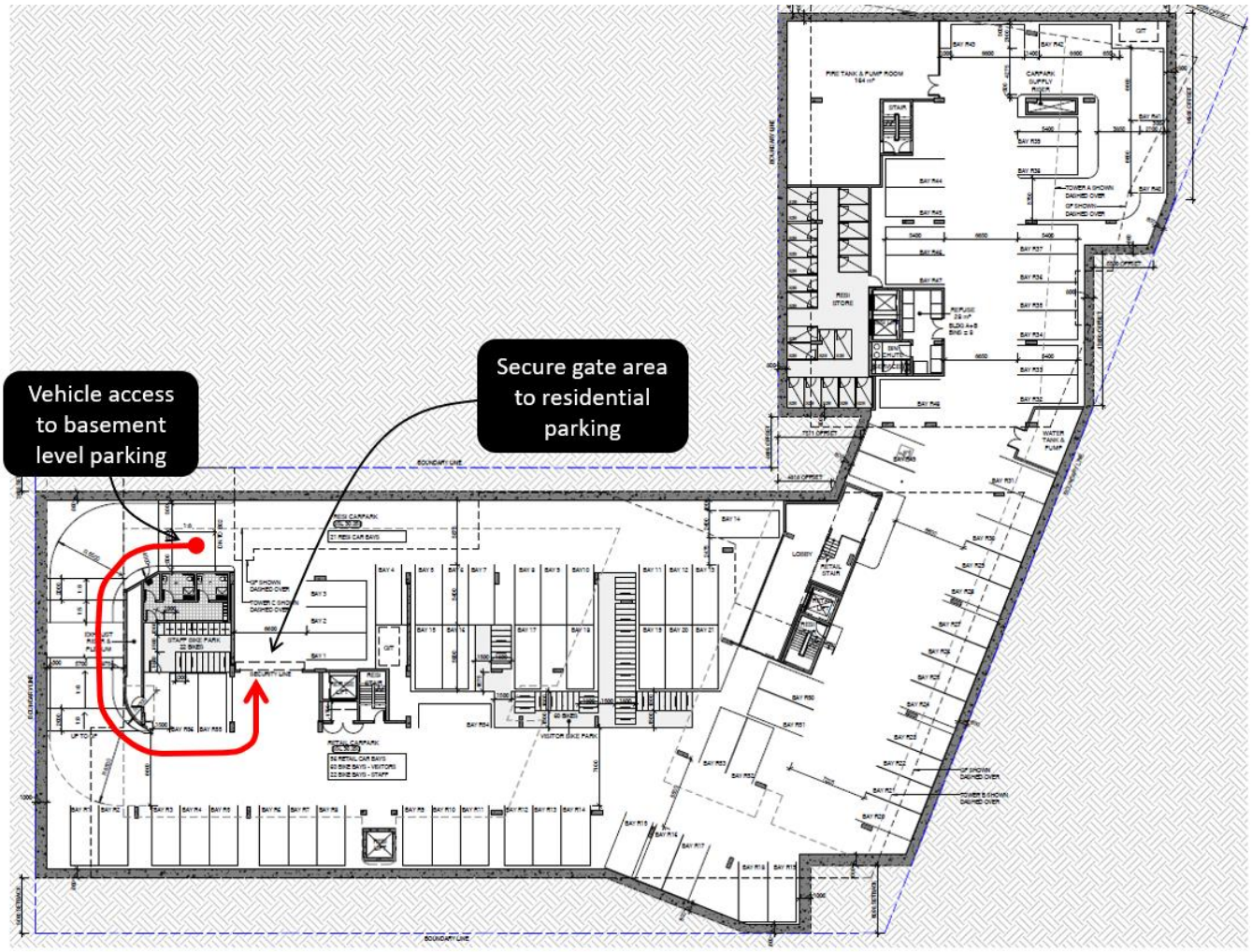


Figure 13 Proposed basement level 1 parking (source: NH Architecture)

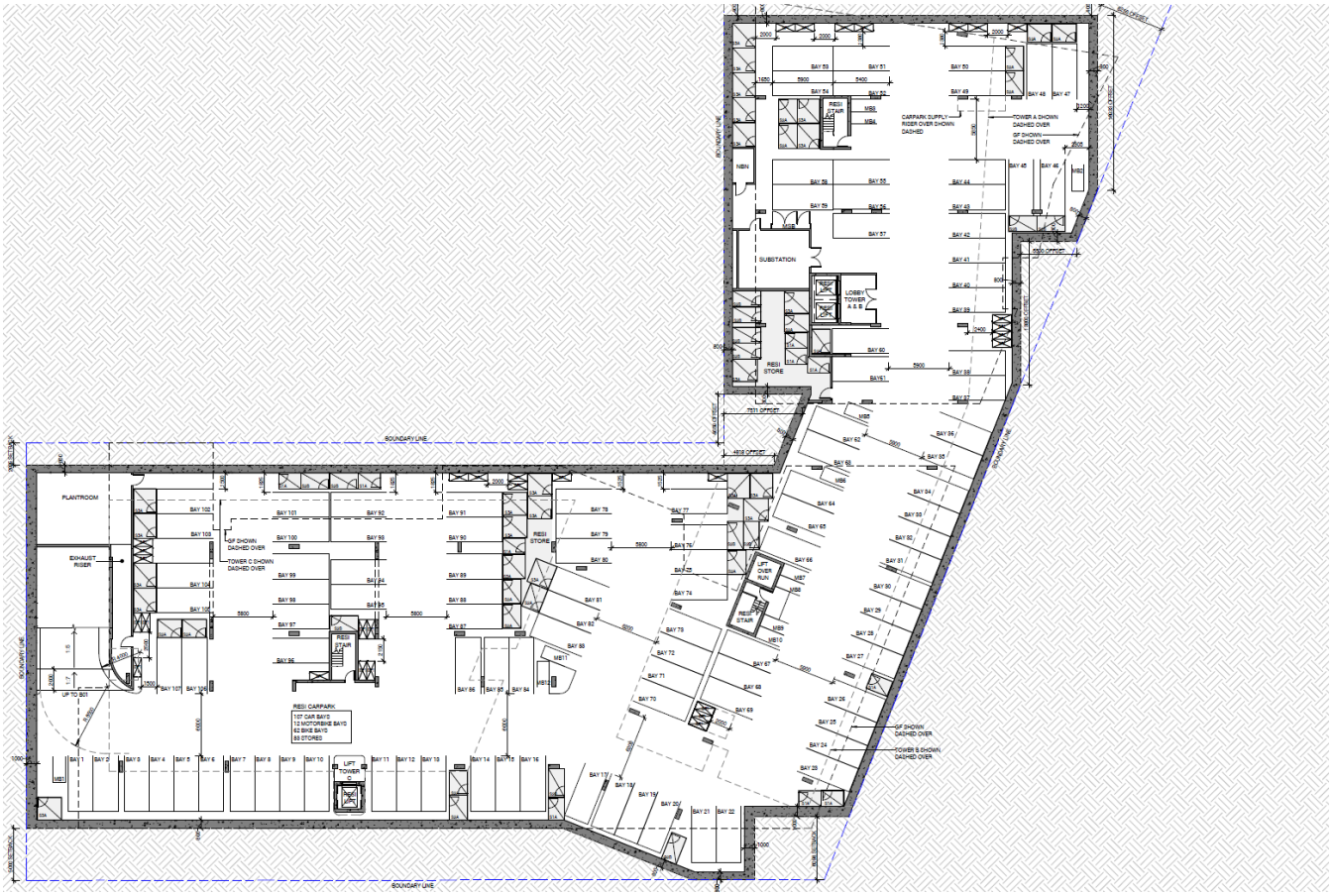


Figure 14 Proposed basement level 2 parking (source: NH Architecture)

4.4 Off-site Parking

15 new 90-degree angled parking bays are proposed to be created along the western side of Manning Street which incorporates two ACROD bays and required shared space. Eight embayed parallel parking bays will be created along Samson Street.

An embayed parking bay on Wellington Street has been allocated for emergency vehicles and the existing embayed bus stop on Manning Street is maintained.

These proposed off-site parking bays, alongside those already provided on the westbound carriageway of Wellington Street are shown in Figure 15.

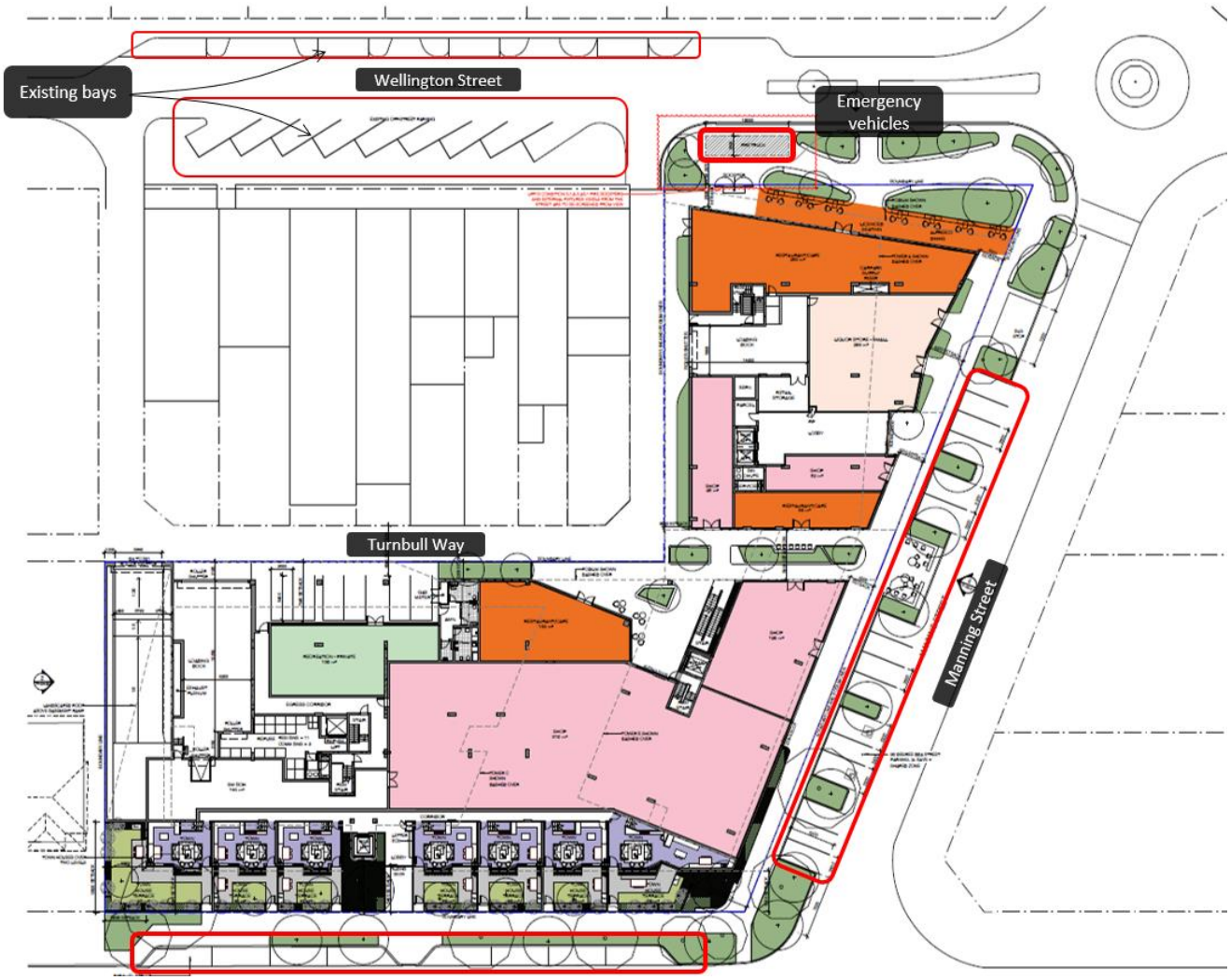


Figure 15 Proposed on-street parking (source: NH Architecture)

4.5 Car Parking

The minimum parking requirement for residents, their visitors and the commercial tenancies are outlined in Table 4. This table displays the acceptable outcomes for parking under State Planning Policy 7.3 Residential Design Codes Volume 2 – Apartments (released in February 2019) within Location B for 83 dwellings, including the grouped dwelling townhouses.

Table 4 Required car parking –SPP 7.3 (Volume 2) and Local Planning Scheme No 3

Bay Type	SPP 7.3 (Volume 2)			Proposed Bays
	Minimum rate	Bays		
Resident	1 bay per dwelling – 1 bedroom 1.25 bay per dwelling – 2+ bedroom	101	203	128
Residential Visitor	3 bays + 0.125 bays per apartment (13th dwelling and above)	12		reciprocal use of 60 retail bays
Residential Motorcycle	1 space for every 10 car bays provided	11		12
Car Share Bays	-	0		2

Residential car parking is proposed at an average rate of 1.66 bays per dwelling. The proposed provision of 128 bays represents an acceptable level under the provisions of SPP 7.3 (Volume 2). 12 Motorcycle bays are also provided for residents.

Residential visitor parking is proposed to be accommodated within the on-street and on-site commercial parking locations as a reciprocal use to commercial visitor parking. Reciprocal use of bays between residential and commercial visitors removes the need for individual bay allocation and results in a more efficient and optimal use of these bays without overprovision. The demand profile for residential visitors typically occur outside the demand for commercial visitors.

The parking requirements for the site based on categories set out within the Town of Mosman Park Local Planning Scheme No.3 are set out in Table 5. This indicates a requirement of 146 total bays for the non-residential land uses. At present, there are 97 on-site bays servicing the existing retail and fast food offerings.

Table 5 Required car parking non-residential land uses

Bay Type	Requirement	Bays	Proposed Bays On Site
Commercial (LPS rates)	Shop 1:20m^2 NLA	68	60
	Café/restaurant 1:4m^2 FOH (70% GFA)	63	
	Podium Retail 1:20m^2 NLA	10	
	Gym (have applied City of Stirling 1 per 20m^2 usable space) as no category applicable	6	

The overall increase in commercial and retail floor space at the site is not substantial with the key difference in use being the provision of two separate tenancies in the site for restaurant and café land uses. The rates set out in Table 5 reflect individual land uses that would stand alone.

For the gym area, there is no specific category within the LPS No.3 Schedule 1, therefore a comparison rate taken from the City of Stirling Parking Policy which sets out a rate of 1 bay per 20m^2 of usable area has been applied.

The total volume of parking provided by the development for uses outside of bays associated with residential units is:

- Basement parking – 54 bays, including 1 ACROD
- On-street bays (Turnbull Way) – 6 bays
- On-street bays (Samson Street) – 8 bays
- On-street bays (Manning Street) – 15 bays, including 2 ACROD.

This equates to a total provision of 83 bays, or a ratio of 1 bay per 24m^2 NLA, the same ratio of parking per m^2 NLA as the seven other centres benchmarked in Table 2.

4.6 Car Share

Two spaces will be allocated to a car share scheme such as Go Get or Green Share Car on basement level 1. These programs, through an annual membership and monthly fees, provide members the option of using the vehicles for private use. Research has shown car share schemes are beneficial to residents who have limited access to private vehicles and provide incentives to reduce both the frequency with which people use a car, as well as reducing rates of car ownership.

Reducing the frequency of car usage as well as reducing car ownership is an essential part of improving the mode balance within an area.

Research undertaken by Philip Boyle Associated for the International Carsharing Association has shown that vehicles associated with residential development car share schemes within Australian cities can replace up to 10 other vehicles that otherwise would be allocated to individual residential units. For mixed use sites with a range of resident demographics such as Mos Lane, car sharing schemes are an efficient means of reducing the impact of private vehicle traffic whilst still affording flexibility of travel modes to residents.

4.7 Commercial Parking Demand

Existing commercial parking demand has been set out in section 4.2. This has been informed by:

- Surveys collected from the site
- Review of seven other similar centres in locations that are comparable
- Review of a range of other material relating to parking demand
- Use of the existing site provisions and profile of use.

A total of 60 bays on site are proposed to cater for the retail and commercial demand profile of the site. In utilising the average of the comparable sites set out in Table 2 of one bay per 24m^2 of combined retail and commercial space, this would result in a requirement for 83 parking bays to be provided. This value is also reflective of State Planning Policy 4.2 for Activity Centre parking rates for non-residential land uses.

4.8 Schedule 1 Assessment

Under the Town of Mosman Park Local Planning Scheme No.3, there is the potential to seek concession for parking levels associated with a development. The criteria, as set down in Schedule 1 are:

"(i) whether a demand for car parking associated with the proposed development, which is less than the requirement in Schedule 1 has been demonstrated;

(ii) the availability and likely use of modes of transport other than the private car;

(iii) the practicability and likelihood that carpooling will be employed, as a means of reducing the demand for parking;

(iv) the availability and likely level of use of end-of-trip bicycle facilities;

(v) the availability of public parking in the locality including street parking;

(vi) any reduction in car parking demand due to the joint use of car spaces;

(vii) any car parking deficiency or surplus associated with the existing use of the land; and

(viii) any other relevant consideration".

These elements are addressed in the following sub-sections.

4.8.1 Demand for parking associated with proposed development

The existing demand for parking relating to the retail and commercial elements of the site are addressed within this TIA in section 4.2, which clearly establishes the existing profile of parking at the site being much less than the existing provision of 97 bays on site during peak operations. The overall average occupancy ratio is reduced when also considering on-street bays.

This is then supplemented by the assessment of seven other similar locations around Perth set out in Table 2 which has an available average of 1 bay per 24m^2 of NLA.

The critical element to the function of the existing retail and commercial land uses is the reality that most vehicle trips to the centre are very short stay and high turnover vehicle trips – many in the afternoon peak period were observed to be linked trips from places of employment and from local schools where stays at the centre were short and based on convenience shopping at the existing Liquor Store, fast food outlet or the IGA supermarket. In the morning peak period, the trips were more predominantly to existing sites on Wellington Street (Post Office, Café), Bakery and the IGA.

During the lunch periods on weekends, the site would typically be at its busiest. With existing occupancy profiles, it would be expected that these land uses would attract more trips but there would still be availability.

This is illustrated from survey data at the site in October 2019 shown in Figure 16 and Figure 17. The longer term bays, available on site and within the secure basement, would cater for the longer stay café and restaurant trips, including the alfresco area, whilst the on-street short terms bays would still provide the function required for the short-stay retail convenience trips.

Staff trips to the site general parked at the rear of the complex away from the higher turnover bays fronting Manning Street.

The key element of change for the site will be the inclusion of Café and Restaurant facilities at the centre. These would more typically expect demands for lunch sittings and evening sittings from Thursday to Sunday. During the evening sittings, there would be ample on and off-street parking to cater for the demands of a restaurant on-site, including the alfresco area, given the total supply of parking around the centre and lack of competing uses still open or attracting trips.

The site walkability catchment and more typical profile of higher average vehicle occupancy or on-demand trips would also reduce demand for vehicle trips and parking to the site.

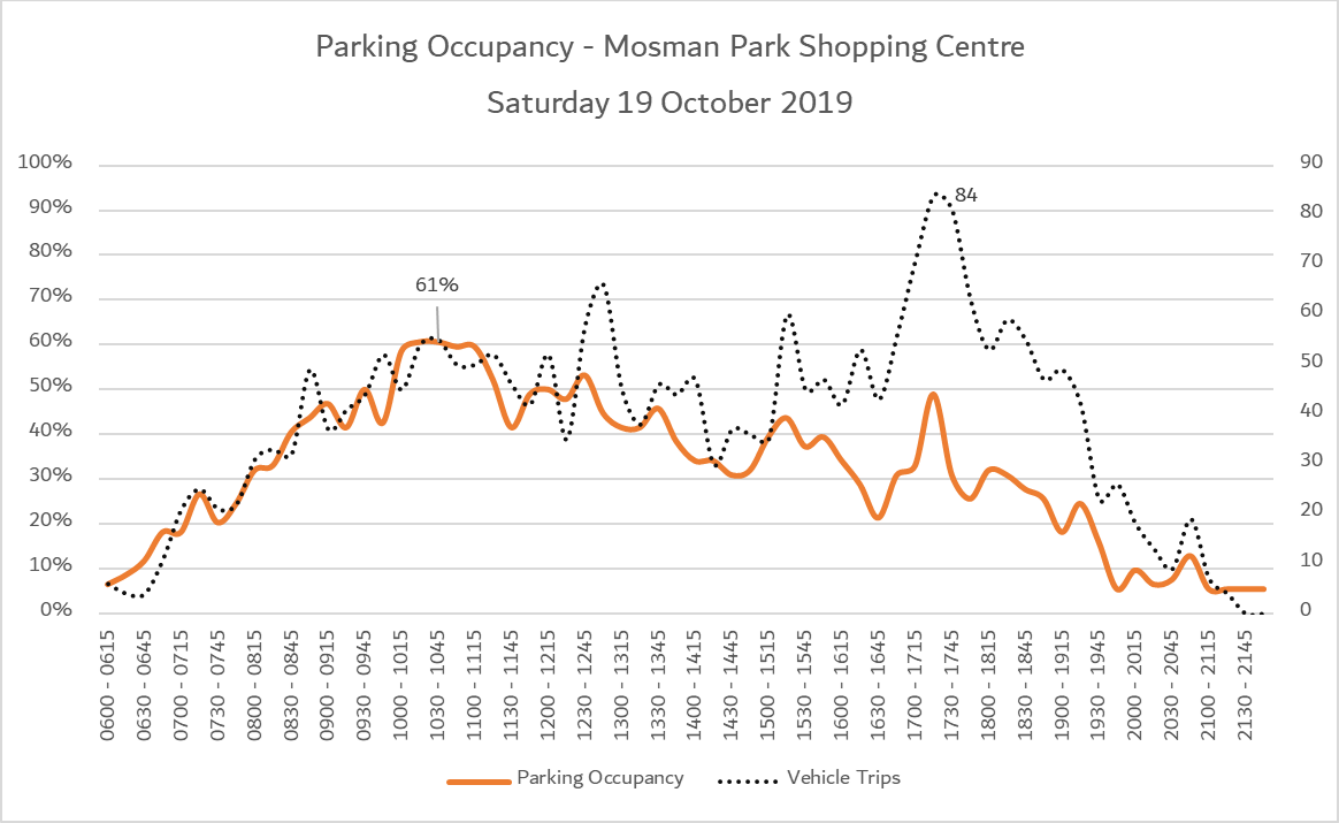


Figure 16 Parking occupancy and trips generated - Saturday 19 October 2019

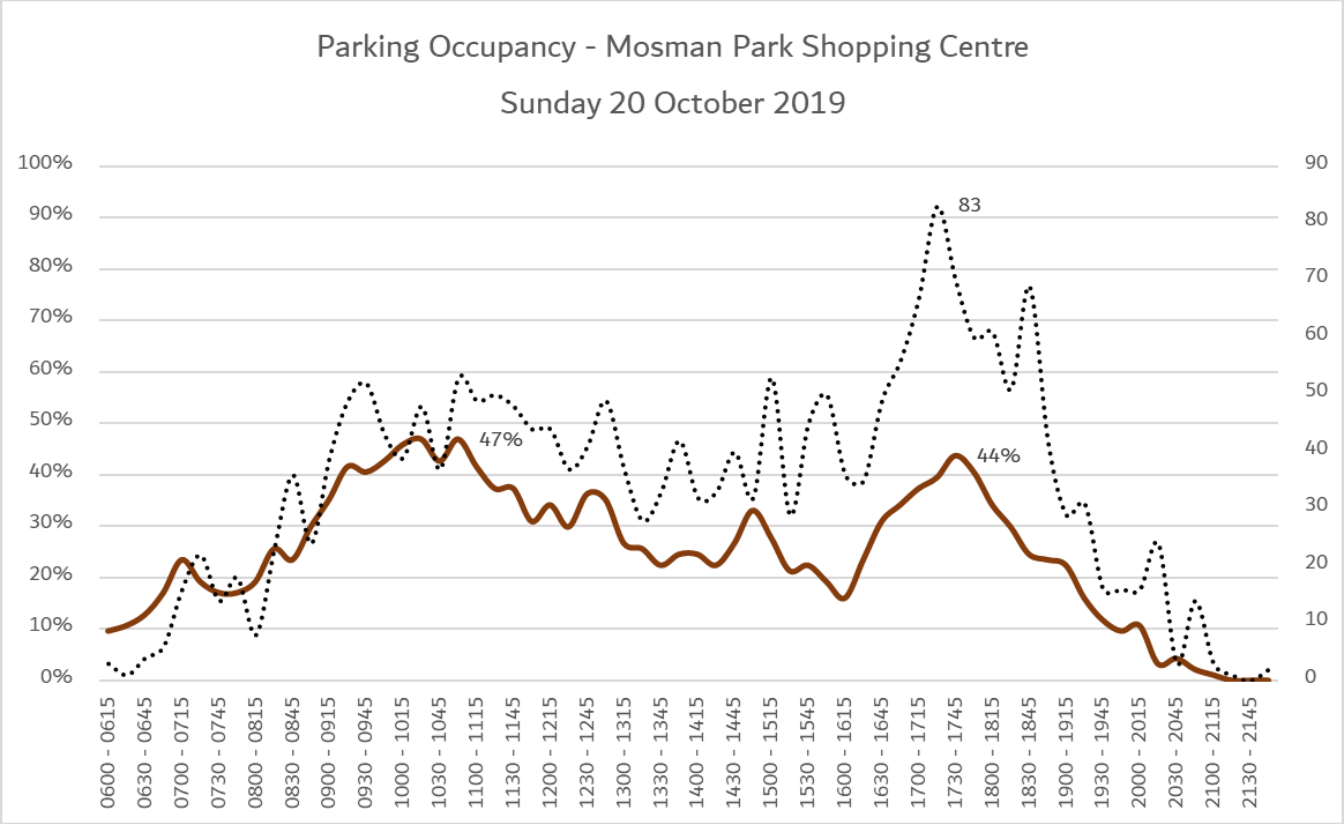


Figure 17 Parking occupancy and trips generated - Sunday 20 October 2019

4.8.2 Availability of other modes

Pedestrian and cycling elements around the site are set out in sections 9 and 10.

