

TRAFFIC AND PARKING IMPACT ASSESSMENT

Proposed Affordable Housing

12-16 Stuart Road in Warrawong

Prepared for: SARM Architects

N244186A (Version 1a)

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Motion Traffic Engineers Pty Ltd
Telephone:
940 33588
sydney@motiontraffic.com.au

ACN 600201583

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1. INTRODUCTION

Motion Traffic Engineers was commissioned by Sarm Architects to undertake a traffic and parking impact assessment of proposed affordable housing at 12-16 Stuart Road in Warrawong.

Currently, the site is occupied by three dwellings.

The carparking area for the proposed affordable housing will be provided on the ground level with vehicle access and egress via Stuart Road.

This traffic report presents an assessment of the anticipated transport implications of the proposed affordable housing, with the following considerations:

- ➡ Background and existing traffic and parking conditions of the proposed affordable housing
- ➡ Assessment of the public transport network within the vicinity of the proposed affordable housing
- ➡ Adequacy of car, bicycle and motorcycle parking provision
- ➡ The projected traffic generation of the proposed affordable housing and;
- ➡ The transport impact of the proposed affordable housing on the surrounding road network.

In the course of preparing this assessment, the proposed affordable housing and its environs have been inspected, plans of the development are examined, all relevant traffic and parking data have been collected and analysed.

2. BACKGROUND AND EXISTING CONDITIONS OF THE PROPOSED AFFORDABLE HOUSING

2.1. Location and Land Use

The proposed affordable housing is located within walking distance of Warrawong Town Centre (to the east). The immediate surroundings of the proposed affordable housing are residential houses of one to two storeys. Hillview Childcare centre is located nearby. Lake Illawarra is located to the south and within walking distance to the site.

Vehicular access and egress to the proposed affordable housing is via one main driveway mainly to ensure entry and exit of the vehicles from Stuart Road.

Figures 1 show the location of the proposed affordable housing from the aerial perspective, and Figure 2 also shows the location of the proposed affordable housing from a street map perspective and the location of the surveyed intersections in relation to the proposed affordable housing. Figure 3 shows the photograph of the proposed affordable housing entry driveway from Stuart Road.



Figure 1: Location of the proposed affordable housing on Aerial

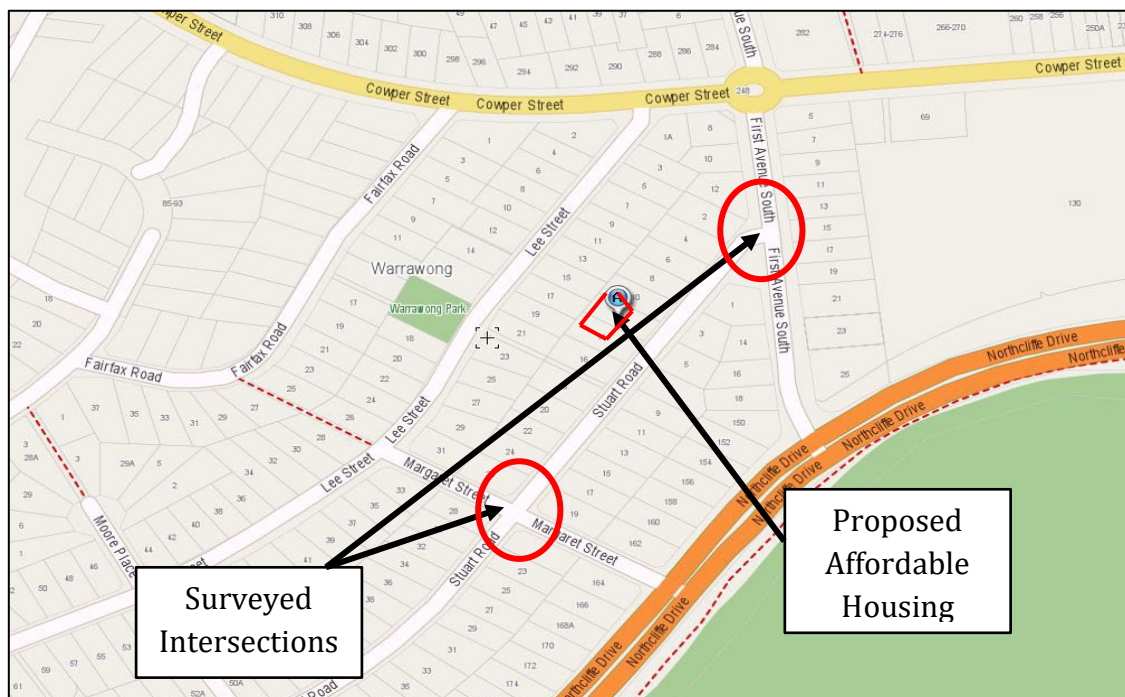


Figure 2: Location of the Proposed affordable housing on Aerial and Surveyed Intersections