The current site layout promotes vehicle use, which is reflected in the existing trip profiles and high turnover/short stay trips. Notwithstanding this, the area has a 360 degrees walking catchment and much of the surrounding street network is serviced by footpaths with shade trees prevalent.

Proposals included within the development plans include:

- Removal of five separate vehicle access points on Wellington Street, Manning Street and Samson Street which will substantially improve pedestrian and cycling amenity around the site
- Higher quality pedestrian interface, including active frontage along Manning and Wellington Streets including al fresco areas
- Internal connections through the site to aide pedestrian movements and permeability at all times of the year
- Substantial bike parking provision for residents and visitors in a range of locations around the site
- Provision of additional shade trees and landscaping improvements as set out in the DA Report and Landscape Plan
- Provision of end of trip facilities for staff on site to reduce staff parking and vehicle trips
- Provision of additional amenity elements such as dog water bowls to encourage as many users to walk to the site as practical.

The site is serviced by Transperth bus stop adjacent to the entrance on Manning Street.

4.8.3 Car Pooling

The potential for car-pooling of staff would be limited but could be expected during some retail shifts. Use of shared rides and higher levels of vehicle occupancy would be expected for visitors to food and beverage outlets through designated drivers or pick up and drop off from multiple residences en route.

4.8.4 Provision and use of End of Trip Facilities

The provision of secure bike storage facilities and dedicated, quality End of Trip facilities within the development will encourage staff to use cycling or walk / run modes to travel to or from the site. This is particularly relevant given the local catchment of the retail and commercial offering proposed and the work force of the site.

Provision of these facilities on site will open up the opportunity for more cycling trips in particular and therefore reduce vehicle demands associated with the retail and commercial land uses on site.

Details in relation to the End of Trip facilities are set out in section 10.3.

4.8.5 Availability of Street Parking

Assessment of parking supply and demand for the site has been extensive and presented to the Town of Mosman Park during the course of preparation for the DA. Assessments in relation to parking supply and demand are set out in sections 4.2, 4.4, 4.5 and 4.6.

As set out in the development plans, the 60 parking bays provided on site for food and beverage, commercial and retail land uses are proposed to be supplemented by the proximity of on-street bays on Wellington Street, Samson Street and Manning Street. When combined, the total provision of on-street bays directly adjacent to the site is proposed to be increased to cater for 23 at maximum capacity, including additional ACROD bays.

This would take the total capacity available for the retail and commercial land uses to 83 bays.

This volume of available on-street parking would complete the role that is required – provision of capacity for short stay trips associated with retail and commercial land uses.

4.8.6 Reduced demand due to Joint Use

The existing profile of parking use at the site is set out in detail using empirical data collected for the DA in October 2019, as well as assessment of historical Nearmap imagery. Those details are shown in section 4.2.1. The key difference in retail and commercial land uses proposed for the site are associated with café and restaurant outlets.

To understand the existing profile of use and how that would translate to potential joint use, four other existing facilities in Mosman Park were examined using the Google mapping functionality which record visitation by mobile devices per time period. These are shown in Figure 18.

This information illustrates that existing facilities in Mosman Park on peak visitation days of Saturday tend to operate as most food and beverage outlets – a much later peak visitation on weekends associated with dinner sittings over a number of hours. Freshwaters includes a breakfast and brunch component, which is also evident at Belin.

From this information, when comparing the four local food and beverage outlets against the visitation profile of the existing IGA on the site, the difference in profile is evident – as shown in Figure 19. This illustrates that the higher demands for the food and beverage outlets proposed, including alfresco areas such as at Samsons Paddock, would be outside of the core areas of demand for the largest land use on site – the IGA.

The profile of the food and beverage would also not compete with residential land uses on the site. These outlets would also tend to utilise the longer stay parking within the basement structure at the site than occupy the on-street parking during the day – this is due to length of stay.

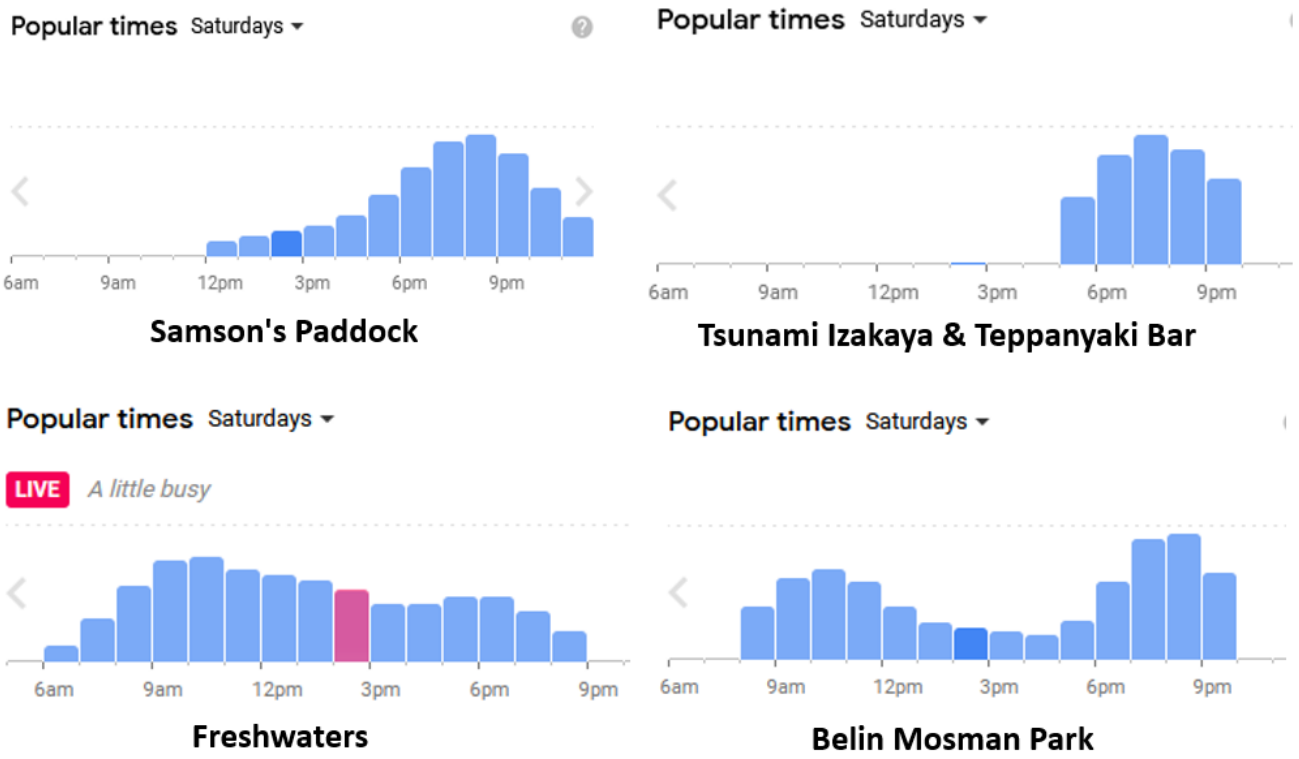


Figure 18 Existing Google use profiles - cafe and restaurant in Mosman Park

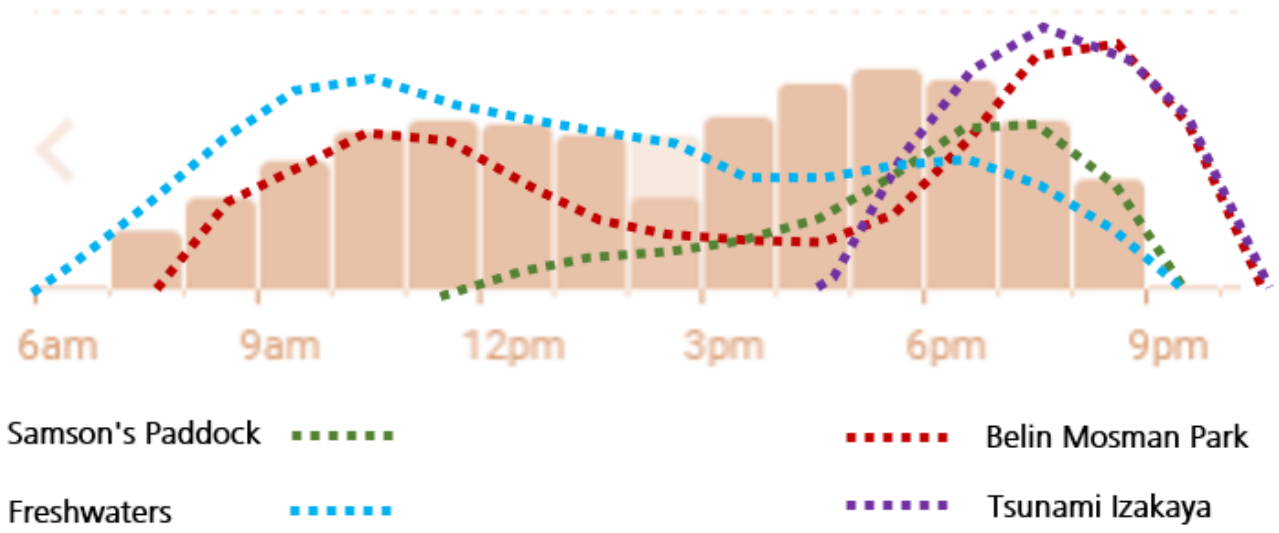


Figure 19 Profile of usage - local restaurants and Naturally Fresh IGA

4.8.7 Deficiency or surplus associated with existing uses

As set out in the parking occupancy assessments within section 4.2, there is a low level of occupancy take up and demands associated with the existing retail premises on site. This would indicate an existing over provision of parking spaces for the effective and efficient functioning of the site. This level is typically acknowledged as being 85% occupancy. At no stage, within site visits, Nearmap assessments or the actual parking occupancy surveys, was there close to capacity demand for parking on site.

4.9 Staff Parking

Staff parking on the site would be accommodated for in the basement parking area. A Parking Management Plan would establish use of the bays and this would be controlled through the strata management agreements over the site.

Bays would be allocated to a specific use subject to control over set times. It would be expected that all retail and commercial bays within the Basement 1 level would be available to visitors to the site outside of general working hours – this is particularly crucial for the weekend periods when food and beverage outlets would be operating.

4.10 Parking Management

Given the nature of the site, accommodating a range of uses, a Parking Management Plan should be developed upon approval of a DA which would cover relevant information such as:

- Location of bays for users
- Markings and identification of bays
- Wayfinding
- Management of bay allocations
- Timing and availability of bays
- Security and control of access for residential bays.

5. PROVISION FOR SERVICE VEHICLES

5.1 Residential Service Vehicles

The Town of Mosman Park will service the waste collection for all residential dwellings at the subject site. The waste collection vehicle will access the loading dock on the ground floor via Turnbull Way from Wellington Street and is shown in Figure 20. Residents will use a dual waste chute system which allows waste to be collected from a centralised location. The townhouses will have their own individual set of bins based on the Town of Mosman Park's standard residential service and will be collected from Samson Street.

More detail on residential waste collection can be found in the Waste Management Plan which accompanies this application.

Small moving trucks, with a cargo capacity for 19.5 cubic metres to 22 cubic metres, and the dimensions 6.4m wide by 2.5m wide and 3.1m tall can be accommodated within the residential loading dock. Apart from trucks, vans (such as Ford Transit Vans) can also be accommodated, with the largest of these vans being 2.8m high.

Figure 20 Ground floor loading dock and swept path of 8.8m truck (source: NH Architecture)

5.2 Commercial Service Vehicles

A private contractor will service the waste collection for the commercial tenancies and will occur three times a week from the loading dock shown in Figure 20.

More detail on commercial waste collection can be found in the Waste Management Plan which accompanies this application.

Deliveries for the commercial tenancies can use the loading dock located on the eastern side of Turnbull Way, shown in Figure 21. These deliveries would be expected to be completed by transit van or small trucks that would be able to complete a reversing manoeuvre into the bay whilst exiting Turnbull Way in forward gear.

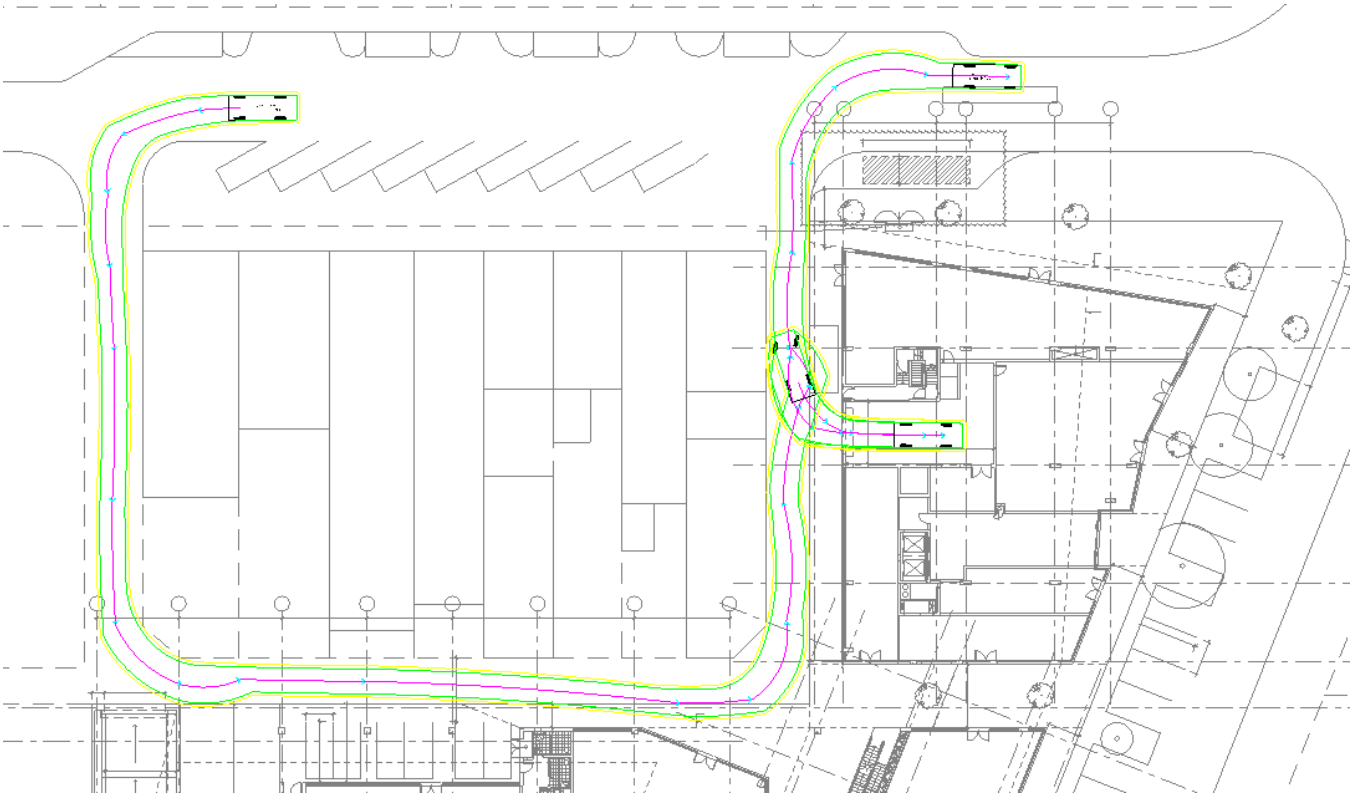


Figure 21 Delivery loading dock (source: NH Architecture)

5.3 Existing Properties – Wellington Street

There are a number of properties fronting Wellington Street that currently utilise Turnbull Way for rear access. In addition, the residential property at 114 Wellington Street uses Turnbull Way to access a rear parking area for a boat. Examples of access points, and the boat storage area at 114 Wellington Street, are shown in Figure 22. Changing the flow in direction of Turnbull Way would not impact access to these sites given the lane width would accommodate service vehicles to the subject site and access gates are generally all on the zero lot line for the existing properties.

Figure 22 Turnbull Way - existing access points (source: Google Street View)

6. DAILY TRAFFIC VOLUMES

6.1 Existing Traffic Volumes - 2019

On-site observations were undertaken in October 2019 to collect traffic and parking data that would inform the design development and the submission of the DA for the site. This data was collected for a Friday, Saturday, Sunday and Monday and has been used in this assessment as an indication of peak movements for vehicle traffic given that it was recorded during schools being in and no impacts of COVID-19 on the network.

The peak periods recorded were:

- AM peak hour for trips into and out of the centre was from 8.15am to 9.15am. This peak is reflective of retail trips being made just after the commuting peak, would include some employee trips and would also be influenced by linked trips of family members visiting the centre after dropping off children to school in their vehicle. A composite of all peak hour movements at the centre for the AM period is shown in Figure 23.
- PM peak hour trips into and out of the centre was from 5.00pm to 6.00pm. This peak is due to convenience trips being made between work and home, the opening of the food and beverage outlets and high turnover of patrons at the liquor store. A composite of all peak hour movements at the centre for the PM period is shown in Figure 24.
- For Saturday and Sunday peaks, the highest recorded volumes was the same as the PM peak which reflected the use of the food and beverage outlets and high turnover of trips associated with the liquor store.

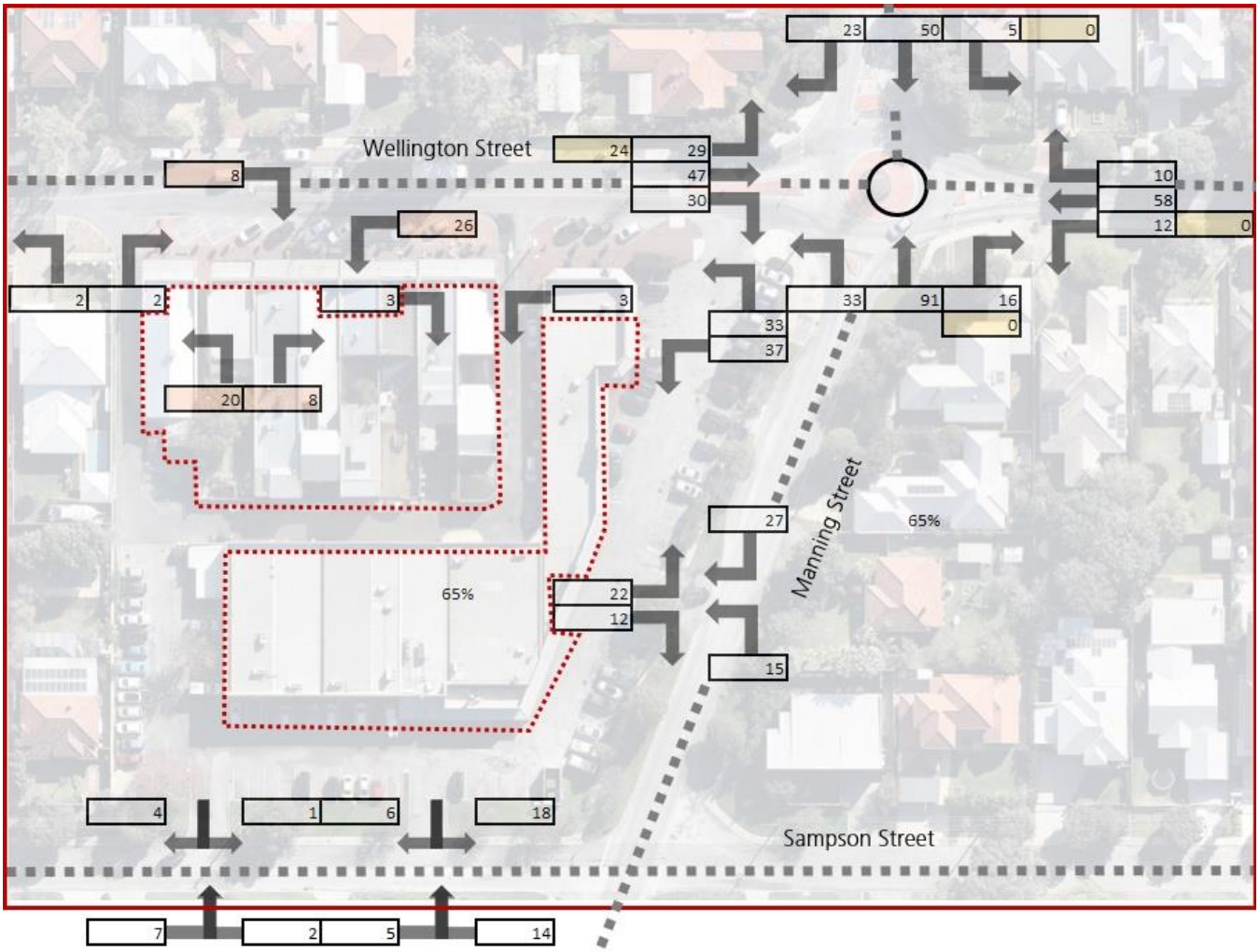


Figure 23 Composite AM peak hour vehicle trips

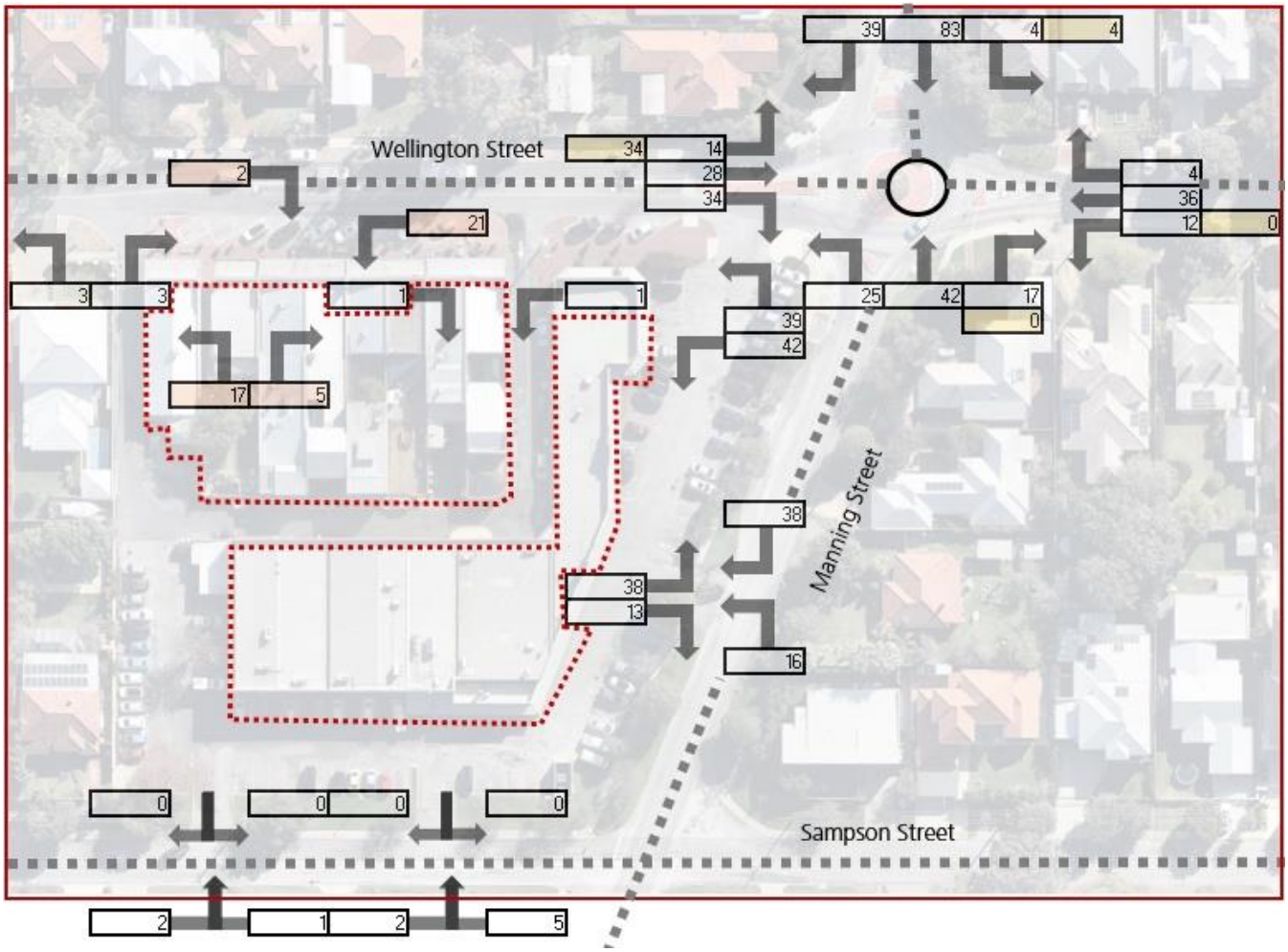


Figure 24 Composite PM peak hour vehicle trips

The existing movement of vehicles into and out of the centre as shown in Figure 23 and Figure 24 show that movements into and out of the centre are generally evenly split between Manning Street entrances and the Wellington Street entrance. The recordings also show that the bays on Wellington Street attracted a higher turnover in the AM period where there were more visits to the Post Office and Café.