Figure 3: Photograph of the Proposed affordable housing Entry Driveway from Stuart Road

2.2.Road Network

This section discusses the road network adjacent to the site.

Stuart Road is a local road with one lane each way. Unrestricted on-street parking is permitted on both sides of the road. The default speed limit is 50km/hr. Figure 4a shows a photograph of Stuart Road.

Traffic and Parking Impact Assessment for Proposed Affordable Housing

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First Avenue South is a local road with one lane each way. Unrestricted on-street parking is permitted on both sides of the road. The sign-posted speed limit is 50km/hr. Figure 4b shows a photograph of First Avenue South.

Margaret Street local is a local road with one lane each way and a sign-posted speed limit of 50km/hr. Unrestricted on-street parking is permitted on both sides of the road Figure 4c shows a photograph of Margaret Street.

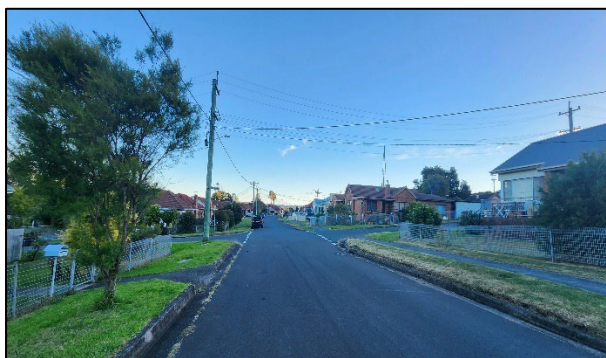


Figure 4a: Stuart Road: looking west with Margaret Street



Figure 4b: First Avenue South: looking north with Stuart Road



Figure 4c: Margaret Street: looking south to Northcliffe drive

2.3.Public Transport

The proposed affordable housing is located to a bus stop approximately 150 metres away on First Avenue to the local area such as Port Kembla with an acceptable frequency for a regional area.

Overall, the proposed affordable housing has good access to public transport and the site is considered accessible to public transport.