These figures, which are a composite of the highest peak hour recordings for all approaches and access points, formed the basis of the traffic assessment for the proposed development.

The total trip generation of the site at present (using the existing crossover movements) is:

- AM period – 113 vehicles in, 100 vehicles out
- PM period – 106 vehicles in, 98 vehicles out.

6.2 Existing Traffic Volumes - 2020

In response to the independent review of the transport information provided to the Town of Mosman Park throughout 2019 and 2020, additional traffic counts were undertaken by SurveyTech on the surrounding street network in 2020 to understand the consistency in movements and also the movements along Samson Street and Manning Street.

The sites surveyed in December 2020, at the request of the Town of Mosman Park are shown in Figure 25.

Figure 25 Sites surveyed - December 2020

AM peak hour movements for the respective surveys are shown in Figure 26. As can be seen, along Wellington Street there was minimal difference in the recorded periods between 2019 and 2020 for an average weekday (2020 used a Thursday). The northbound approach to the Wellington Street and Manning Street roundabout was higher in 2019, potentially associated with all schools being in during that time. The differences in volumes on Manning Street accord with turning movements made associated with parking at the site.

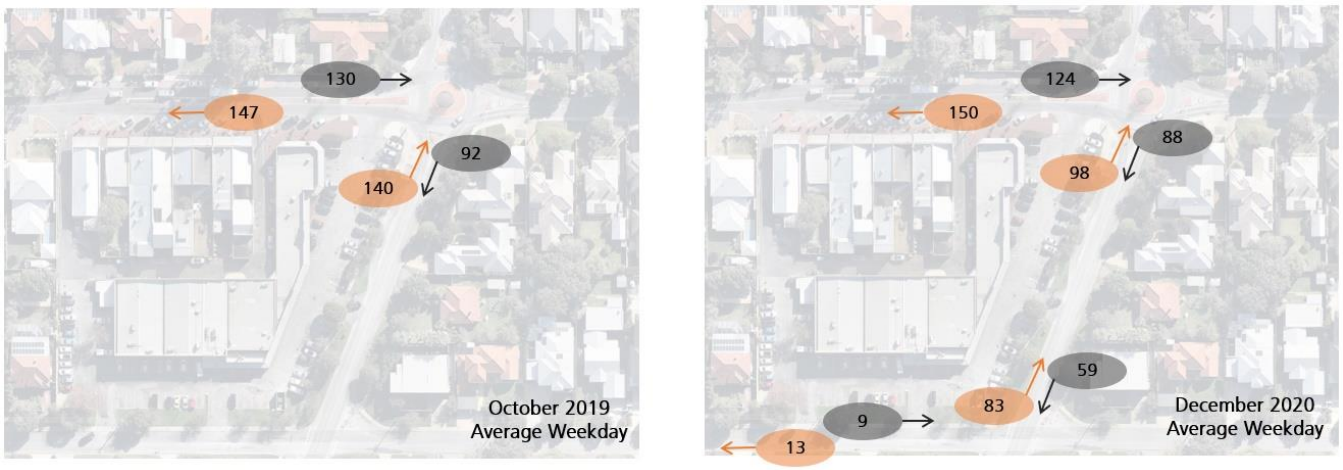
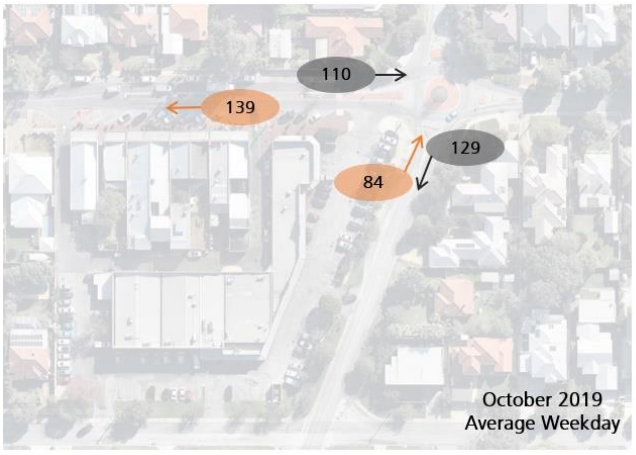


Figure 26 AM Peak Hour – Average Weekday 2019 and 2020

PM peak hour movements for the respective surveys are shown in Figure 27. As can be seen, along Wellington Street or Manning Street there were minimal differences in the recorded periods between 2019 and 2020 for an average weekday (2020 used a Thursday). As a comparison, recorded volumes along Samson Street are low. In the 2019 survey, there were 10 movements made into or out of the site during the PM peak hour.

Saturday peak hour movements for the respective surveys are shown in Figure 27. For both years, this was taken as the highest recorded volumes during either 10.00am to 11.00am or 12noon to 1.00pm due to availability of data. The 2020 peak on a Saturday is higher along Wellington Street, which could be associated with the time of the year closer to the festive season with more vehicle trips being generated. The overall volume recorded is not considered to be substantially different. Volumes along Manning Street were consistent for both periods.



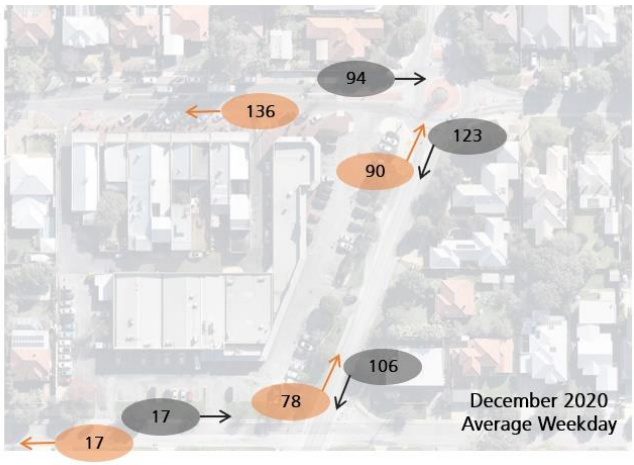
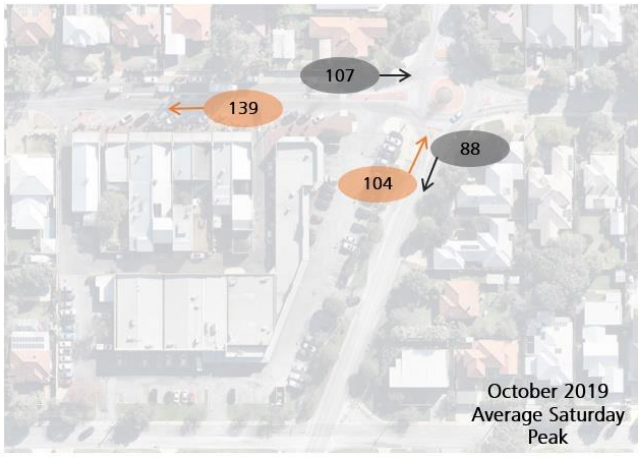


Figure 27 PM Peak Hour – Average Weekday 2019 and 2020



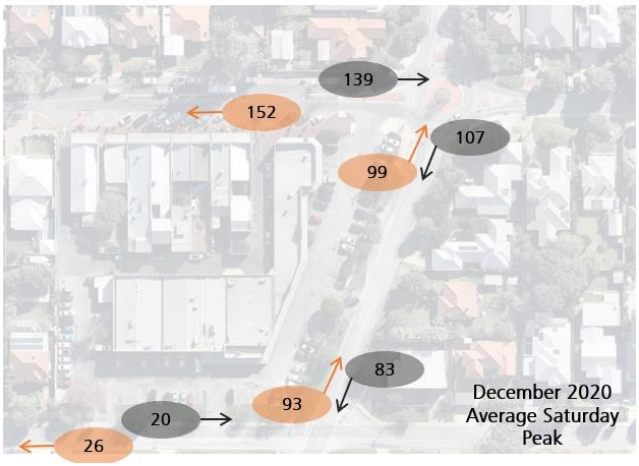


Figure 28 Saturday Peak Hour – Average 2019 and 2020

6.3 Trip Generation

A range of approaches was undertaken to determine potential vehicle trip generation from the site, with empirical data the preferred source of information given it is current and contextual. This section sets out the different approaches and conclusions.

6.3.1 WAPC Rates

The WAPC's Transport Impact Assessment Guidelines Volume 5 – Technical Guidance suggest peak hour trip rates for both residential and commercial land uses. The residential trip rates are based on the Perth and Regions Travel Surveys (PARTS) data averaged over the range of dwelling types. The recommended rate for residential land use is 0.8 vehicle trips per dwelling for the AM and PM peak hours.

These rates are considered high, given they represent an average of the entire Metropolitan area and include a high proportion of detached dwellings rather than apartments. The overall rates for residential and commercial land uses taken from the WAPC guidance is shown in Figure 29.

Table 1: Typical land use vehicle trip rates

LAND USE	UNIT	AM peak hour trip rate			PM peak hour trip rate		
		In	Out	Total	In	Out	Total
Residential	Dwellings	0.2	0.6	0.8	0.5	0.3	0.8
School	Pupils	0.5	0.5	1.0	0.5	0.5	1.0
Commercial	100m² GFA	1.6	0.4	2.0	0.4	1.6	2.0
Retail (Food) [ab]	100m² GFA	2.0	0.5	2.5	5.0	5.0	10.0
Retail (Non-food) [b]	100m² GFA	1.0	0.25	1.25	2.0	2.0	4.0
Industrial	100m² GFA	0.8	0.2	1.0	0.2	0.8	1.0

GFA = gross floor area

a – These rates should be applied to retail developments/ shopping centres that have a significant food retail component.

b – The trip rates for both food and non-food retail stores can vary significantly depending upon a number of issues including type of goods sold, location and size. Caution should be used in applying these rates arbitrarily.

Figure 29 WAPC land use vehicle trip generation rates

The only rates that were not applicable to this proposed development are those for a gym facility. Readily available information on vehicle trip generation for these types of land uses is limited, with the type of gym facility dictating the level of vehicle trips. For instance, a 24 hour access members only gymnasium would see trips spread out over the entire day whilst a class specific facility, such as the site that is directly next to the Flyt Office in Leederville, only runs classes at set times and has limited numbers.

Details on a gym facility that would closely reflect the type of facility proposed for Mos Lane was found in a DA in Melbourne, Victoria with a rate of 9 vehicle trips per 100m² in the PM peak period provided. This rate was therefore applied to the three different analyses.

The forecast total trips to and from the site in the AM and PM peak hours utilising the WAPC Guidelines trip generation rates are shown in Table 6.

Table 6 Forecast Vehicle Trips using WAPC Guidelines Rates

	AM Peak Hour Vehicle Trips	PM Peak Hour Vehicle Trips
In	40	120
Out	64	89
Total	104	209

6.3.2 Comparable Centres Rates

The second vehicle trip generation exercise completed for the site was utilising survey information from locations around Perth that had similar characteristics to this site. These included:

- Vehicle trips from the Coles development in South Perth on Angelo Street recorded by Flyt used for the supermarket component of 7.64 trips per 100m² in the AM peak and 13.88 trips per 100m² in the PM peak

- Residential unit trip rates recorded by Flyt for the Department of Planning in developing State Planning Policy SPP 7.3 of 0.3 trips per unit
- Office, commercial and other retail land use trip rates extracted from the South Perth Activity Centre Plan report
- Use of the WAPC rates for food based retail set out in Figure 29 but with a 30% reduction in the AM peak to reflect the impact of local or linked trips made to the land uses by people living in the residential component of the development
- Gym rates based on the Melbourne example discussed in section 6.3.2.

The outcomes of this assessment are shown in Table 7.

Table 7 Forecast Vehicle Trips using other local rates

	AM Peak Hour Vehicle Trips	PM Peak Hour Vehicle Trips
In	65	104
Out	43	94
Total	107	198

6.3.3 Trip Generation for Existing Development

To inform the overall assessment, use of a ratio for trips based on the existing total commercial floor space has also been applied. This ratio is based on the observations completed during peak periods in October 2019. This ensures that there is a local context to the expected volume of vehicles and reflects the use of the existing retail and food and beverage units on the site.

These ratios took into account the total level of traffic generated from all commercial and retail properties in the area, including those on Wellington Street. The ratios were 8.34 vehicle trips per 100m^2 of existing floorspace in the AM peak and 8.54 vehicle trips per 100m^2 of existing floorspace in the PM peak.

For the residential land uses proposed, a trip rate of 0.5 trips per dwelling was utilised which is higher than the empirical rates taken from the Department of Planning surveys, but lower that rates in the WAPC Guidelines which are more reflective of Ellenbrook than Mosman Park. The gym rates applied were the same as the other two analyses. The outcomes are shown in Table 8.

Table 8 Forecast Vehicle Trips using other ratio of trips to existing site

	AM Peak Hour Vehicle Trips	PM Peak Hour Vehicle Trips
In	109	131
Out	111	109
Total	220	240

6.3.4 Trip Generation Analysis Outcomes

Three separate approaches have been utilised to understand potential vehicle trip generation outcomes for the proposed development.

All three total forecast vehicle trips generated by the site have commonality for the PM peak period.

For the AM, it is clear that the use of a ratio reflecting existing behaviours at the site, alongside higher vehicle trip rates for residential land uses, has a much higher level of vehicle trips forecast. Given this, the overall volumes set out in Table 8 were used in the analysis to ensure there is a conservative reporting of traffic relating to road network performance.

Notwithstanding this, empirical data from other similar locations around Perth shows a lower level of vehicle trips than would be expected. This would be likely in this location given the immediate population and the impact of trips from within the site.

To provide this in context, the existing traffic generation of the site set out in section 6.1 is compared to the forecast trip ratio in Table 8. This comparison, in Table 9, shows that the actual growth in volume won't be substantial as the existing trips to the retail offerings are unlikely to change substantially in volume, timing or function.

Table 9 Comparison 2019 movements and 2023 forecast movements

	Existing AM (2019)	Existing PM (2019)	AM Peak Hour Forecast Vehicle Trips	PM Peak Hour Forecast Vehicle Trips
In	113	106	109	131
Out	100	98	111	109
Total	213	204	220	240

The key changes to the movements around the network will include:

- Use of Turnbull Way for movements into and out of the site. There are very few movements at present along this carriageway, therefore any increase in the volume of movements would be considered substantial over what is a very low base. Forecast trips into Turnbull Way in the AM are 38 and 56 in the PM. Forecast trips out of Turnbull Way in the AM are 30 and 41 in the PM peak. This is shown in Figure 30.
- Manning Street vehicle trips would increase as those movements that currently use the entrance and exit point on Wellington Street would use the short term bays proposed on Manning Street for the convenience trips.
- This is also true of Samson Street – where traffic that presently uses entrance and exist points off Samson Street would use Manning Street for short term parking and also Wellington Street to access the undercover bays off Turnbull Way.
- There would likely be a more consistent volume of traffic throughout a day associated with movements to and from the residential units which are not present on the site at present. This would not result in a deterioration of the network performance from a traffic perspective. As a result of the existing use and development of the site, the proposed development is forecast to generate very minimal increases in traffic on all major surrounding streets.

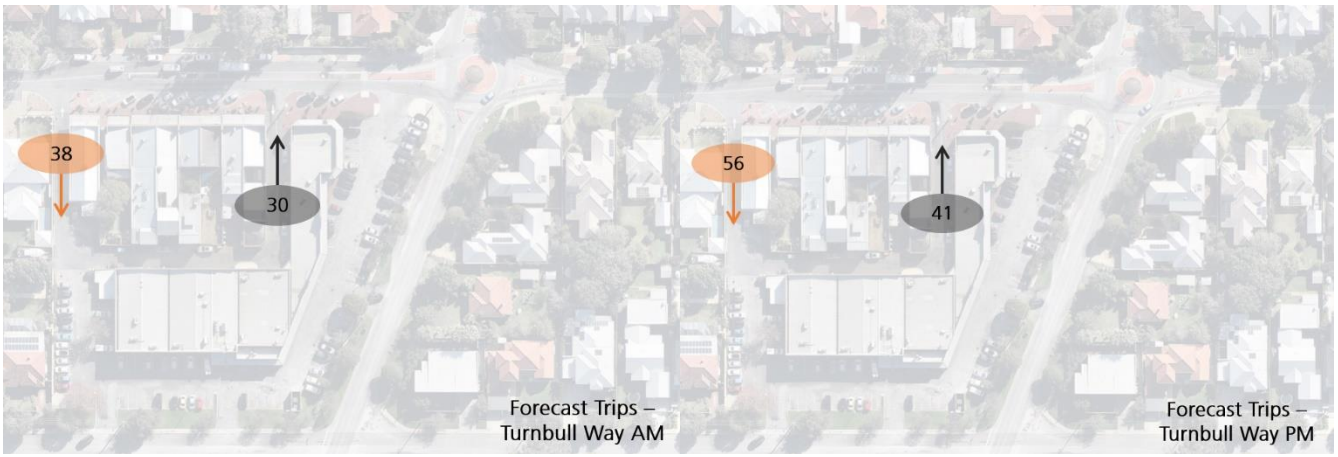


Figure 30 Forecast vehicle trips - Turnbull Way

6.4 Trip Distribution

Vehicle trips leaving the site have the following broader options:

- East – via Wellington Street from Turnbull Way
- South – via Manning Road (turn right onto Wellington Street and then right onto Manning Street) or via Stirling Highway (turn right onto Wellington Street and then right onto Manning Street, left onto McCabe Street and then left onto Stirling Highway)
- North – via Stirling Highway (turn left onto Wellington Street and then right onto Stirling Highway) or via Manning Street (turn right onto Wellington Street and left onto Manning Street).

These routes are indicatively shown in Figure 31.

Figure 31 Outbound routes from the site

Car trips travelling towards the site have the following broader options:

- From the East – via Wellington Street
- From the South – via Manning Street or via Stirling Highway (turn left into McCabe Street and then left into Manning Street)
- From the North – from Stirling Highway (turn left into Wellington Street) or from Manning Street.

These routes are indicatively shown in Figure 32.

Figure 32 Inbound routes to the site

The distribution of the vehicle traffic entering and exiting the site has utilised the proportional volumes shown in Figure 23 and Figure 24. Other routes using a combination of local streets could be utilised however these would be considered the main routes into and out of the site.

The AM distribution proportions applied in the modelling exercise of the traffic impacts are shown in Figure 33 and Figure 34, with the PM distribution proportions applied in the modelling exercise of the traffic impacts shown in Figure 35 and Figure 36.

This approach is reasonable given that many of the land uses will reflect the existing uses on site, travel behaviour through the area is well defined and there are limited routes for vehicle trips to reach regional or distributor roads.