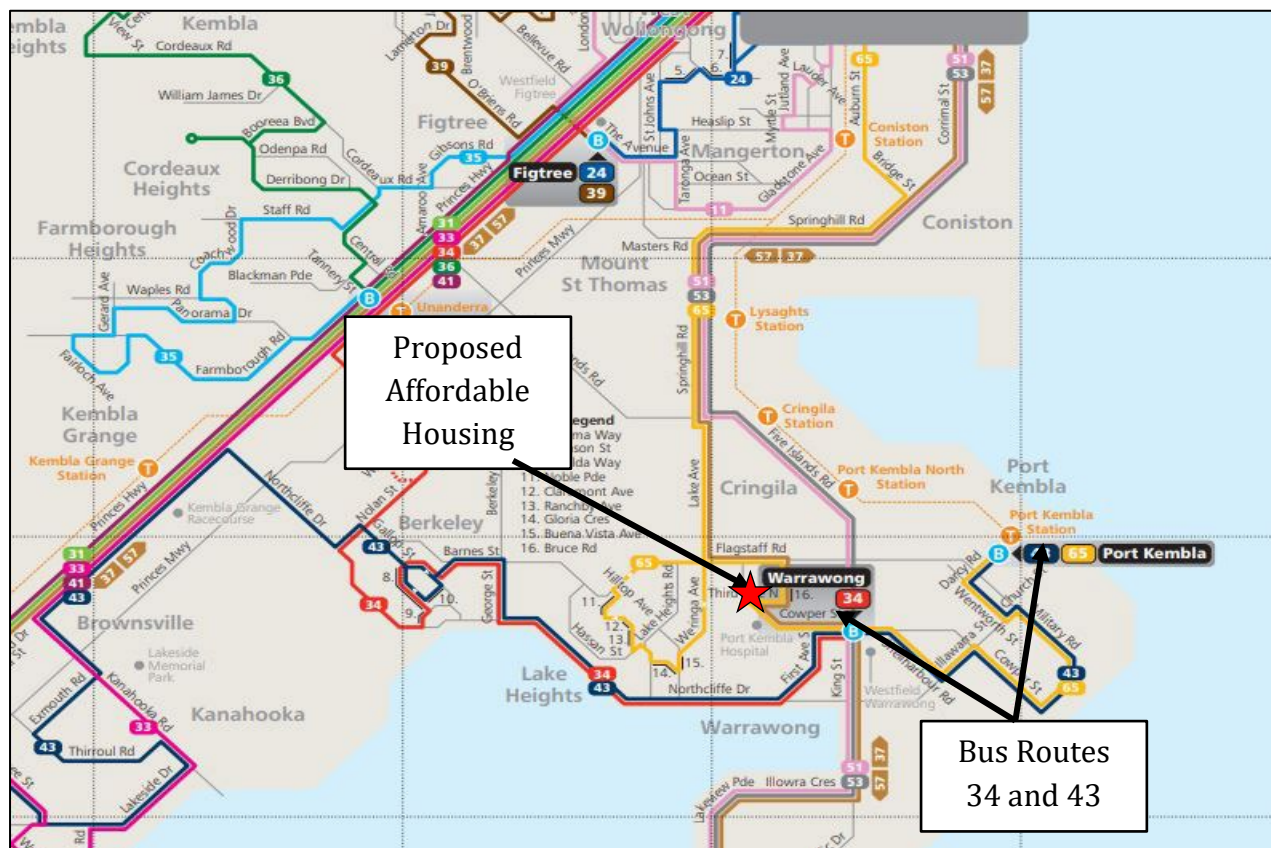


Figure 5: Bus Routes 34 and 43 in relation Bus Route Maps and Proposed Site

2.4. Public Parking

Unrestricted on-street parking is permitted on Stuart Road, First Avenue South, Margaret Road and nearby residential roads with no time restrictions.

Site visits show there are number of vacant car space can be found. Many of the residential dwellings have on-site parking and do not necessarily need to park on-street.

2.5. Intersection Description

As part of the traffic impact assessment, the performance of the nearby intersection was surveyed and assessed:

- ➡ Stop Intersection of First Avenue South with Stuart Road
- ➡ Priority Intersection of Margaret Street with Stuart Road

External traffic travelling to and from the development is likely to travel through the intersection mentioned above.

The Stop intersection of First Avenue South with Stuart Road is a three-leg intersection with all turn movements permitted. Drivers travelling on Stuart Road must stop and give way to traffic on First Avenue South. Figure 6a shows the layout of the intersection using SIDRA 9.1 – an industry standard intersection software. Figure 6b shows the photograph of the intersection in aerial.

The priority intersection of Margaret Street with Stuart Road is a four-leg intersection with all turn movements permitted. Drivers travelling on Stuart Road need to give way to traffic on Margaret Street. Figure 6c shows the layout of the intersection using SIDRA 9.1 Figure 6d shows the photograph of intersection in aerial.