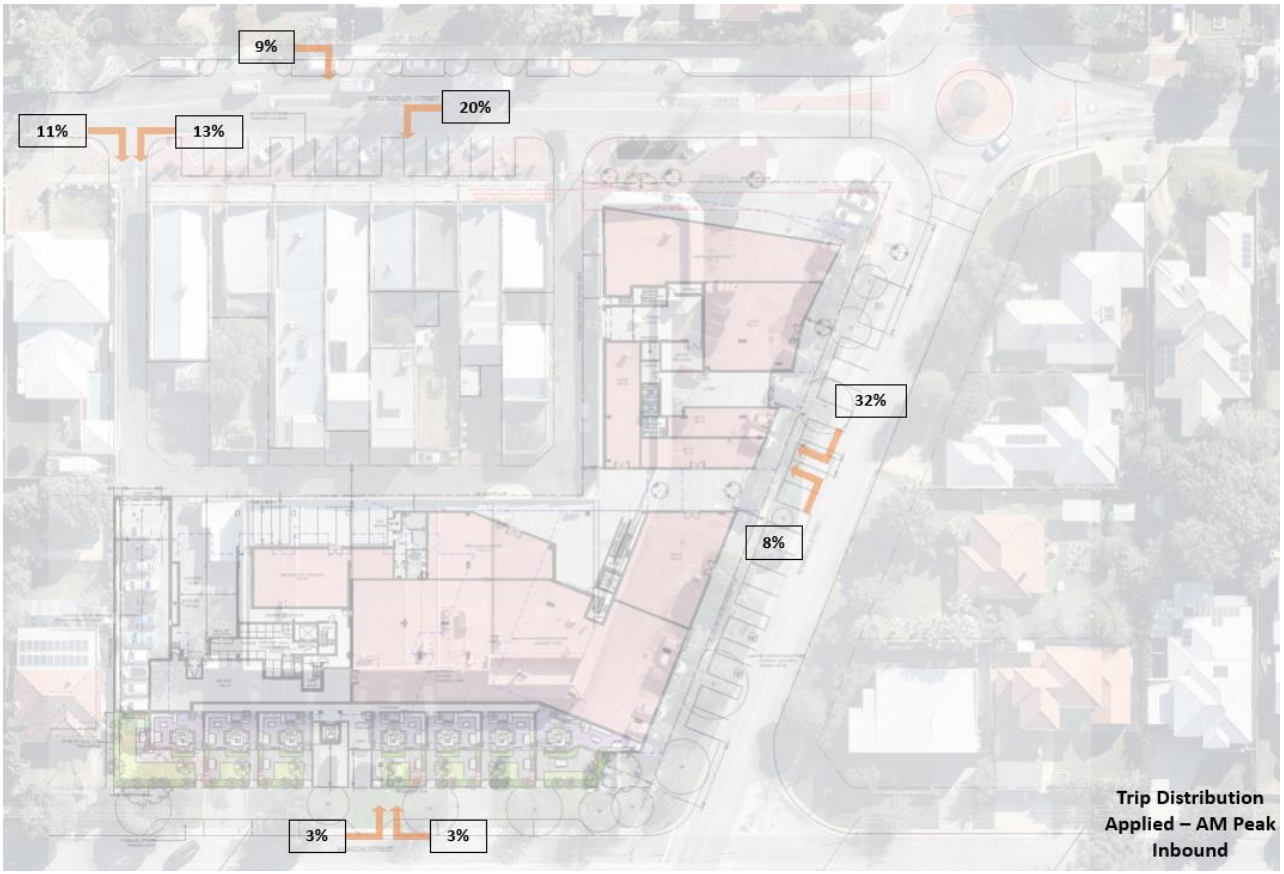


Figure 33 Distribution applied to AM inbound trips in modelling

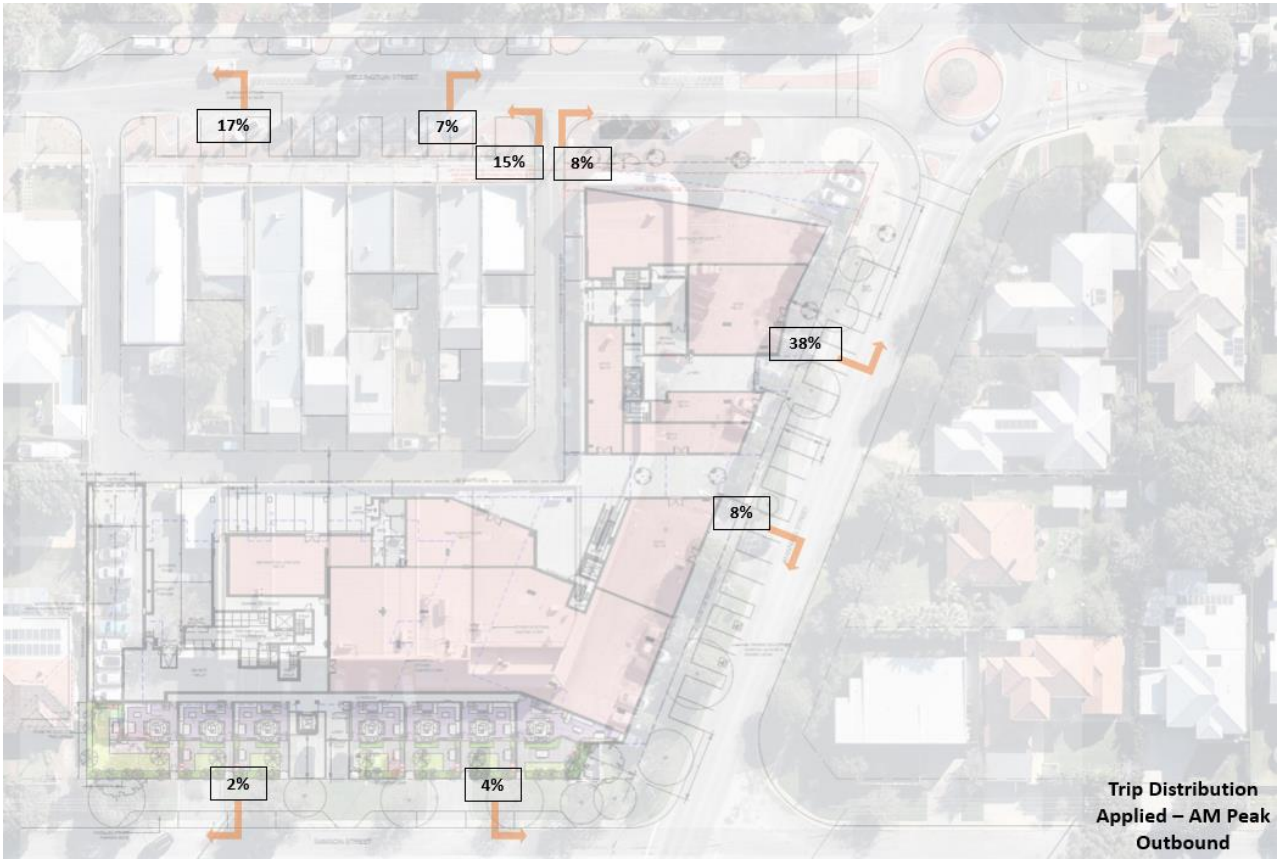


Figure 34 Distribution applied to AM outbound trips in modelling

Figure 35 Distribution applied to PM inbound trips in modelling

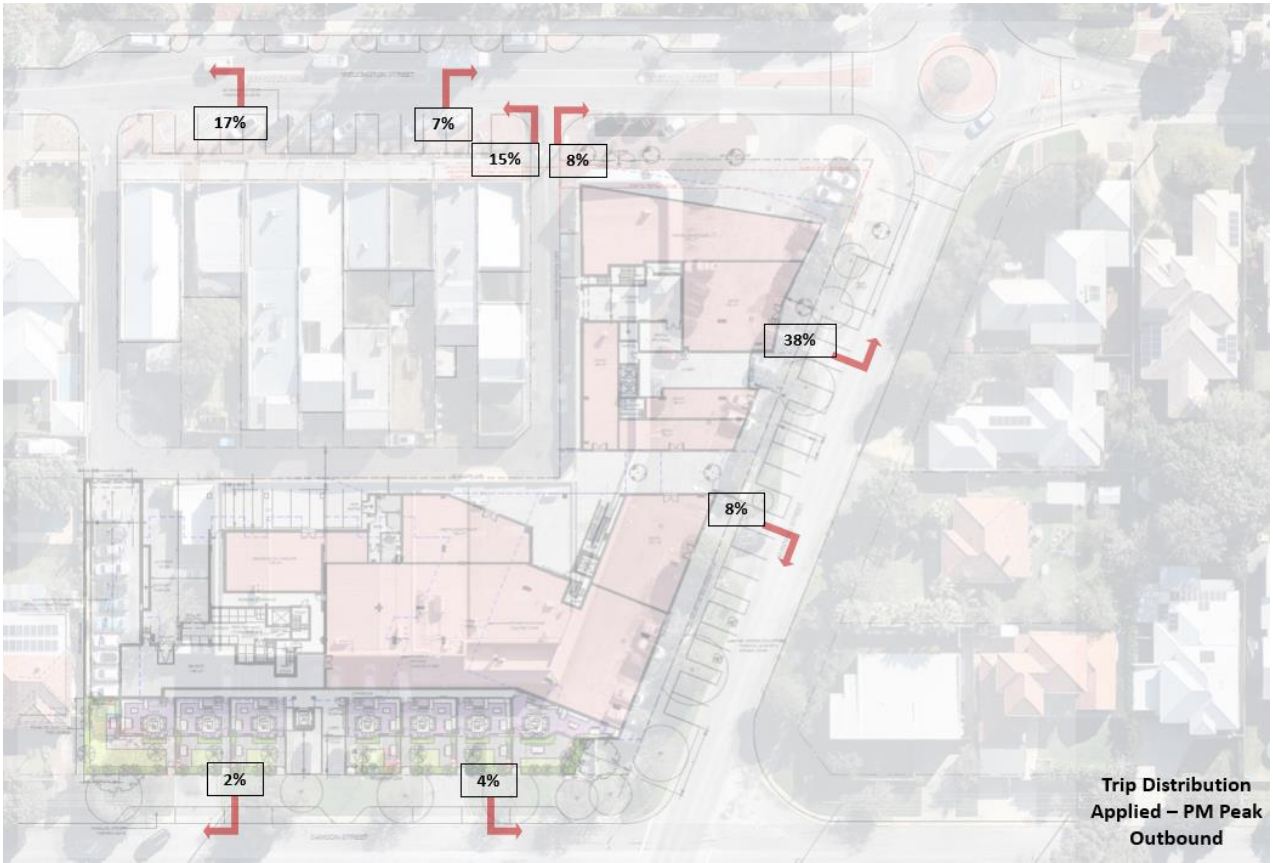


Figure 36 Distribution applied to PM outbound trips in modelling

6.5 Traffic Impact

The surveys conducted in October 2019, found that during the AM peak, 213 trips were associated with the existing development and during the PM peak there were 204 trips. These figures are used in Table 10 against the proposed trip generation to understand the actual increase in trips. The afternoon peak would see a higher volume than the AM due to the addition of residential units and their travel profile.

Table 10 Comparison of existing and proposed trip generation

	Existing trips (2019)	Forecast trips (2023)	% Change
AM Peak	213	220	3.3%
PM Peak	204	240	17.6%

Existing traffic volumes along Wellington Street at commuting travel times is low, therefore any additional traffic will have a localised impact.

6.6 SIDRA Modelling

Assessment of the street network associated with the proposed development was undertaken using SIDRA 9, including a network analysis of the proposed site access using Turnbull Way. The scenarios modelled were:

- 2020 AM and PM base peak hour
- 2023 AM and PM peak hours
- 2023 AM and PM peak hours with double vehicle movements on each approach.

6.6.1 2020 AM and PM Base

The 2020 base models examined the current operation of the network. This exercise was informed by:

- Traffic counts undertaken for peak periods in October 2019
- Traffic counts undertaken for peak periods in December 2020 as a result of an independent review of transport information undertaken for the Town of Mosman Park
- On-site observations and video surveys of entrance and exit points into and out of the site
- Aerial imagery and measurements from Nearmap.

In all cases for the AM and PM modelling, the highest values recorded were used to understand, from a traffic engineering perspective, any potential issues with the capacity of the network.

The overall outputs from the 2020 AM and PM modelling exercise are included within Appendix 1.

Both AM and PM peak periods saw the existing roundabout intersection at Manning Road and Wellington Street perform without any issues, as evidenced in the lane level of service figures shown in Figure 37 and the movement summaries set out in Figure 38. These outputs reflect observed performance at the intersection during site visits.

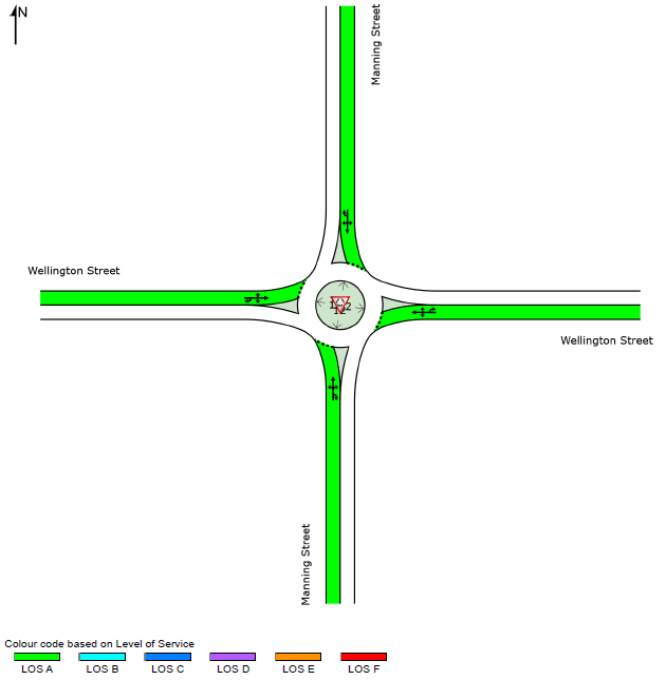
LEVEL OF SERVICE

Lane Level of Service

Site: 2020 [Mos Lane 2020 AM (Site Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

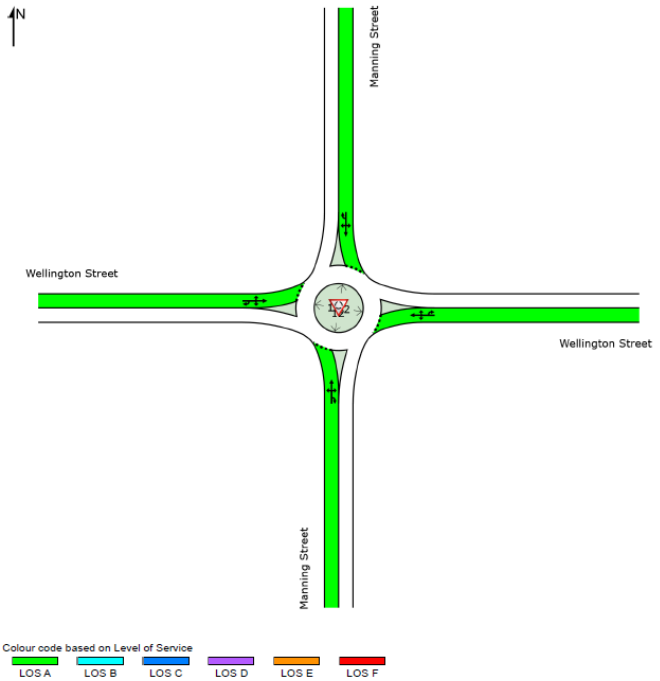
LEVEL OF SERVICE

Lane Level of Service

Site: 2020 [Mos Lane 2020 PM (Site Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Figure 37 Lane level of service 2020 AM and PM peak hours

MOVEMENT SUMMARY

Site: 2020 [Mos Lane 2020 AM (Site Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Manning Street														
1	L2	36	3	38	8.3	0.129	4.3	LOS A	0.7	5.2	0.31	0.47	0.31	41.0
2	T1	87	1	92	1.1	0.129	4.1	LOS A	0.7	5.2	0.31	0.47	0.31	38.1
3	R2	16	0	17	0.0	0.129	7.6	LOS A	0.7	5.2	0.31	0.47	0.31	43.3
3u	U	1	0	1	0.0	0.129	9.2	LOS A	0.7	5.2	0.31	0.47	0.31	43.9
Approach		140	4	147	2.9	0.129	4.6	LOS A	0.7	5.2	0.31	0.47	0.31	40.0
East: Wellington Street														
4	L2	16	0	17	0.0	0.071	4.2	LOS A	0.4	2.6	0.33	0.47	0.33	43.7
5	T1	51	0	54	0.0	0.071	4.2	LOS A	0.4	2.6	0.33	0.47	0.33	44.8
6	R2	8	0	8	0.0	0.071	7.7	LOS A	0.4	2.6	0.33	0.47	0.33	42.5
6u	U	1	0	1	0.0	0.071	9.3	LOS A	0.4	2.6	0.33	0.47	0.33	45.9
Approach		76	0	80	0.0	0.071	4.6	LOS A	0.4	2.6	0.33	0.47	0.33	44.4
North: Manning Street														
7	L2	4	1	4	25.0	0.075	4.5	LOS A	0.4	2.9	0.31	0.50	0.31	43.0
8	T1	49	1	52	2.0	0.075	4.1	LOS A	0.4	2.9	0.31	0.50	0.31	44.4
9	R2	26	0	27	0.0	0.075	7.6	LOS A	0.4	2.9	0.31	0.50	0.31	44.1
9u	U	1	0	1	0.0	0.075	9.2	LOS A	0.4	2.9	0.31	0.50	0.31	31.0
Approach		80	2	84	2.5	0.075	5.3	LOS A	0.4	2.9	0.31	0.50	0.31	44.0
West: Wellington Street														
10	L2	30	0	32	0.0	0.114	4.2	LOS A	0.6	4.7	0.33	0.53	0.33	41.1
11	T1	43	2	45	4.7	0.114	4.2	LOS A	0.6	4.7	0.33	0.53	0.33	44.7
12	R2	30	3	32	10.0	0.114	7.8	LOS A	0.6	4.7	0.33	0.53	0.33	44.1
12u	U	18	0	19	0.0	0.114	9.2	LOS A	0.6	4.7	0.33	0.53	0.33	45.0
Approach		121	5	127	4.1	0.114	5.8	LOS A	0.6	4.7	0.33	0.53	0.33	43.9
All Vehicles		417	11	439	2.6	0.129	5.1	LOS A	0.7	5.2	0.32	0.50	0.32	43.2

MOVEMENT SUMMARY

Site: 2020 [Mos Lane 2020 PM (Site Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Manning Street														
1	L2	20	3	21	15.0	0.084	5.3	LOS A	0.5	3.3	0.32	0.52	0.32	41.0
2	T1	55	0	58	0.0	0.084	5.3	LOS A	0.5	3.3	0.32	0.52	0.32	38.5
3	R2	13	0	14	0.0	0.084	8.8	LOS A	0.5	3.3	0.32	0.52	0.32	43.5
3u	U	1	0	1	0.0	0.084	10.5	LOS B	0.5	3.3	0.32	0.52	0.32	44.2
Approach		89	3	94	3.4	0.084	5.9	LOS A	0.5	3.3	0.32	0.52	0.32	40.4
East: Wellington Street														
4	L2	12	0	13	0.0	0.053	5.5	LOS A	0.3	2.0	0.40	0.53	0.40	45.8
5	T1	36	0	38	0.0	0.053	5.7	LOS A	0.3	2.0	0.40	0.53	0.40	47.0
6	R2	4	0	4	0.0	0.053	9.3	LOS A	0.3	2.0	0.40	0.53	0.40	45.5
6u	U	1	0	1	0.0	0.053	11.0	LOS B	0.3	2.0	0.40	0.53	0.40	48.0
Approach		53	0	56	0.0	0.053	6.0	LOS A	0.3	2.0	0.40	0.53	0.40	46.6
North: Manning Street														
7	L2	4	0	4	0.0	0.120	5.1	LOS A	0.7	4.7	0.32	0.54	0.32	45.9
8	T1	83	0	87	0.0	0.120	5.2	LOS A	0.7	4.7	0.32	0.54	0.32	46.9
9	R2	39	0	41	0.0	0.120	8.8	LOS A	0.7	4.7	0.32	0.54	0.32	46.6
9u	U	4	0	4	0.0	0.120	10.5	LOS B	0.7	4.7	0.32	0.54	0.32	27.5
Approach		130	0	137	0.0	0.120	6.5	LOS A	0.7	4.7	0.32	0.54	0.32	46.1
West: Wellington Street														
10	L2	14	1	15	7.1	0.096	4.9	LOS A	0.5	3.8	0.26	0.59	0.26	43.4
11	T1	27	1	28	3.7	0.096	5.1	LOS A	0.5	3.8	0.26	0.59	0.26	46.7
12	R2	34	0	36	0.0	0.096	8.6	LOS A	0.5	3.8	0.26	0.59	0.26	46.5
12u	U	33	0	35	0.0	0.096	10.3	LOS B	0.5	3.8	0.26	0.59	0.26	47.3
Approach		108	2	114	1.9	0.096	7.7	LOS A	0.5	3.8	0.26	0.59	0.26	46.5
All Vehicles		380	5	400	1.3	0.120	6.6	LOS A	0.7	4.7	0.31	0.55	0.31	45.5

Figure 38 Movement summaries - AM and PM peak hour 2020

6.6.2 2023 AM and PM Peak

The network modelled for 2023 (which was taken as an "opening year" for the purposes of modelling) included:

- Closure of all access points along Manning Street
- The redirection of traffic flow along Turnbull Way as proposed within the development plans

- Single access into and out of the site via Wellington Street
- Distribution of the vehicle trips generated by the site to on-street bays on Manning Street and Samson Street, as well as internal bays on site. To replicate current patterns, existing trips that entered or exited the existing development via Manning Street and Samson Street were retained on those streets to reflect usage of on-street bays and turning movements were apportioned using present day peak patterns
- All residential demands in and out of the site were via Turnbull Way
- Retail trips attributed to employees in the AM peak were via Turnbull Way
- 15% of the retail and commercial trips were via Turnbull Way to replicate drop off and use of the internal bays
- The totals for retail and commercial trips, as set out in section 6.3.4 were maximised to reflect a conservative, highest value.
- Values for intersection spacing and carriageway widths were taken from Nearmap
- The internal speed of Turnbull Way was set as 10km/h, with approach and exit speeds for Wellington Street set as 40km/h
- Given the very low volume of existing heavy vehicle movements, no proportion of heavy vehicles was factored in to the modelling exercise.

The overall network level of service for approaches are shown in Figure 39 and Figure 40. Full outputs from the SIDRA network model exercise are included in Appendix 2 for reference. These outputs indicate that from a traffic engineering perspective, the traffic generated by the site would not have a deleterious impact on the network performance during AM or PM peak periods.

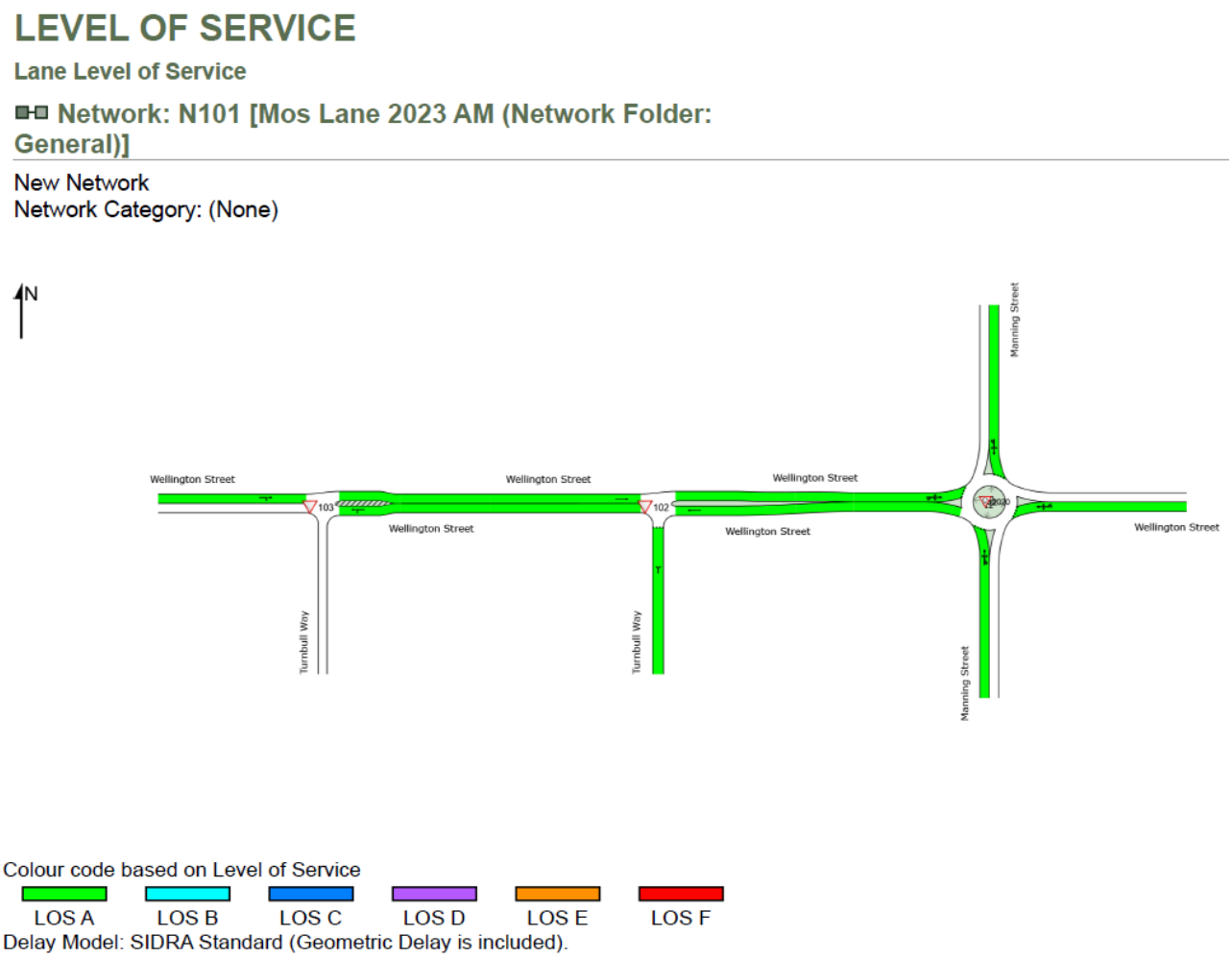


Figure 39 Network lane level of service AM peak 2023

LEVEL OF SERVICE

Lane Level of Service

Network: N102 [Mos Lane 2023 PM (Network Folder: General)]

New Network
Network Category: (None)

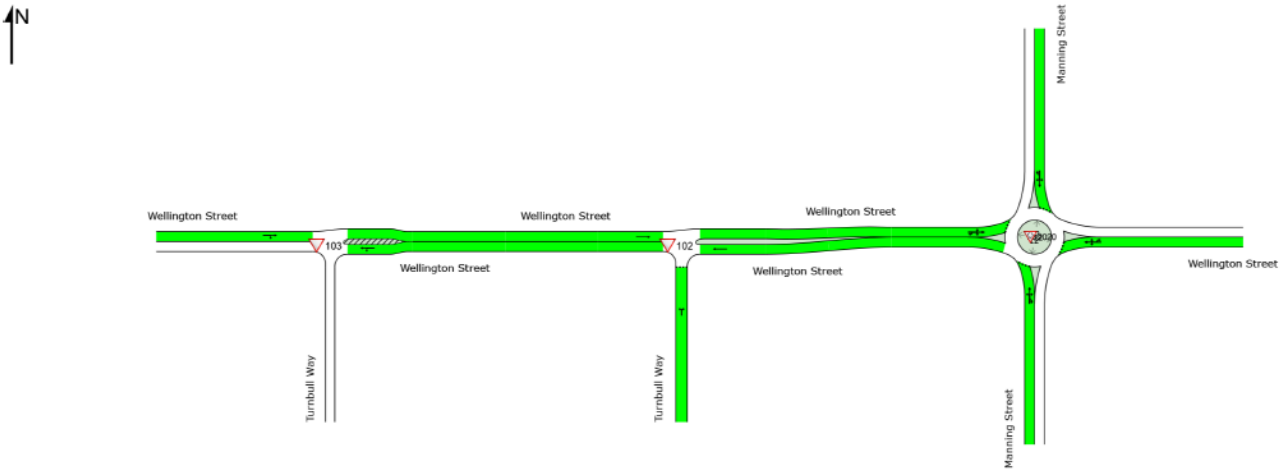


Figure 40 Network lane level of service PM peak 2023

6.6.3 2023 AM and PM peak – double demands

In order to understand if there were any substantial potential impacts of traffic generated by the proposed development, the 2023 demands calculated for the AM and PM peak periods were doubled for all movements on all intersection legs of the network. This represents an unlikely scenario for a number of reasons, but it was modelled to also reflect a future year scenario of much higher traffic volumes on the network and also to understand if any intersection legs were likely to see an impact or if the entrance and exit legs to the site required remediation.

The full network SIDRA outputs for this scenario are included within Appendix 3 of this report.

The outputs from this test show no discernable change from the forecast level of service for traffic movements on the network, even when doubling numbers of all movements. This indicates that the network will perform well from a traffic demands perspective, even using unrealistic volumes on all approaches of the network.

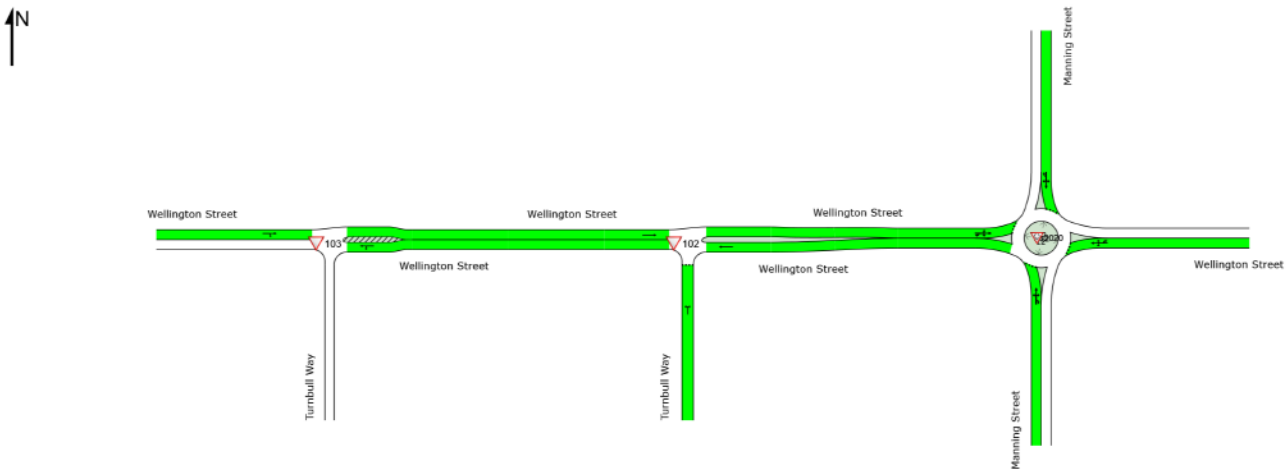
On the basis of the base year, forecast year and forecast year test models, the street network will function appropriately for the forecast traffic volumes associated with the site.