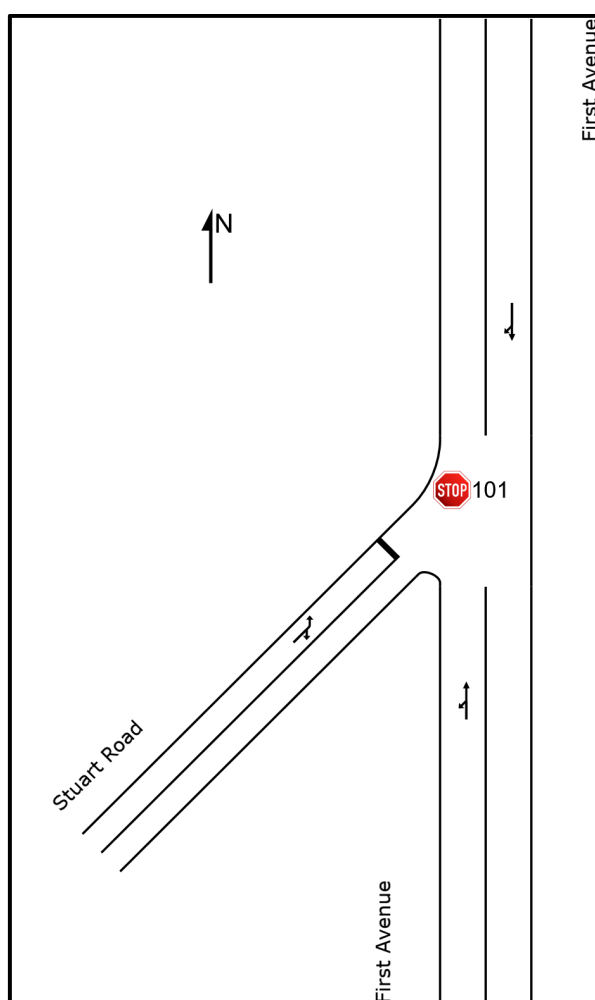


Figure 6a: Stop Intersection of First Avenue South with Stuart Road (SIDRA)



Figure 6b: Stop Intersection of First Avenue South with Stuart Road (Aerial)

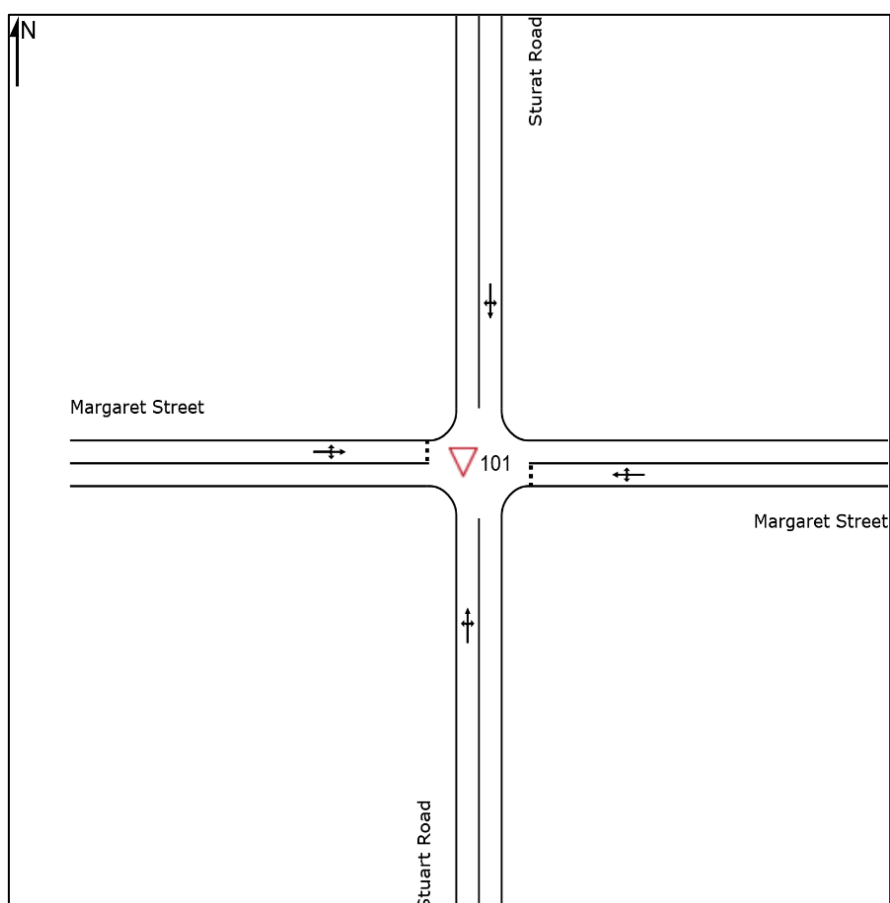


Figure 6c: Priority Intersection of Margaret Street with Stuart Road (SIDRA)



Figure 6d: Priority Intersection of Margaret Street with Stuart Road (Aerial)

2.6. Existing Traffic Volume

As part of the traffic assessment, traffic counts have been undertaken at the above-mentioned intersections and the AM and PM peak hours are identified accordingly. The AM peak hour is 8am to 9am and the PM peak hour is 4:45 to 5:45pm.

The following figures present the traffic volumes in vehicles for the weekday peak hours. The bracketed numbers are trucks/buses and the un-bracketed are cars.