LEVEL OF SERVICE

Lane Level of Service

Network: N101 [Mos Lane 2023 Double AM (Network Folder: General)]

New Network
Network Category: (None)



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Delay Model: SIDRA Standard (Geometric Delay is included).

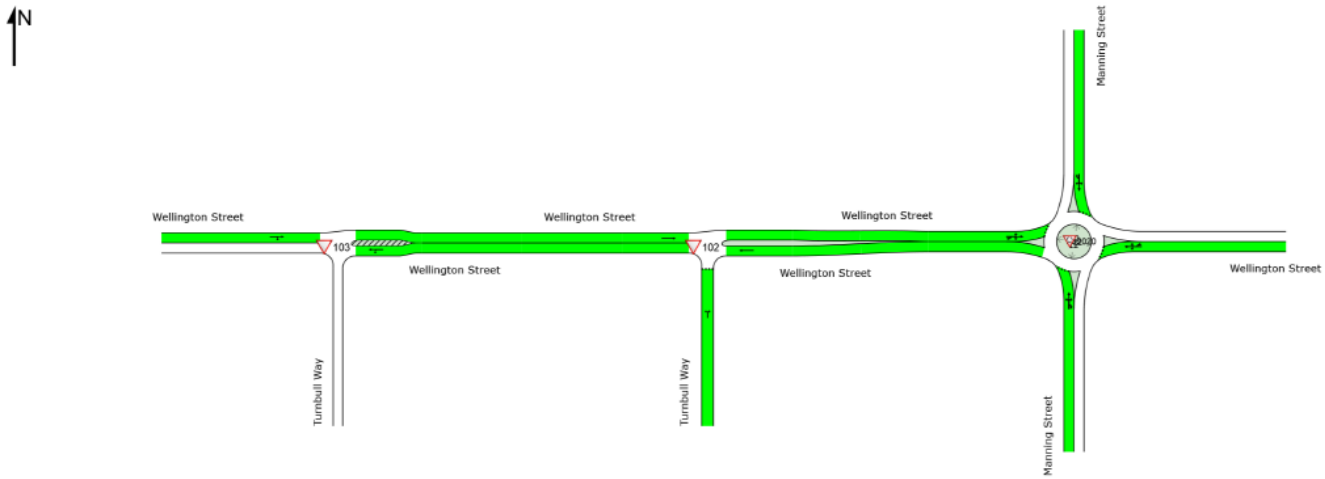
Figure 41 Network lane level of service AM peak 2023 (double demands)

LEVEL OF SERVICE

Lane Level of Service

Network: N101 [Mos Lane 2023 Double PM (Network Folder: General)]

New Network
Network Category: (None)



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Delay Model: SIDRA Standard (Geometric Delay is included).

Figure 42 Network lane level of service PM peak 2023 (double demands)

7. TRAFFIC MANAGEMENT ON FRONTAGE STREETS

7.1 Frontage Streets

The site has frontage to Wellington Street, Manning Street, Samson Street and Turnbull Way. The site is also within 1.35km of Stirling Highway which provides for inter-regional traffic connections between Perth and Fremantle. The local road network surrounding the development site has good connectivity with a permeable grid street network. There are many local connections to the north, south, east and west.

The road hierarchy surrounding the development site is shown in Figure 43 and the speed zones are shown in Figure 44

Figure 43 Road hierarchy surrounding development site (source: MRWA)

Figure 44 Speed zoning surrounding development site (source: MRWA)

7.1.1 Wellington Street

Wellington Street is classified as Local Distributor Road, running east-west between the Swan River to the east where it terminates at Bateman Street and Stirling Highway to the west. The carriageway is constructed to a general width of 6.4m, within a 14m road reserve. A cross section of Wellington Street adjacent to the development site is shown in Figure 45.

Figure 45 Wellington Street cross section looking east (source: Flyt)

The posted speed limit is 50 kph. To the west of Manning Street intersection, on-street parking is permitted within embayed parking bays in front of retail premises on the westbound carriageway. On the eastbound carriageway, there are parallel bays that also service the retail land uses and residential properties.

To the east of Manning Street intersection, parking is permitted on-street. There is a 1.8m concrete footpath path along the northern side of Wellington Street, and a 1m path on the southern side.

Traffic volumes for the existing site are discussed in detail in section 6. In respect of overall daily volumes, the nearest Main Roads WA recording site available on TrafficMap is located adjacent to the intersection of Stirling Highway, as shown in Figure 46. The average weekday vehicle flows for the recording period in 2017 are shown in Figure 47. These recordings highlight the commuting peak hour traffic flows and also the impact of the school trips in the area.

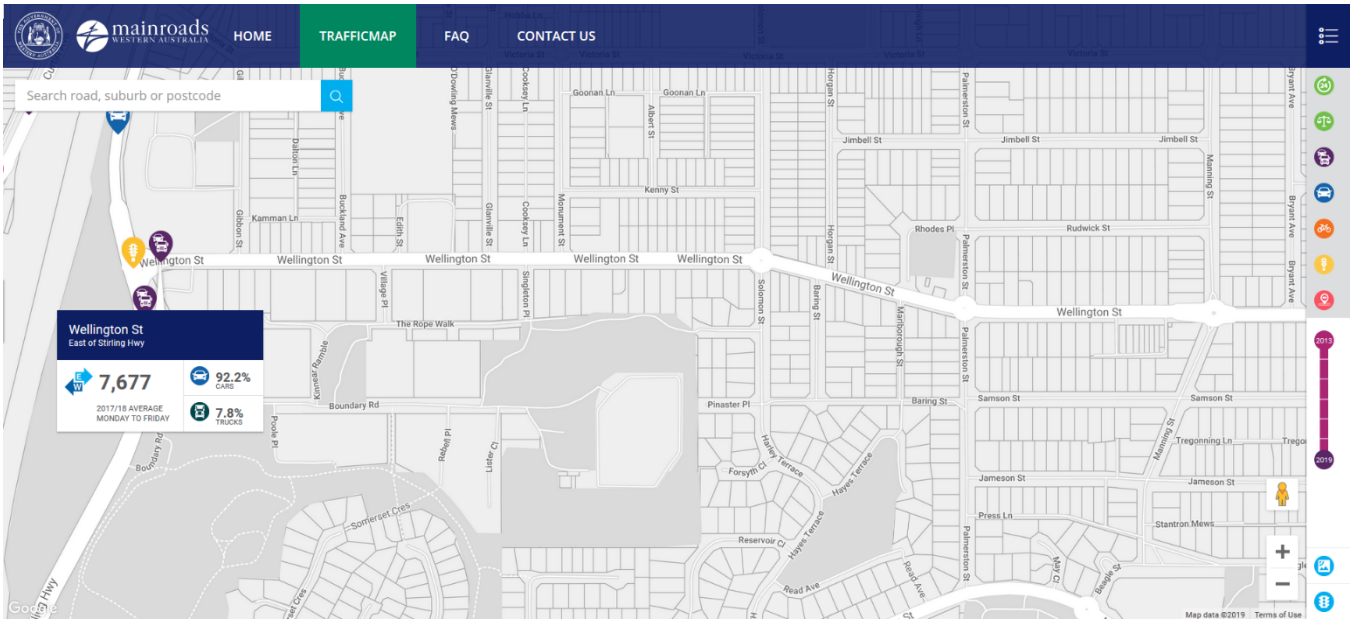


Figure 46 Main Roads WA recording location

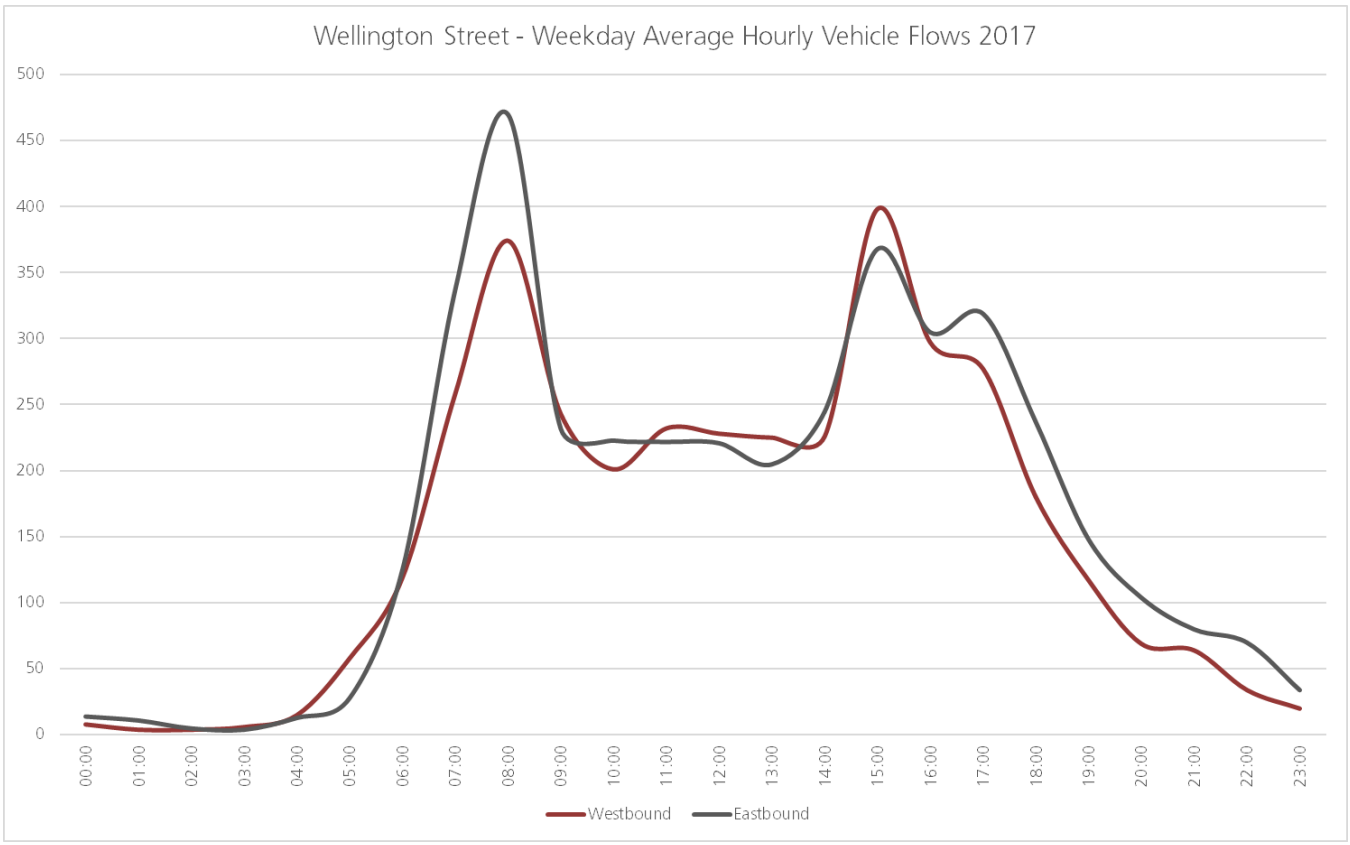


Figure 47 Wellington Street Average Weekday Vehicle Flows 2017 (source: Main Roads WA)

7.1.2 Manning Street

Manning Street is classified as an Access Road, running north-south between Bay View Terrace to the north and McCabe Street to the south. It is constructed to a carriageway width of 7.4m, within a 20m road reserve. A cross section of Manning Street is shown in Figure 48.

Figure 48 Manning Street cross section looking south (source: Flyt)

On-street parking is permitted along most sections of Manning Street, except on the western side adjacent to the subject site. North of Wellington Street, there is a 1m concrete footpath along the western side of Manning Street, adjacent to the subject site the path is on the eastern side and south of Samson Street, the path reverts back to the western side.

7.1.3 Samson Street

Samson Street is an Access Road, running east-west between Owsten Street to the east and Palmerston Street to the west. It is constructed to a width of 7.4m within a 20m road reserve. A cross section of Samson Street is shown in Figure 48.

Figure 49 Samson Street cross section looking east (source: Flyt)

On-street parking is permitted along Samson Street. There is a 1.5m concrete footpath along the northern side of Samson Street.

7.1.4 Turnbull Way

Turnbull Way is a laneway which runs around existing retail premises that front on to Wellington Street. The lane way runs from east to west and is used for service vehicle movements and some access to existing parking bays and areas of the retail lots fronting on to Wellington Street. The existing exit point of Turnbull Way is shown in Figure 50.

Figure 50 Turnbull Way western access point (source: Flyt)

7.2 Intersections

The site is flanked by three streets, with a number of existing intersections. These are discussed in the following sub-sections.

7.2.1 Wellington Street / Manning Street

The four-way intersection of Wellington Street and Manning Street is controlled by a single lane roundabout. This form of intersection control would be retained.

The form of this intersection is shown in the aerial image from Nearmap in Figure 51. To the south of the intersection is the existing bus stop on the western side of the carriageway. There are two crossing points of the intersection for pedestrians on the northern and eastern arms and there is an offset crossing point on the western arm. There is no formalised pedestrian crossing point on the southern arm of the intersection.

Figure 51 Intersection of Wellington Street and Manning Street

7.2.2 Manning Street / Samson Street

The four-way intersection of Manning Street and Samson Street is Give Way controlled with priority given to Manning Street, as shown in the aerial image from Nearmap in Figure 52.

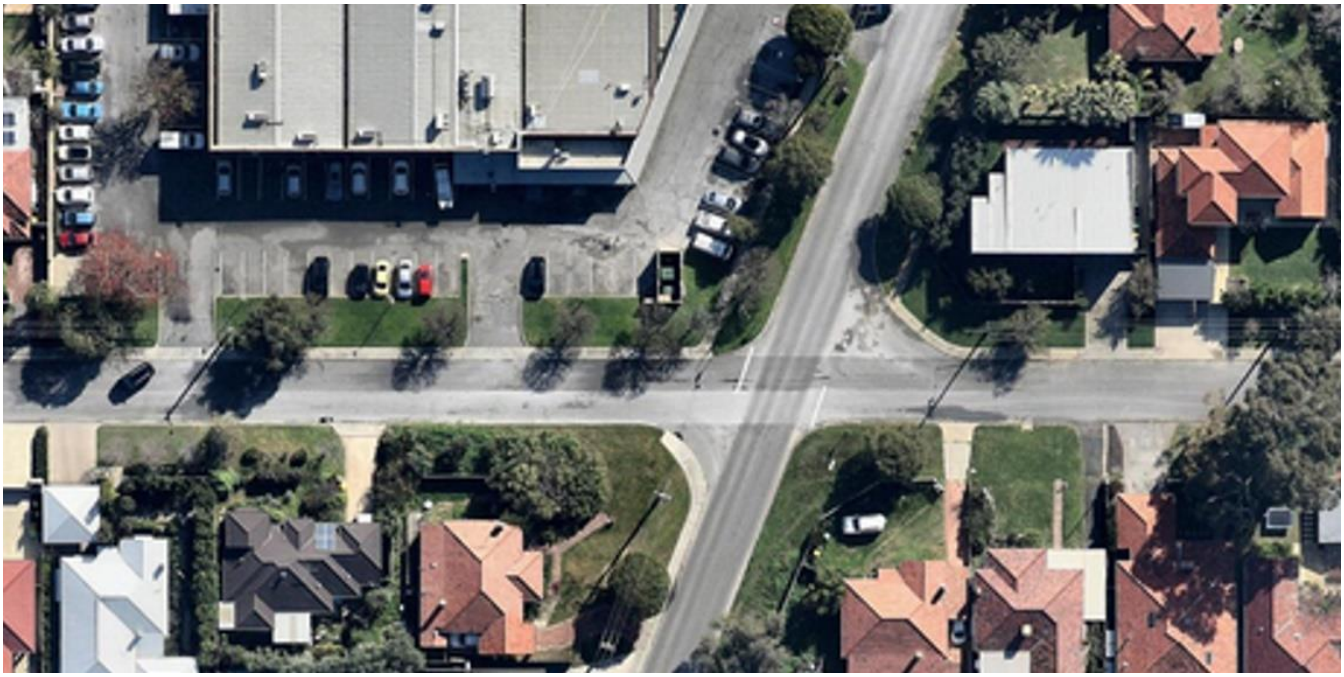


Figure 52 Intersection of Samson Street and Manning Street

7.2.3 Turnbull Way / Wellington Street

The two intersections of Turnbull Way with Wellington Street are T-intersections with priority given to Wellington Street. The eastern crossover is entry only, where both left and right turning movements into Turnbull Way are accommodated. The western crossover is exit only where both left and right turning movements are accommodated into Wellington Street.

8. PUBLIC TRANSPORT ACCESS

8.1 Existing Services

The development site is located within close and convenient access to the 107 bus route which travels between Fremantle Station and Elizbeth Quay Bus Station via Stirling Highway.

The 107 bus route only travels in a clockwise direction around Victoria Street, Owston Street, Manning Street, Beagle Street and Wellington Street. Bus routes 103 and the high frequency services 998 and 999 are located 1.4km from the subject site on Stirling Highway as shown in Figure 53.

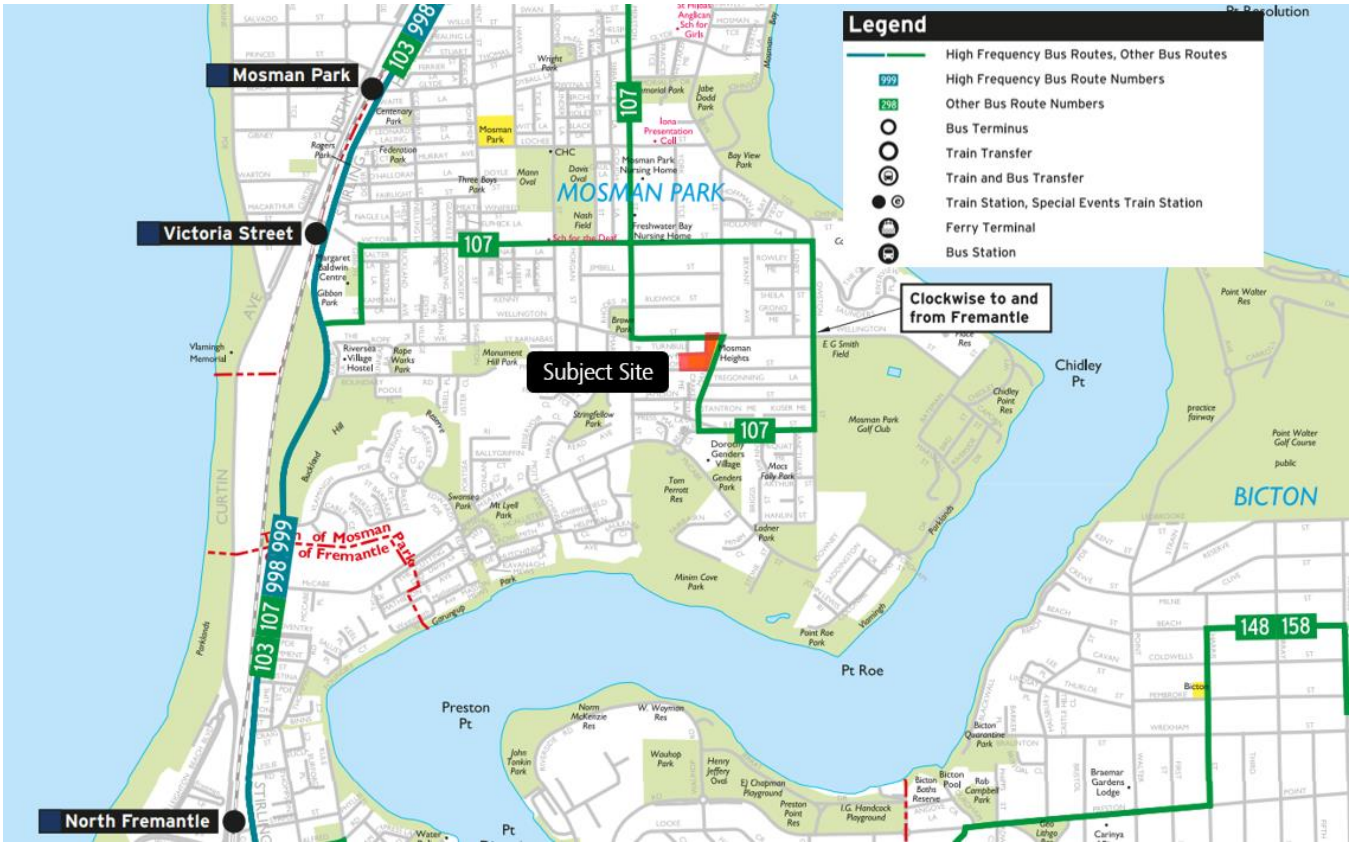


Figure 53 Adjacent bus routes (source: Transperth)

The site is within 1.6km of Victoria Street Station and 2.7km of North Fremantle Station, with direct train services between Fremantle, Perth and onwards towards Midland.

The nearest bus stop is shown in Figure 54. More detail of bus route services and frequencies is provided in Table 11.

The existing embayed bus stop is proposed to be replaced with a verge based build out bus stop. The existing stop is not a timed stop or on a major road, therefore the need for an embayment is removed.

Figure 54 Closest bus stops (source: Transperth)

Table 11 Bus frequency and service numbers (source: Transperth)

Route	Direction	Weekday Summary		Saturday Summary	Sunday/ Public Holiday Summary
		No. Services	AM/ PM Peak Frequency		
Fremantle Line	Fremantle	81 services 5.40am to 2.40am	Every 15 minutes	68 services, 15 minute frequency	62 services, 15 -30 minute frequency
	Perth	89 services 5.17 to 2.54am			
998	Clockwise	64 services 5:30am to 11.30pm	5-15 mins	48 services, 15 minute frequency	29 services, 15-30 minute frequency
999	Anti-clockwise	69 services 6.17am to 11.14pm	5-15 mins	46 services, 15 minute frequency	27 services, 15-30 minute frequency
103	To City	13 services 5.30am to 5.21pm	Hourly frequency	10 services, hourly frequency	9 services, hourly frequency
	To Fremantle Station	14 services 7.50am to 6.34pm	Hourly frequency	9 services, hourly frequency	9 services, hourly frequency
107	To City	16 services 7:09am to 6.08pm	Hourly frequency	10 services, hourly frequency	4 services, 2 hourly frequency
	To Fremantle Station	16 services 7.49am to 5.53pm	Hourly frequency	10 services, 2 hourly frequency	4 services, 2 hourly frequency

9. PEDESTRIAN ACCESS/AMENITY

9.1 Existing Pedestrian Network

The site has an excellent level of pedestrian connectivity resulting from the grid network in the area. Footpaths are located on at least one side of all surrounding streets. The surrounding streets are all local access roads which means traffic volumes and speeds tend to be low, creating a safer and more enjoyable walking environment.

The Walk Score walkability assessment tool considers the development site to be “somewhat walkable” where some daily errands do not require a car, with a walk score of 62 out of 100, as shown in Figure 55 . The 15-minute walkable catchment is shown in Figure 56, which includes destinations such as Monument Hill, Chidley Reserve, St Hilda’s Anglican Junior School for Girls, Mosman Park Skate Park, Mosman Park Primary School and Camelot Outdoor Cinema: Arts and Event Venue; Theatre, Cafe Bar.

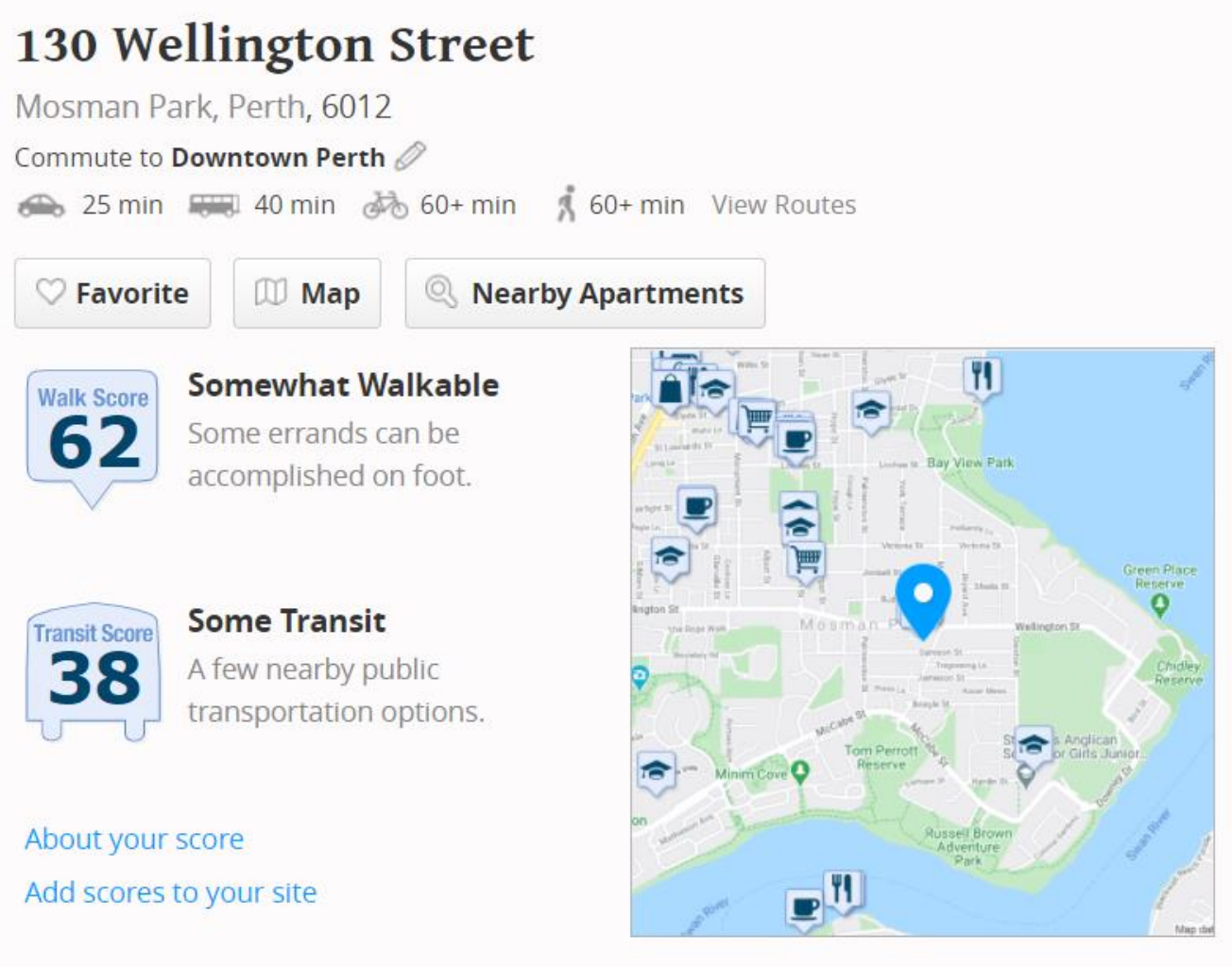


Figure 55 Walking accessibility rating for development site and surrounding area (source: Walk Score)

For the residential component of the development, the walkability of the area would be significant, with residents able to utilise retail land uses below them, as well as amenities within the site. With the redevelopment of the site, the walkability score of the area would increase.

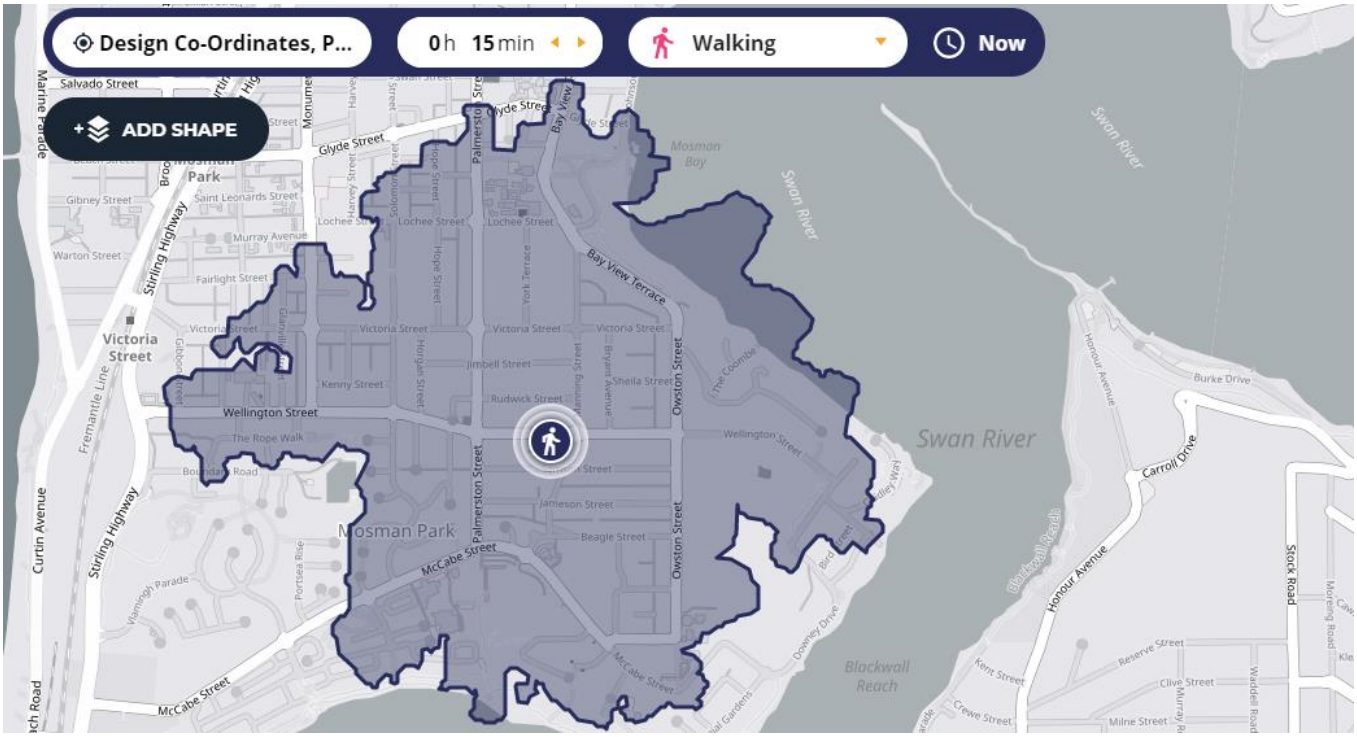


Figure 56 Travel Time 15 minute walking catchment from development site (source: Traveltime App)

The Department of Planning, Lands and Heritage recently released the Urban Tree Canopy Dashboard which provides an interactive snapshot of the extent of tree canopy coverage across the Perth and Peel regions. The urban tree canopy is an essential part of creating healthy, liveable neighbourhoods, where more dense and mature tree canopies can support active travel along walking and cycling paths.

The street blocks in Mosman Park have 16% canopy cover from trees over 3m tall, resulting in 84% of the street block area without any canopy cover. The Perth Metropolitan area has an average of 12% canopy cover from trees over 3m tall in street blocks.

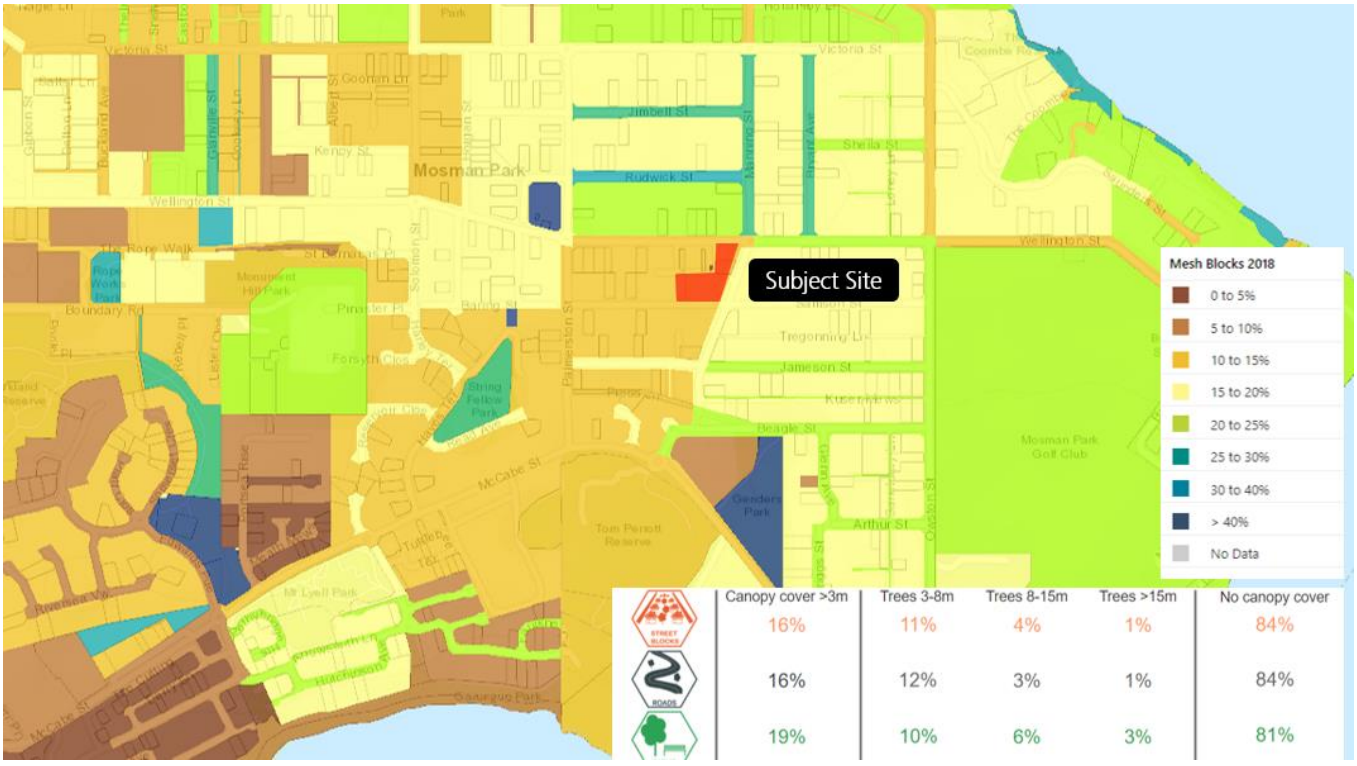


Figure 57 Mosman Park Urban Tree Canopy (source: Department of Planning, Lands and Heritage)

9.2 Development Proposals

The existing development prioritises access by private vehicles, where substantial off-street parking is located in-front of the building at the street edge. This style of development constrains pedestrian access and detracts from the urban amenity and streetscape along Wellington and Manning Street.

The proposed development re-configures this arrangement with a people-focused approach to access. The majority of parking for residents and visitors is located below ground which allows for the creation of more direct access arrangements, where people can walk up to the commercial and retail tenancies without navigating a car park. The creation of a high-quality pedestrian focused environment includes:

- An internal public square accessed from Turnbull Way
- An alfresco village plaza on the corner of Wellington and Manning Street
- 3m footpath on Manning Street and a 5m footpath on Samson Street
- Pedestrian path along the eastern side of the exit leg of Turnbull Way linking Wellington Street
- New pedestrian access way between Manning Street and Turnbull Way
- Walk up commercial and retail outlets with direct access from the street.

There are a number of residential access points to the lifts and stairs on the ground floor level with direct access from Turnbull Way, Manning Street and Samson Street. The commercial tenancies will have their own entry points direct from the street.

The townhouses will be accessed via a private gate fronting Samson Street or from the lifts from the basement level parking. Proposed residential access is shown in Figure 58.

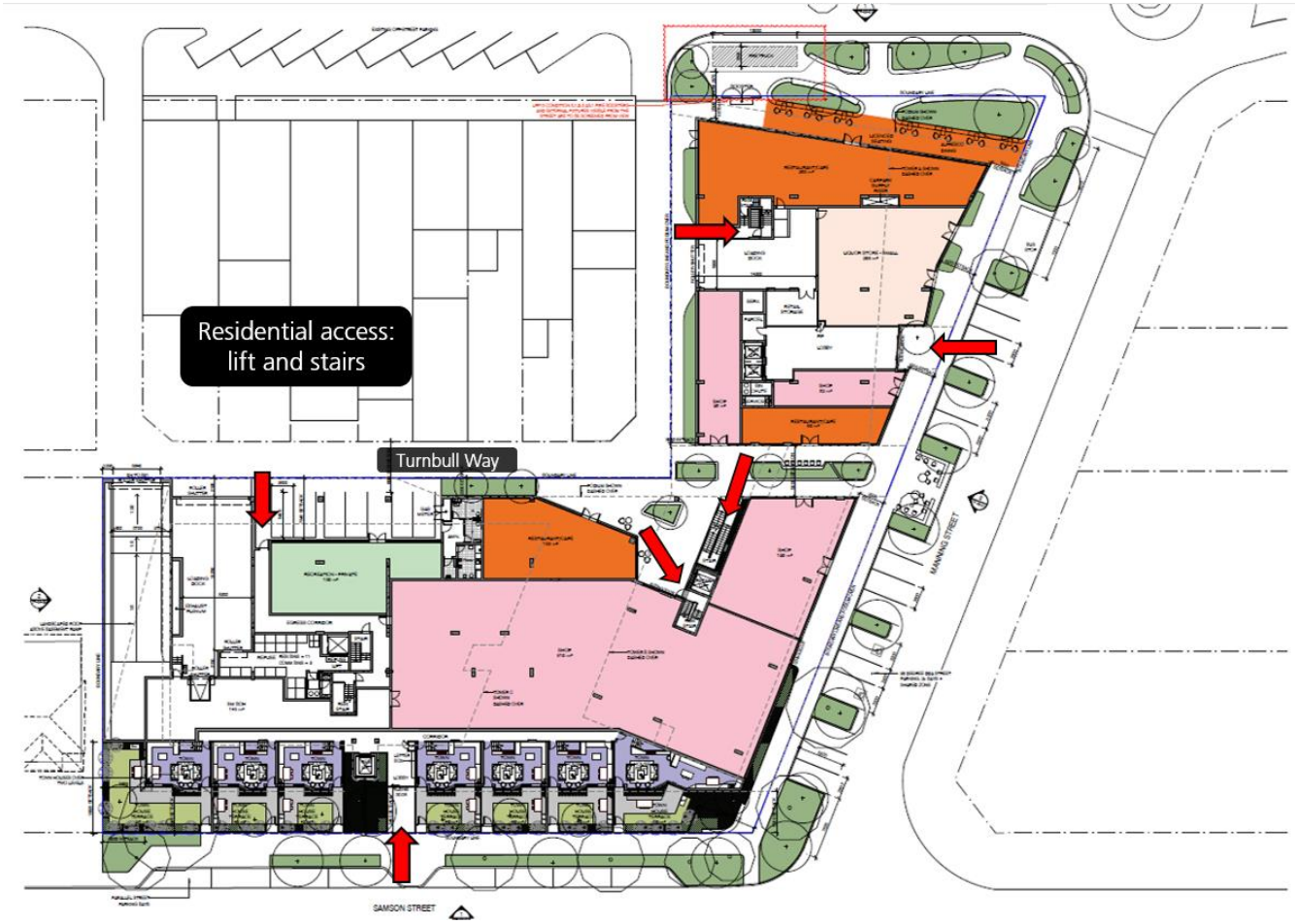


Figure 58 Proposed location of residential access (source: NH Architecture)

10. CYCLE ACCESS/AMENITY

10.1 Existing Cycle Network

The site has an average level of cycle accessibility, with the existing cycle network shown in Figure 59.

All roads surrounding the subject site are local access roads with no additional cycling infrastructure. 950m south of the subject site is a high-quality shared path which runs around the northern edge of the Swan River.

Palmerston Road is identified as having a good road riding environment and is located 250m to the west of the subject site. The Perth Bicycle Network is located to the north of the subject site which provides regional connections.

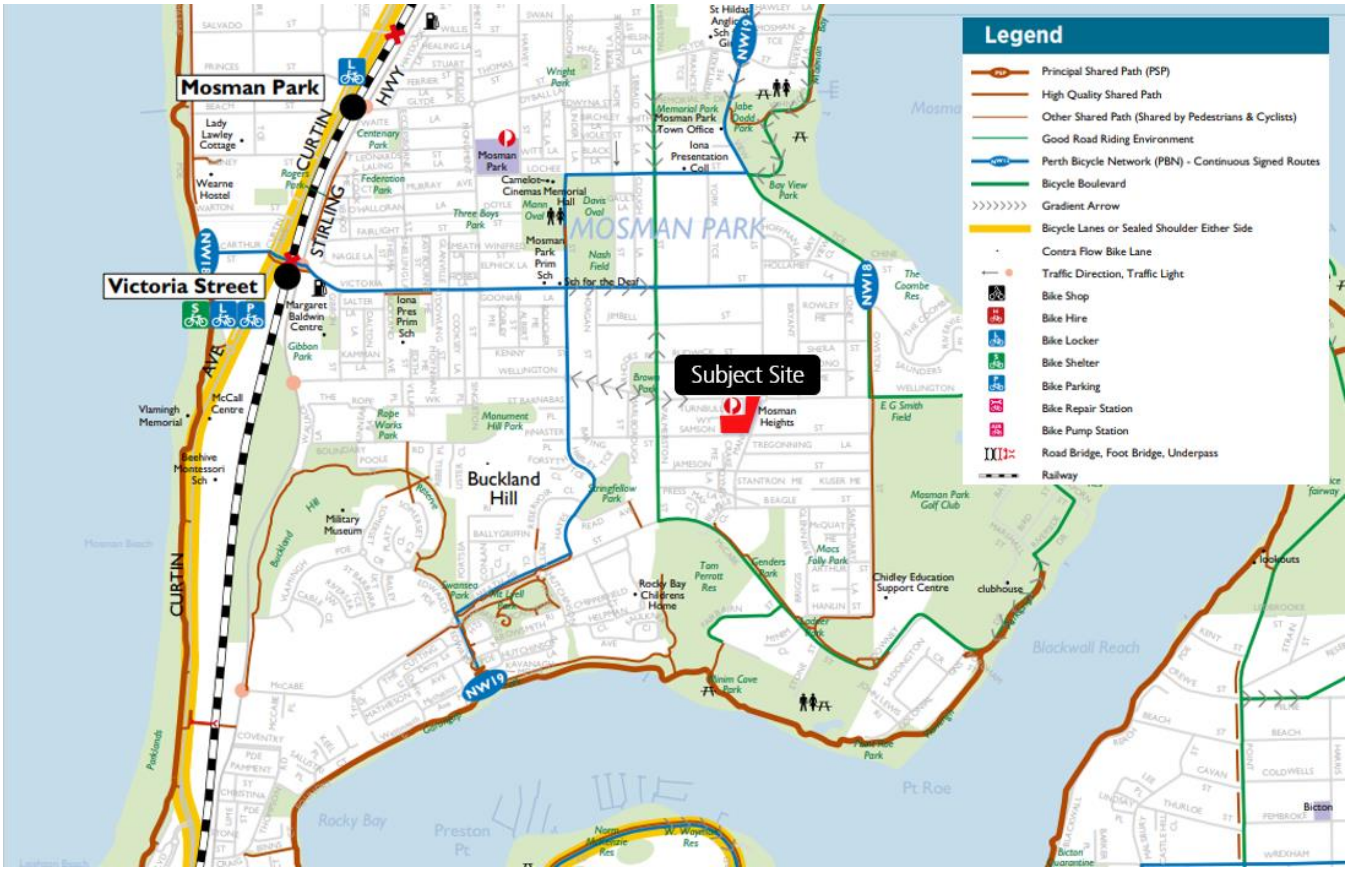


Figure 59 Cyclist network surrounding development site (source: Department of Transport)

A heatmap of cycle activity in the vicinity of the development site is shown in Figure 60. This is produced by cyclists tracking their trips using the commercial product Strava.

McCabe Street to the south of the subject site, Owsten Street to the east and the coastal shared path further west are the most popular cycle routes with Strava users in the area.

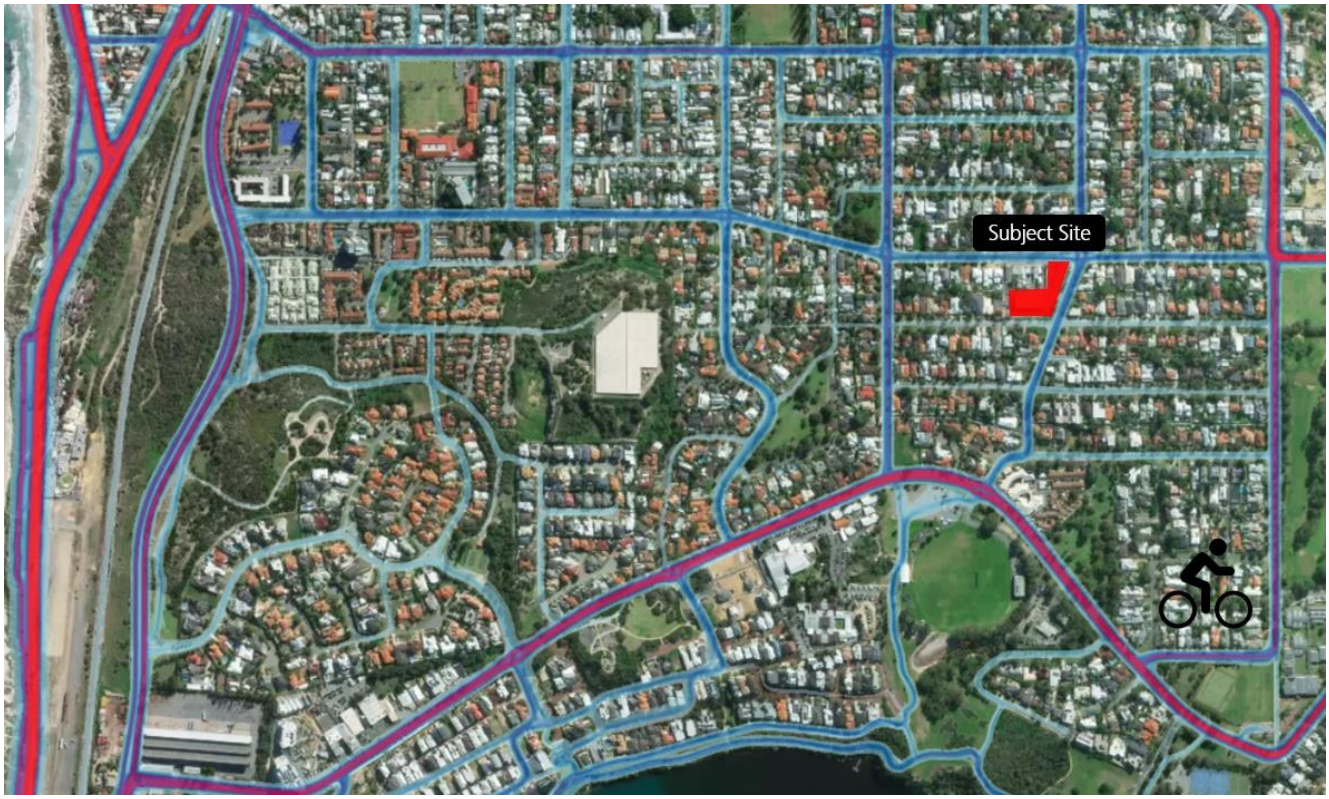


Figure 60 Strava heatmap for cycling in vicinity of development site

10.2 Proposed Cycle Network

The design for the Principal Shared Path (PSP) extension from Victoria Street to North Fremantle has been completed, however works are yet to begin. The PSP extension from North Fremantle to Fremantle will be delivered in conjunction with the replacement of the Fremantle Traffic Bridge.

As part of the WA's Recovery Plan to recover from COVID-19 related impacts, the construction of the Fremantle Traffic Bridge has been brought forward.

The construction of these paths will dramatically increase the cycling environment between the subject site and Fremantle and Perth, as well as allowing more regional trips to be taken.

The Draft Mosman Park Cycling & Pedestrian Plan 2012 – 2032 network plan, shown in Figure 61, identifies that Wellington Street is proposed to have bi-directional on-road cycling lane in the form of a sealed shoulder located on between on-street parking bays and the motorist lane. Some primary network route options may be delivered as part of the Long Term Cycle Network (LTCN), with joint funding provided by the Department of Transport.

Locating the bicycle lane between parked cars and travelling vehicles provides the least amount of protection for cyclists and would not be considered adequate for the "Interested but Concerned" cycle group which require separation from vehicles.

Figure 61 Town of Mosman Park Cycling Network Plan (source: Town of Mosman Park)

10.3 Development Proposals

The proposed development includes parking racks for 62 residential bikes in line with the acceptable outcomes of SPP 7.3 (Volume 2). These are provided within Basement 2. As the townhouses will have direct access to Samson Street, bike parking will be provided within their courtyards.

The development includes 22 employee bike bays and associated end of trip facilities in basement level 2 in accordance with the requirements of the Town of Mosman Park Local Planning Policy 15. A minimum of 60 bike spaces for commercial visitors are provided within Basement Level 1. The proposed locations for the residential bike parking are shown in Figure 62.

Bike riders will enter from Turnbull Way and travel down the vehicle driveway to the basement levels.

There will also be four on-street locations for short stay bicycle parking with a capacity of 18 bikes on 9 racks, as set out on Figure 63. Combined with the 60 spaces in the basement, there is capacity for 78 visitor bikes on the site.

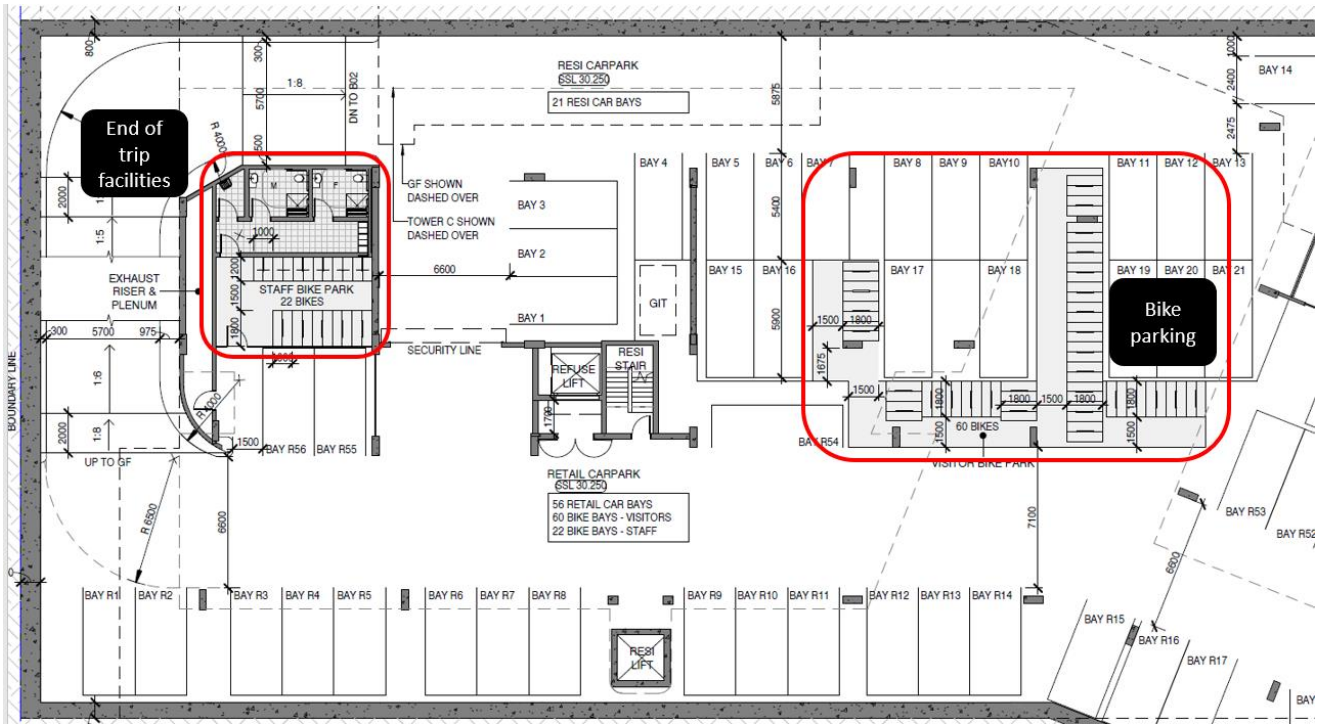


Figure 62 Proposed location of residential and employee bike parking and end of trip facilities basement level 1 (source: NH Architecture)

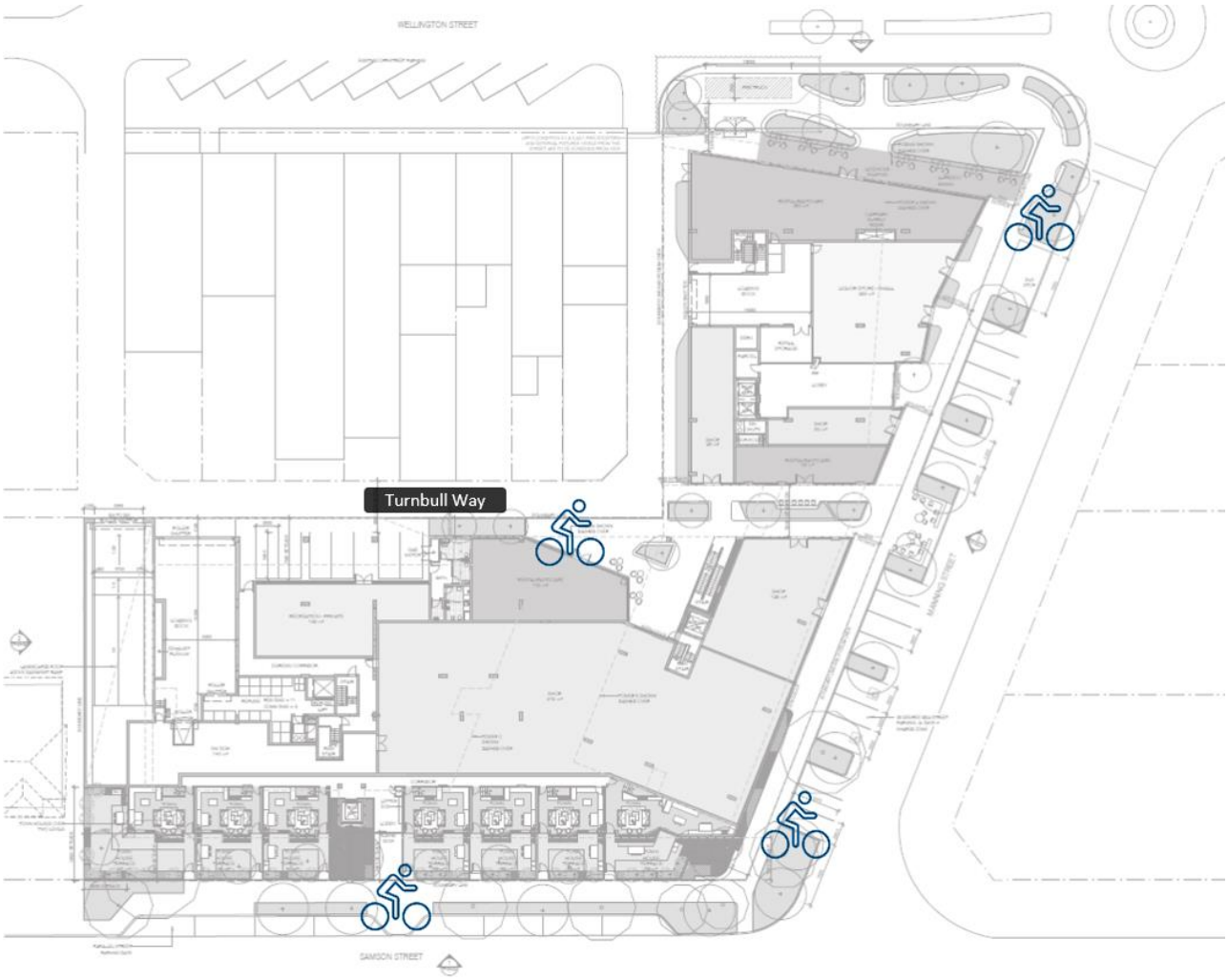


Figure 63 On street short stay bicycle parking

10.4 Required Bike Parking

Table 12 shows the minimum bike parking requirement for residents and their visitors guided by SPP 7.3 (Volume 2) and the commercial tenancies as outlined in the Town of Mosman Park Local Planning Policy 15. End of trip facilities are provided using the 5 Star Green Star Guidelines. These Guidelines use the proposed number of employees to determine how many showers are needed, with the number of lockers derived from the number of bicycle spaces.

The number of employees will be directly related to the individual needs of the final occupancy of each retail and commercial tenancy. The number of employees is determined using an average of 1 employee per 15m^2 NLA. The minimum bike parking requirements for residential, residential visitor, employees and commercial visitors as well as end of trip facilities are shown in Table 12.

Table 12 Bike parking –SPP 7.3 (Volume 2) and Town of Mosman Park Local Planning Policy 15

Bay Type	SPP 7.3 (Volume 2)		
	Minimum rate	**Bikes**	**Proposed**
Resident	0.5 per dwelling	42	62
Residential Visitor	1 per every 10 dwellings	9	78 (reciprocal)
Town of Mosman Park LPP 15			
Commercial Employee	Shop 1:100m^2 GFA Café 1:100m^2 GFA Other (Gym) 1:100m^2 GFA	24	25
Commercial Visitor	Shop 1:125m^2 GFA Café 1:50m^2 GFA Office 1:750m^2 GFA	87	78 (reciprocal)
End of Trip 5 Star Green Star			
Showers	50-149 employees (1:15m^2 NLA = 140 employees)	4 showers	2
Lockers	1.2 lockers per bicycle space	29	22

The proposed development adequately provides both bicycle parking for residents and visitors as well as end of trip facilities for employees. The location of end of trip facilities is within close walking distance to the bike parking on basement level 1 and to the lifts to take employees up to the ground floor level. Additional EoT could also be provided in individual tenancies at fit out stage if desired.

10.5 Green Travel Plan

Given the nature of the site, and the potential to increase walking, cycling and use of public transport to and from the area, it would be appropriate to develop a Green Travel Plan that would make information available to retail tenancies upon occupancy. This plan could include information detailing:

- Available information on walking, cycling and public transport
- Facilities available on site
- Process to utilise facilities via the Strata Management
- Information links to appropriate sites for details
- Other details as appropriate.

This information could also be made available to residents in the development as part of a welcome pack.

11. SITE SPECIFIC ISSUES

11.1 Pedestrian Priority

The vehicle entry and exit points from Turnbull Way onto Wellington Street will experience higher volumes of traffic as a result of the proposed development (proposed exit point shown in Figure 64). This is an acknowledged outcome of the site development, which will remove other vehicle crossovers and improve street frontage and access.

To facilitate pedestrian focused outcomes of the development it is recommended that a zebra crossing style treatment is incorporated at these points, as well as placement of mirrors for driver use. Other treatments for exiting traffic, such as change in pavement surface and management measures could support safer outcomes. This will mitigate potential conflict with vehicles by ensuring pedestrians have priority over the laneway entry and exit points, while supporting the high-quality urban design of the proposed development at Mos Lane.

Figure 64 Turnbull Way eastern access point (source: Flyt)

12. SAFE ROUTES TO SCHOOL

12.1 Local Primary Schools

The development site is within the catchment of Mosman Park Primary School as well as two private primary schools. Mosman Park Primary School is 885m distance from the subject site which is a 10 minute walk or a 2 minute ride. The route to travel to school is shown in Figure 65.

From 130 Wellington Street, travel west along Wellington Street and turn right onto Palmerston Street. Walk north along Palmerston Street and turn left onto Victoria Street. Mosman Park Primary School is located on the western corner of Solomon Street and Victoria Street.

Bus route 107 takes an almost identical route from the subject site and can drop students at the front of Mosman Park Primary School. Due to the grid network of streets, there are many alternative routes to travel to school of equal duration and length.

Figure 65 Safe routes to local primary schools

13. SAFETY ISSUES

13.1 Crash History

In the five-year period ending October 17th 2019, there were five reported crashes along Wellington, Manning and Samson Street, as indicated on the locations extracted from the Main Roads WA Crash Reporting system shown in Figure 66.

Four of the five were minor property damage only. The crash at the corner of Manning and Samson Street was a right-angle crash resulting in major property damage only.

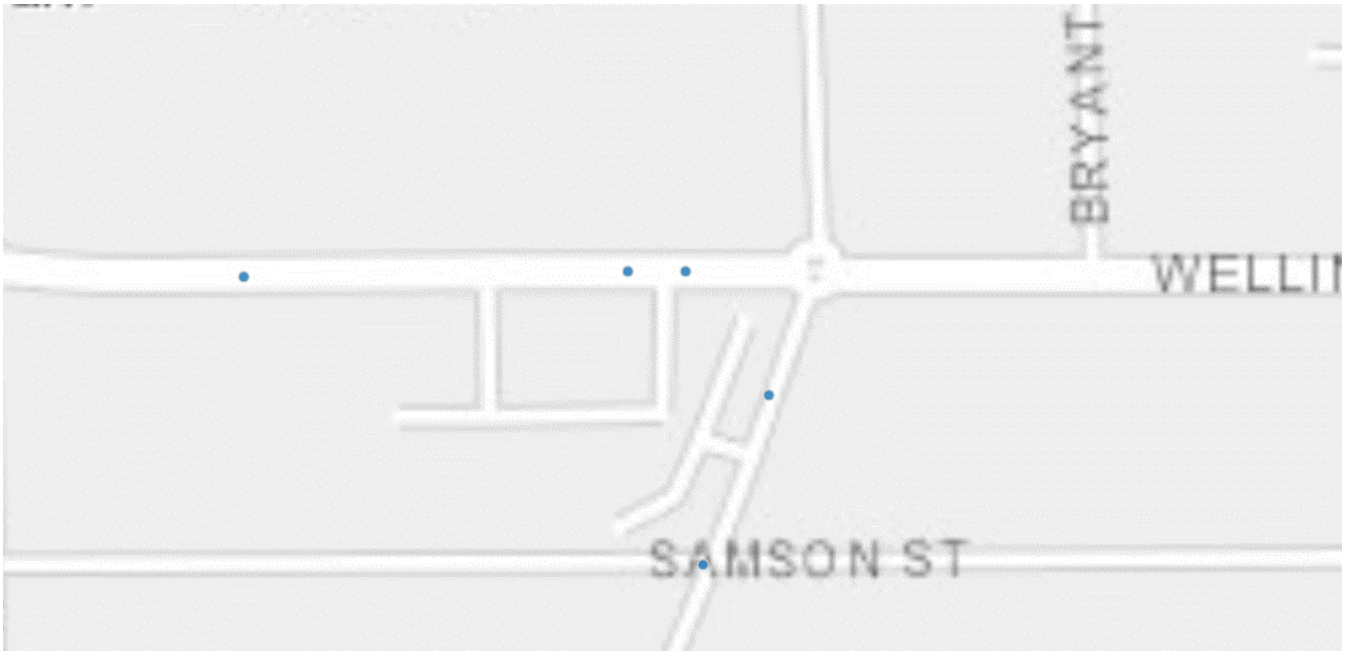


Figure 66 Main Roads WA Crash Data (last five years) (Source: MRWA)

14. SUMMARY AND CONCLUSIONS

14.1 Assessment

This Transport Impact Assessment has been prepared in support of the proposed mixed use development at 130 Wellington Street, Mosman Park.

The development includes 76 apartments and seven townhouses over five levels with three levels of parking accommodating 128 residential bays, 12 on-site motorcycle bays, 60 on-site commercial visitor bays (reciprocal use with residential visitors), 2 car share bays and 23 on-street short stay bays proposed.

There are 62 residential bike parking bays on basement level 2. The townhouses will retain bicycles onsite. Additionally, there will be 22 commercial employee bike parking bays, 60 commercial visitor bike bays (with reciprocal use by residential visitors) and end of trip facilities for staff located on site. Additional racks will be provided along street frontage locations for convenience trips and cargo bikes.

Vehicle access to the development site is proposed via an existing crossover of Turnbull Way which runs off Wellington Street. Turnbull Way will be reconfigured to run in the opposite direction with entry only movements to the western crossover and exit only movements from the eastern crossover. This alteration in direction of flow will not impact access to existing commercial or residential properties on Wellington Street.

The accessway from Turnbull Way will provide access to parking on basement levels 1 and 2 for residents, visitors, car share and retail or commercial trips. The crossover will also accommodate service vehicles associated with the residential and commercial component of the development including moving trucks and waste collection vehicles. These vehicle movements have been analysed for functionality and can be accommodated.

Substantial data collection and assessment of existing parking provision and occupancy has informed the proposed approach within the LDP and DA for this site. The proposed range of on-street short term bays for convenience shopping and off-street bays for longer stays associated with Food and Beverage and shopping retail would be effective in providing for demands. A Parking Management Plan would be developed upon approval of the DA setting out controls for parking on-site.

Based on a total of 76 apartments, seven townhouses, 1,997m^2 NLA of retail and commercial areas with a total of 189 on-site bays and 23 on-street bays, the development is forecast to generate 220 trips in the AM and 240 trips in the PM peak hours using existing trip patterns associated with the current retail offering and mid-range trip generation levels for the residential component. This is a minimal increase from existing movements and will have limited impacts on the surrounding street network.

The traffic impact on the site was assessed using SIDRA 9. The current network functions well. Two separate forecast year scenarios were tested – a 2023 opening year and a 2023 opening year with double the total vehicle movements. The latter test was undertaken to ascertain if there were any substantial impacts on the network. Modelling indicates this is not the case, therefore the traffic impact of the proposed development is acceptable.

The development site is located within close and convenient access to bus route 107 which provides a direct connection to Victoria Street Station and high frequency bus routes 998 and 998 which are 1.4km from the subject site. The existing embayed bus stop will be replaced with a new verge based stop.

The site is very walkable with footpaths on at least one side of all surrounding streets and a higher than average amount of urban tree canopy along street blocks. All roads within the area are local access roads where speeds and volumes are typically low. Footpaths surrounding the proposed development will be widened between 3m – 5m and overall pedestrian permeability and conditions improved.

The site has an average level of cycle accessibility and is located in proximity to various cycle paths including the Perth Bicycle Network route NW18, and some on road cycle lanes and good riding environments. End of trip facilities are provided in the development to encourage non vehicle trips for employees.

APPENDIX 1

SIDRA Output (2020)

MOVEMENT SUMMARY

Site: 2020 [Mos Lane 2020 AM (Site Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Manning Street														
1	L2	36	3	38	8.3	0.129	4.3	LOS A	0.7	5.2	0.31	0.47	0.31	41.0
2	T1	87	1	92	1.1	0.129	4.1	LOS A	0.7	5.2	0.31	0.47	0.31	38.1
3	R2	16	0	17	0.0	0.129	7.6	LOS A	0.7	5.2	0.31	0.47	0.31	43.3
3u	U	1	0	1	0.0	0.129	9.2	LOS A	0.7	5.2	0.31	0.47	0.31	43.9
Approach		140	4	147	2.9	0.129	4.6	LOS A	0.7	5.2	0.31	0.47	0.31	40.0
East: Wellington Street														
4	L2	16	0	17	0.0	0.071	4.2	LOS A	0.4	2.6	0.33	0.47	0.33	43.7
5	T1	51	0	54	0.0	0.071	4.2	LOS A	0.4	2.6	0.33	0.47	0.33	44.8
6	R2	8	0	8	0.0	0.071	7.7	LOS A	0.4	2.6	0.33	0.47	0.33	42.5
6u	U	1	0	1	0.0	0.071	9.3	LOS A	0.4	2.6	0.33	0.47	0.33	45.9
Approach		76	0	80	0.0	0.071	4.6	LOS A	0.4	2.6	0.33	0.47	0.33	44.4
North: Manning Street														
7	L2	4	1	4	25.0	0.075	4.5	LOS A	0.4	2.9	0.31	0.50	0.31	43.0
8	T1	49	1	52	2.0	0.075	4.1	LOS A	0.4	2.9	0.31	0.50	0.31	44.4
9	R2	26	0	27	0.0	0.075	7.6	LOS A	0.4	2.9	0.31	0.50	0.31	44.1
9u	U	1	0	1	0.0	0.075	9.2	LOS A	0.4	2.9	0.31	0.50	0.31	31.0
Approach		80	2	84	2.5	0.075	5.3	LOS A	0.4	2.9	0.31	0.50	0.31	44.0
West: Wellington Street														
10	L2	30	0	32	0.0	0.114	4.2	LOS A	0.6	4.7	0.33	0.53	0.33	41.1
11	T1	43	2	45	4.7	0.114	4.2	LOS A	0.6	4.7	0.33	0.53	0.33	44.7
12	R2	30	3	32	10.0	0.114	7.8	LOS A	0.6	4.7	0.33	0.53	0.33	44.1
12u	U	18	0	19	0.0	0.114	9.2	LOS A	0.6	4.7	0.33	0.53	0.33	45.0
Approach		121	5	127	4.1	0.114	5.8	LOS A	0.6	4.7	0.33	0.53	0.33	43.9
All Vehicles		417	11	439	2.6	0.129	5.1	LOS A	0.7	5.2	0.32	0.50	0.32	43.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is Included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2020 [Mos Lane 2020 PM (Site Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Manning Street														
1	L2	20	3	21	15.0	0.084	5.3	LOS A	0.5	3.3	0.32	0.52	0.32	41.0
2	T1	55	0	58	0.0	0.084	5.3	LOS A	0.5	3.3	0.32	0.52	0.32	38.5
3	R2	13	0	14	0.0	0.084	8.8	LOS A	0.5	3.3	0.32	0.52	0.32	43.5
3u	U	1	0	1	0.0	0.084	10.5	LOS B	0.5	3.3	0.32	0.52	0.32	44.2
Approach		89	3	94	3.4	0.084	5.9	LOS A	0.5	3.3	0.32	0.52	0.32	40.4
East: Wellington Street														
4	L2	12	0	13	0.0	0.053	5.5	LOS A	0.3	2.0	0.40	0.53	0.40	45.8
5	T1	36	0	38	0.0	0.053	5.7	LOS A	0.3	2.0	0.40	0.53	0.40	47.0
6	R2	4	0	4	0.0	0.053	9.3	LOS A	0.3	2.0	0.40	0.53	0.40	45.5
6u	U	1	0	1	0.0	0.053	11.0	LOS B	0.3	2.0	0.40	0.53	0.40	48.0
Approach		53	0	56	0.0	0.053	6.0	LOS A	0.3	2.0	0.40	0.53	0.40	46.6
North: Manning Street														
7	L2	4	0	4	0.0	0.120	5.1	LOS A	0.7	4.7	0.32	0.54	0.32	45.9
8	T1	83	0	87	0.0	0.120	5.2	LOS A	0.7	4.7	0.32	0.54	0.32	46.9
9	R2	39	0	41	0.0	0.120	8.8	LOS A	0.7	4.7	0.32	0.54	0.32	46.6
9u	U	4	0	4	0.0	0.120	10.5	LOS B	0.7	4.7	0.32	0.54	0.32	27.5
Approach		130	0	137	0.0	0.120	6.5	LOS A	0.7	4.7	0.32	0.54	0.32	46.1
West: Wellington Street														
10	L2	14	1	15	7.1	0.096	4.9	LOS A	0.5	3.8	0.26	0.59	0.26	43.4
11	T1	27	1	28	3.7	0.096	5.1	LOS A	0.5	3.8	0.26	0.59	0.26	46.7
12	R2	34	0	36	0.0	0.096	8.6	LOS A	0.5	3.8	0.26	0.59	0.26	46.5
12u	U	33	0	35	0.0	0.096	10.3	LOS B	0.5	3.8	0.26	0.59	0.26	47.3
Approach		108	2	114	1.9	0.096	7.7	LOS A	0.5	3.8	0.26	0.59	0.26	46.5
All Vehicles		380	5	400	1.3	0.120	6.6	LOS A	0.7	4.7	0.31	0.55	0.31	45.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

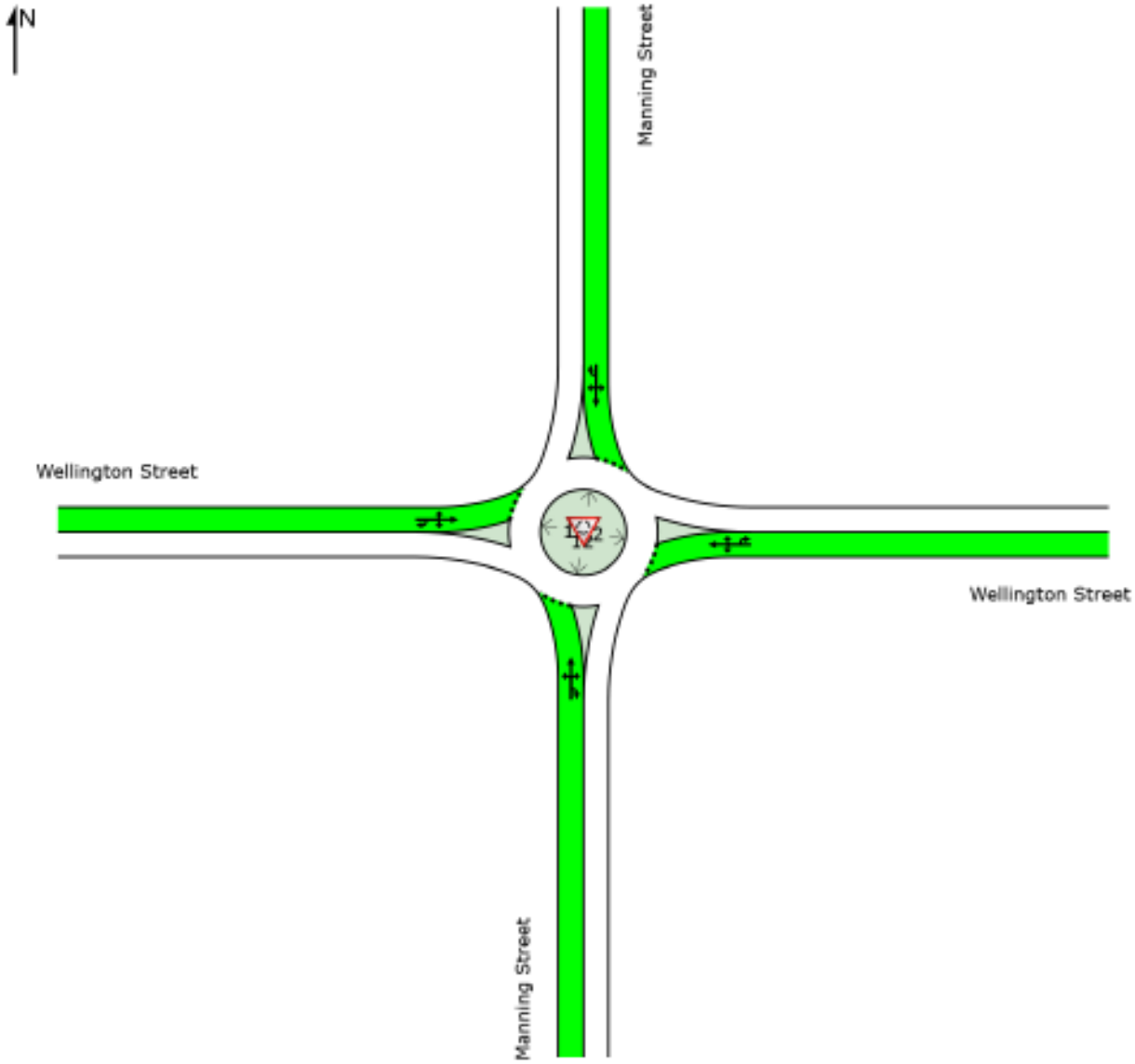
LEVEL OF SERVICE

Lane Level of Service

Site: 2020 [Mos Lane 2020 AM (Site Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: SIDRA Roundabout LOS
Delay Model: SIDRA Standard (Geometric Delay is Included).

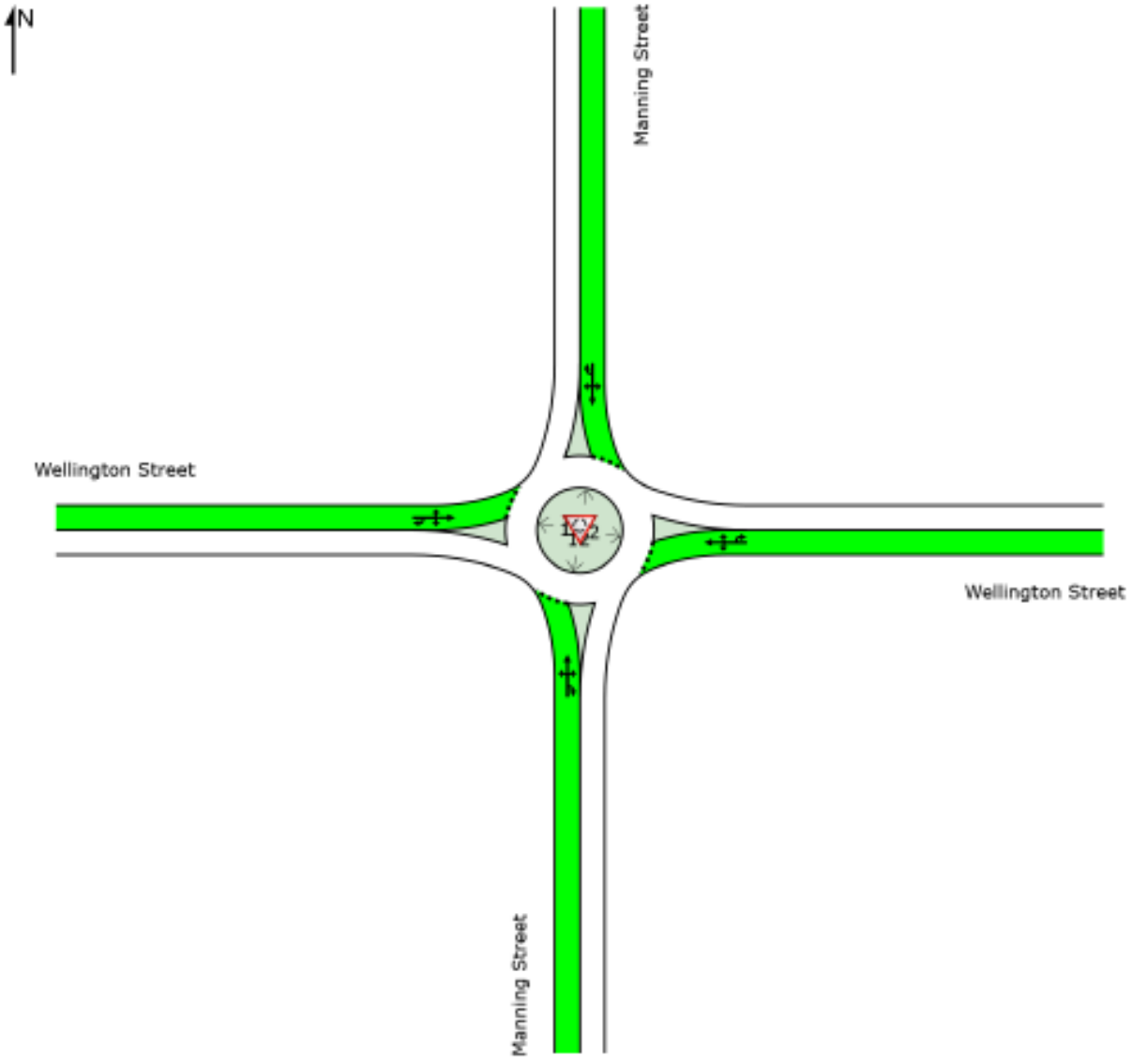
LEVEL OF SERVICE

Lane Level of Service

Site: 2020 [Mos Lane 2020 PM (Site Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: SIDRA Roundabout LOS
Delay Model: SIDRA Standard (Geometric Delay is included).

APPENDIX 2

SIDRA Output (2023)

MOVEMENT SUMMARY

Site: 2020 [Mos Lane 2023 AM (Site Folder: General)]

Network: N101 [Mos Lane 2023 AM (Network Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Manning Street														
1	L2	48	6.5	48	6.5	0.187	4.4	LOS A	0.5	3.2	0.35	0.50	0.35	30.2
2	T1	133	0.8	133	0.8	0.187	4.3	LOS A	0.5	3.2	0.35	0.50	0.35	37.5
3	R2	23	0.0	23	0.0	0.187	7.8	LOS A	0.5	3.2	0.35	0.50	0.35	42.9
3u	U	11	0.0	11	0.0	0.187	9.3	LOS A	0.5	3.2	0.35	0.50	0.35	43.5
Approach		215	2.0	215	2.0	0.187	4.9	LOS A	0.5	3.2	0.35	0.50	0.35	37.9
East: Wellington Street														
4	L2	28	0.0	28	0.0	0.096	4.6	LOS A	0.2	1.5	0.39	0.51	0.39	43.4
5	T1	63	0.0	63	0.0	0.096	4.6	LOS A	0.2	1.5	0.39	0.51	0.39	39.6
6	R2	11	0.0	11	0.0	0.096	8.1	LOS A	0.2	1.5	0.39	0.51	0.39	42.2
6u	U	1	0.0	1	0.0	0.096	9.6	LOS A	0.2	1.5	0.39	0.51	0.39	45.6
Approach		103	0.0	103	0.0	0.096	5.0	LOS A	0.2	1.5	0.39	0.51	0.39	41.5
North: Manning Street														
7	L2	5	20.0	5	20.0	0.099	4.8	LOS A	0.2	1.6	0.38	0.51	0.38	43.1
8	T1	75	1.4	75	1.4	0.099	4.4	LOS A	0.2	1.6	0.38	0.51	0.38	44.4
9	R2	25	0.0	25	0.0	0.099	7.9	LOS A	0.2	1.6	0.38	0.51	0.38	39.5
9u	U	1	0.0	1	0.0	0.099	9.5	LOS A	0.2	1.6	0.38	0.51	0.38	31.0
Approach		106	2.0	106	2.0	0.099	5.3	LOS A	0.2	1.6	0.38	0.51	0.38	43.4
West: Wellington Street														
10	L2	32	0.0	32	0.0	0.148	3.5	LOS A	0.3	2.5	0.41	0.58	0.41	32.5
11	T1	51	4.2	51	4.2	0.148	3.7	LOS A	0.3	2.5	0.41	0.58	0.41	42.3
12	R2	48	6.5	48	6.5	0.148	7.0	LOS A	0.3	2.5	0.41	0.58	0.41	41.2
12u	U	26	0.0	26	0.0	0.148	8.5	LOS A	0.3	2.5	0.41	0.58	0.41	23.1
Approach		157	3.4	157	3.4	0.148	5.5	LOS A	0.3	2.5	0.41	0.58	0.41	39.2
All Vehicles		581	2.0	581	2.0	0.187	5.2	LOS A	0.5	3.2	0.38	0.52	0.38	40.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is Included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [Turnbull Way Entry 2023 AM (Site Folder: General)] **Network: N101 [Mos Lane 2023 AM (Network Folder: General)]**

Mos Lane 2023 Opening Year
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wellington Street														
4	L2	21	0.0	21	0.0	0.087	7.2	LOS A	0.0	0.0	0.00	0.14	0.00	35.8
5	T1	149	0.0	149	0.0	0.087	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	38.4
Approach		171	0.0	171	0.0	0.087	0.9	NA	0.0	0.0	0.00	0.14	0.00	38.2
West: Wellington Street														
11	T1	147	0.0	147	0.0	0.087	0.1	LOS A	0.1	0.4	0.08	0.10	0.08	37.9
12	R2	19	0.0	19	0.0	0.087	6.2	LOS A	0.1	0.4	0.08	0.10	0.08	19.2
Approach		166	0.0	166	0.0	0.087	0.8	NA	0.1	0.4	0.08	0.10	0.08	32.6
All Vehicles		337	0.0	337	0.0	0.087	0.8	NA	0.1	0.4	0.04	0.12	0.04	35.5

MOVEMENT SUMMARY

Site: 102 [Turnbull Way Exit 2023 AM (Site Folder: General)] **Network: N101 [Mos Lane 2023 AM (Network Folder: General)]**

Mos Lane 2023 Opening Year
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Turnbull Way														
1	L2	21	0.0	21	0.0	0.026	0.5	LOS A	0.0	0.3	0.26	0.13	0.26	9.8
3	R2	11	0.0	11	0.0	0.026	1.1	LOS A	0.0	0.3	0.26	0.13	0.26	9.8
Approach		32	0.0	32	0.0	0.026	0.7	LOS A	0.0	0.3	0.26	0.13	0.26	9.8
East: Wellington Street														
5	T1	162	0.0	162	0.0	0.082	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		162	0.0	162	0.0	0.082	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
West: Wellington Street														
11	T1	146	0.0	146	0.0	0.074	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		146	0.0	146	0.0	0.074	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
All Vehicles		340	0.0	340	0.0	0.082	0.1	NA	0.0	0.3	0.02	0.01	0.02	26.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2020 [Mos Lane 2023 PM (Site Folder: General)]

Network: N102 [Mos Lane 2023 PM (Network Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Manning Street														
1	L2	49	6.4	49	6.4	0.156	5.3	LOS A	0.4	2.6	0.34	0.55	0.34	30.6
2	T1	82	0.0	82	0.0	0.156	5.4	LOS A	0.4	2.6	0.34	0.55	0.34	37.9
3	R2	44	0.0	44	0.0	0.156	8.9	LOS A	0.4	2.6	0.34	0.55	0.34	43.2
3u	U	1	0.0	1	0.0	0.156	10.6	LOS B	0.4	2.6	0.34	0.55	0.34	43.7
Approach		177	1.8	177	1.8	0.156	6.3	LOS A	0.4	2.6	0.34	0.55	0.34	38.9
East: Wellington Street														
4	L2	32	0.0	32	0.0	0.076	6.0	LOS A	0.2	1.2	0.47	0.57	0.47	45.6
5	T1	39	0.0	39	0.0	0.076	6.2	LOS A	0.2	1.2	0.47	0.57	0.47	43.4
6	R2	4	0.0	4	0.0	0.076	9.7	LOS A	0.2	1.2	0.47	0.57	0.47	45.3
6u	U	1	0.0	1	0.0	0.076	11.4	LOS B	0.2	1.2	0.47	0.57	0.47	47.9
Approach		76	0.0	76	0.0	0.076	6.4	LOS A	0.2	1.2	0.47	0.57	0.47	44.8
North: Manning Street														
7	L2	4	0.0	4	0.0	0.166	5.6	LOS A	0.4	2.7	0.41	0.57	0.41	45.7
8	T1	127	0.0	127	0.0	0.166	5.7	LOS A	0.4	2.7	0.41	0.57	0.41	46.7
9	R2	42	0.0	42	0.0	0.166	9.3	LOS A	0.4	2.7	0.41	0.57	0.41	43.1
9u	U	4	0.0	4	0.0	0.166	11.0	LOS B	0.4	2.7	0.41	0.57	0.41	27.4
Approach		178	0.0	178	0.0	0.166	6.7	LOS A	0.4	2.7	0.41	0.57	0.41	45.5
West: Wellington Street														
10	L2	17	6.3	17	6.3	0.132	3.3	LOS A	0.3	2.2	0.36	0.61	0.36	32.5
11	T1	34	3.1	34	3.1	0.132	3.7	LOS A	0.3	2.2	0.36	0.61	0.36	42.6
12	R2	60	0.0	60	0.0	0.132	6.9	LOS A	0.3	2.2	0.36	0.61	0.36	41.7
12u	U	37	0.0	37	0.0	0.132	8.6	LOS A	0.3	2.2	0.36	0.61	0.36	24.2
Approach		147	1.4	147	1.4	0.132	6.2	LOS A	0.3	2.2	0.36	0.61	0.36	39.4
All Vehicles		578	0.9	578	0.9	0.166	6.4	LOS A	0.4	2.7	0.38	0.57	0.38	42.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [Turnbull Way Entry 2023 PM (Site Folder: General)]

Network: N102 [Mos Lane 2023 PM (Network Folder: General)]

Mos Lane 2023 Opening Year
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wellington Street														
4	L2	25	0.0	25	0.0	0.099	7.2	LOS A	0.0	0.0	0.00	0.14	0.00	35.7
5	T1	168	0.0	168	0.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	38.3
Approach		194	0.0	194	0.0	0.099	0.9	NA	0.0	0.0	0.00	0.14	0.00	38.1
West: Wellington Street														
11	T1	139	0.0	139	0.0	0.095	0.2	LOS A	0.1	0.7	0.14	0.17	0.14	36.4
12	R2	36	0.0	36	0.0	0.095	6.3	LOS A	0.1	0.7	0.14	0.17	0.14	18.9
Approach		175	0.0	175	0.0	0.095	1.4	NA	0.1	0.7	0.14	0.17	0.14	28.8
All Vehicles		368	0.0	368	0.0	0.099	1.2	NA	0.1	0.7	0.07	0.16	0.07	33.3

MOVEMENT SUMMARY

Site: 102 [Turnbull Way Exit 2023 PM (Site Folder: General)]

Network: N102 [Mos Lane 2023 PM (Network Folder: General)]

Mos Lane 2023 Opening Year
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Turnbull Way														
1	L2	34	0.0	34	0.0	0.037	0.5	LOS A	0.1	0.4	0.26	0.14	0.26	9.8
3	R2	13	0.0	13	0.0	0.037	1.1	LOS A	0.1	0.4	0.26	0.14	0.26	9.8
Approach		46	0.0	46	0.0	0.037	0.7	LOS A	0.1	0.4	0.26	0.14	0.26	9.8
East: Wellington Street														
5	T1	167	0.0	167	0.0	0.085	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		167	0.0	167	0.0	0.085	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
West: Wellington Street														
11	T1	135	0.0	135	0.0	0.068	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		135	0.0	135	0.0	0.068	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
All Vehicles		348	0.0	348	0.0	0.085	0.1	NA	0.1	0.4	0.03	0.02	0.03	23.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX 3

SIDRA Output (2023 Double Volumes)

MOVEMENT SUMMARY

Site: 2020 [Mos Lane 2023 AM - Double (Site Folder: General)]

Network: N101 [Mos Lane 2023 Double AM (Network Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Manning Street														
1	L2	97	3.3	97	3.3	0.425	5.8	LOS A	1.3	8.9	0.61	0.63	0.61	27.8
2	T1	265	0.4	265	0.4	0.425	5.6	LOS A	1.3	8.9	0.61	0.63	0.61	35.5
3	R2	46	0.0	46	0.0	0.425	9.1	LOS A	1.3	8.9	0.61	0.63	0.61	41.6
3u	U	21	0.0	21	0.0	0.425	10.7	LOS B	1.3	8.9	0.61	0.63	0.61	42.0
Approach		429	1.0	429	1.0	0.425	6.3	LOS A	1.3	8.9	0.61	0.63	0.61	35.9
East: Wellington Street														
4	L2	53	0.0	53	0.0	0.226	6.1	LOS A	0.6	3.9	0.60	0.65	0.60	42.4
5	T1	126	0.0	126	0.0	0.226	6.1	LOS A	0.6	3.9	0.60	0.65	0.60	38.0
6	R2	21	0.0	21	0.0	0.226	9.6	LOS A	0.6	3.9	0.60	0.65	0.60	40.8
6u	U	2	0.0	2	0.0	0.226	11.1	LOS B	0.6	3.9	0.60	0.65	0.60	44.6
Approach		202	0.0	202	0.0	0.226	6.5	LOS A	0.6	3.9	0.60	0.65	0.60	40.1
North: Manning Street														
7	L2	11	10.0	11	10.0	0.233	6.0	LOS A	0.6	4.2	0.58	0.64	0.58	42.5
8	T1	149	0.7	149	0.7	0.233	5.7	LOS A	0.6	4.2	0.58	0.64	0.58	43.4
9	R2	51	0.0	51	0.0	0.233	9.2	LOS A	0.6	4.2	0.58	0.64	0.58	38.0
9u	U	2	0.0	2	0.0	0.233	10.7	LOS B	0.6	4.2	0.58	0.64	0.58	30.3
Approach		213	1.0	213	1.0	0.233	6.6	LOS A	0.6	4.2	0.58	0.64	0.58	42.4
West: Wellington Street														
10	L2	63	0.0	63	0.0	0.349	5.2	LOS A	1.0	6.9	0.67	0.72	0.67	29.9
11	T1	95	2.2	95	2.2	0.349	5.4	LOS A	1.0	6.9	0.67	0.72	0.67	40.5
12	R2	97	3.3	97	3.3	0.349	8.7	LOS A	1.0	6.9	0.67	0.72	0.67	39.3
12u	U	53	0.0	53	0.0	0.349	10.1	LOS B	1.0	6.9	0.67	0.72	0.67	20.0
Approach		307	1.7	307	1.7	0.349	7.2	LOS A	1.0	6.9	0.67	0.72	0.67	36.9
All Vehicles		1152	1.0	1152	1.0	0.425	6.6	LOS A	1.3	8.9	0.62	0.66	0.62	38.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is Included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [Turnbull Way Entry 2023 AM - Double (Site Folder: General)]

Network: N101 [Mos Lane 2023 Double AM (Network Folder: General)]

Mos Lane 2023 Opening Year
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wellington Street														
4	L2	42	0.0	42	0.0	0.172	7.2	LOS A	0.0	0.0	0.00	0.14	0.00	35.8
5	T1	295	0.0	295	0.0	0.172	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	38.4
Approach		337	0.0	337	0.0	0.172	0.9	NA	0.0	0.0	0.00	0.14	0.00	38.1
West: Wellington Street														
11	T1	295	0.0	295	0.0	0.183	0.3	LOS A	0.2	1.1	0.14	0.11	0.14	37.2
12	R2	42	0.0	42	0.0	0.183	7.0	LOS A	0.2	1.1	0.14	0.11	0.14	19.0
Approach		337	0.0	337	0.0	0.183	1.1	NA	0.2	1.1	0.14	0.11	0.14	31.8
All Vehicles		674	0.0	674	0.0	0.183	1.0	NA	0.2	1.1	0.07	0.12	0.07	34.9

MOVEMENT SUMMARY

Site: 102 [Turnbull Way Exit 2023 AM - Double (Site Folder: General)]

Network: N101 [Mos Lane 2023 Double AM (Network Folder: General)]

Mos Lane 2023 Opening Year
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Turnbull Way														
1	L2	42	0.0	42	0.0	0.063	1.1	LOS A	0.1	0.6	0.40	0.29	0.40	9.6
3	R2	21	0.0	21	0.0	0.063	2.7	LOS A	0.1	0.6	0.40	0.29	0.40	9.6
Approach		63	0.0	63	0.0	0.063	1.6	LOS A	0.1	0.6	0.40	0.29	0.40	9.6
East: Wellington Street														
5	T1	316	0.0	316	0.0	0.160	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		316	0.0	316	0.0	0.160	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
West: Wellington Street														
11	T1	274	0.0	274	0.0	0.139	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		274	0.0	274	0.0	0.139	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
All Vehicles		653	0.0	653	0.0	0.160	0.2	NA	0.1	0.6	0.04	0.03	0.04	25.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2020 [Mos Lane 2023 PM - Double (Site Folder: General)]

Network: N101 [Mos Lane 2023 Double PM (Network Folder: General)]

Manning Street and Wellington Street
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Manning Street														
1	L2	101	3.1	101	3.1	0.353	6.5	LOS A	1.0	6.8	0.56	0.65	0.56	28.5
2	T1	164	0.0	164	0.0	0.353	6.6	LOS A	1.0	6.8	0.56	0.65	0.56	36.2
3	R2	88	0.0	88	0.0	0.353	10.1	LOS B	1.0	6.8	0.56	0.65	0.56	42.0
3u	U	2	0.0	2	0.0	0.353	11.8	LOS B	1.0	6.8	0.56	0.65	0.56	42.5
Approach		356	0.9	356	0.9	0.353	7.5	LOS A	1.0	6.8	0.56	0.65	0.56	37.2
East: Wellington Street														
4	L2	63	0.0	63	0.0	0.195	8.3	LOS A	0.5	3.4	0.70	0.74	0.70	43.8
5	T1	74	0.0	74	0.0	0.195	8.5	LOS A	0.5	3.4	0.70	0.74	0.70	40.2
6	R2	8	0.0	8	0.0	0.195	12.0	LOS B	0.5	3.4	0.70	0.74	0.70	42.6
6u	U	2	0.0	2	0.0	0.195	13.7	LOS B	0.5	3.4	0.70	0.74	0.70	46.0
Approach		147	0.0	147	0.0	0.195	8.7	LOS A	0.5	3.4	0.70	0.74	0.70	42.5
North: Manning Street														
7	L2	8	0.0	8	0.0	0.401	7.4	LOS A	1.1	8.0	0.68	0.73	0.68	44.4
8	T1	255	0.0	255	0.0	0.401	7.6	LOS A	1.1	8.0	0.68	0.73	0.68	45.2
9	R2	84	0.0	84	0.0	0.401	11.1	LOS B	1.1	8.0	0.68	0.73	0.68	40.8
9u	U	8	0.0	8	0.0	0.401	12.8	LOS B	1.1	8.0	0.68	0.73	0.68	26.6
Approach		356	0.0	356	0.0	0.401	8.5	LOS A	1.1	8.0	0.68	0.73	0.68	44.0
West: Wellington Street														
10	L2	34	3.1	34	3.1	0.312	4.6	LOS A	0.9	6.0	0.58	0.70	0.58	30.9
11	T1	67	1.6	67	1.6	0.312	4.9	LOS A	0.9	6.0	0.58	0.70	0.58	41.3
12	R2	126	0.0	126	0.0	0.312	8.1	LOS A	0.9	6.0	0.58	0.70	0.58	40.3
12u	U	74	0.0	74	0.0	0.312	9.8	LOS A	0.9	6.0	0.58	0.70	0.58	21.8
Approach		301	0.7	301	0.7	0.312	7.4	LOS A	0.9	6.0	0.58	0.70	0.58	37.8
All Vehicles		1160	0.5	1160	0.5	0.401	7.9	LOS A	1.1	8.0	0.62	0.70	0.62	40.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [Turnbull Way Entry 2023 PM - Double (Site Folder: General)]

Network: N101 [Mos Lane 2023 Double PM (Network Folder: General)]

Mos Lane 2023 Opening Year
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Wellington Street														
4	L2	53	0.0	53	0.0	0.199	7.2	LOS A	0.0	0.0	0.00	0.15	0.00	35.6
5	T1	337	0.0	337	0.0	0.199	0.0	LOS A	0.0	0.0	0.00	0.15	0.00	38.3
Approach		389	0.0	389	0.0	0.199	1.0	NA	0.0	0.0	0.00	0.15	0.00	38.0
West: Wellington Street														
11	T1	274	0.0	274	0.0	0.200	0.6	LOS A	0.3	1.9	0.25	0.18	0.25	35.4
12	R2	74	0.0	74	0.0	0.200	7.3	LOS A	0.3	1.9	0.25	0.18	0.25	18.7
Approach		347	0.0	347	0.0	0.200	2.0	NA	0.3	1.9	0.25	0.18	0.25	28.1
All Vehicles		737	0.0	737	0.0	0.200	1.5	NA	0.3	1.9	0.12	0.16	0.12	32.9

MOVEMENT SUMMARY

Site: 102 [Turnbull Way Exit 2023 PM - Double (Site Folder: General)]

Network: N101 [Mos Lane 2023 Double PM (Network Folder: General)]

Mos Lane 2023 Opening Year
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Turnbull Way														
1	L2	67	0.0	67	0.0	0.089	1.1	LOS A	0.1	0.9	0.40	0.29	0.40	9.6
3	R2	25	0.0	25	0.0	0.089	2.7	LOS A	0.1	0.9	0.40	0.29	0.40	9.6
Approach		93	0.0	93	0.0	0.089	1.5	LOS A	0.1	0.9	0.40	0.29	0.40	9.6
East: Wellington Street														
5	T1	316	0.0	316	0.0	0.160	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		316	0.0	316	0.0	0.160	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
West: Wellington Street														
11	T1	253	0.0	253	0.0	0.128	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	40.0
Approach		253	0.0	253	0.0	0.128	0.0	NA	0.0	0.0	0.00	0.00	0.00	40.0
All Vehicles		661	0.0	661	0.0	0.160	0.2	NA	0.1	0.9	0.06	0.04	0.06	22.7