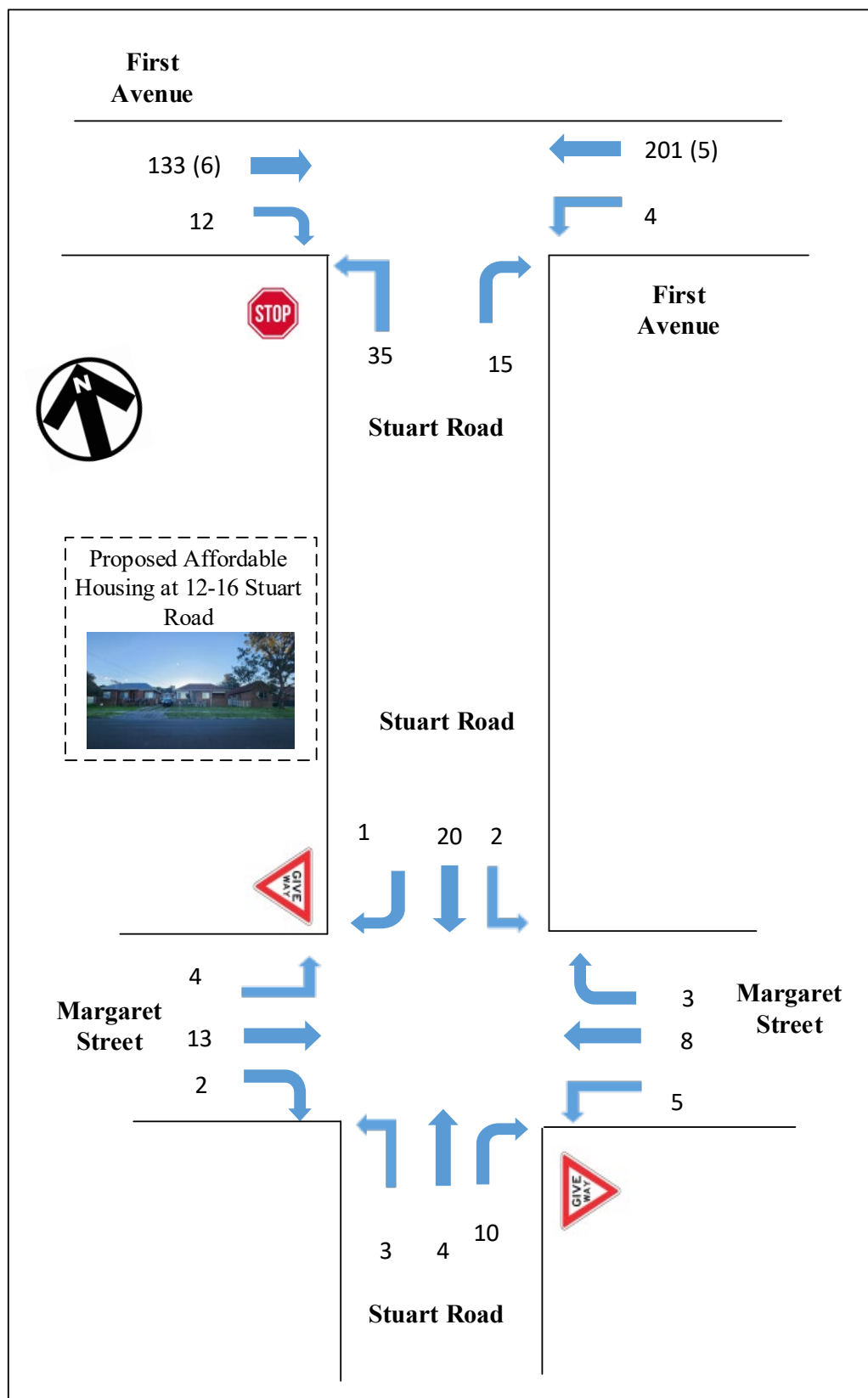


Figure 7: Existing Weekday Traffic Volumes AM Peak Hour

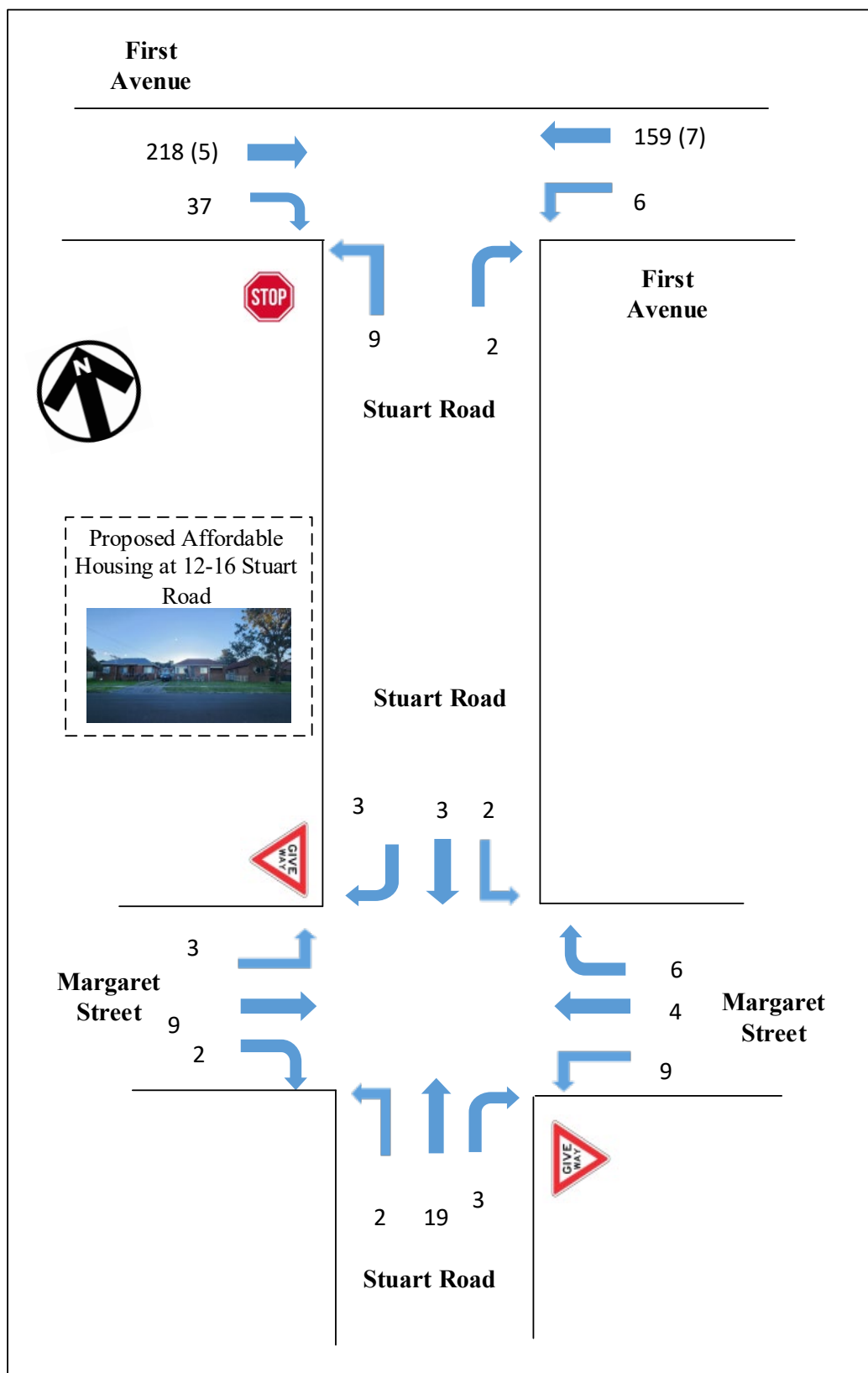


Figure 8: Existing Weekday Traffic Volumes PM Peak Hour

2.7. Intersection Assessment with Existing Traffic

An intersection assessment has been undertaken for the:

- ➔ Stop Intersection of First Avenue South with Stuart Road
- ➔ Priority Intersection of Margaret Street with Stuart Road

The existing intersection operating performance was assessed using the SIDRA software package (version 9.1) to determine the Degree of Saturation (DS), Average Delay (AVD in seconds) and Level of Service (LoS) at each intersection. The SIDRA program provides Level of Service Criteria Tables for various intersection types. The key indicator of intersection performance is Level of Service, where results are placed on a continuum from 'A' to 'F', as shown in Table 1.

LoS	Traffic Signal / Roundabout	Give Way / Stop Sign / T-Junction control
A	Good operation	Good operation
B	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory , but accident study required
D	Operating near capacity	Near capacity & accident study required
E	At capacity, at signals incidents will cause excessive delays.	At capacity, requires other control mode
F	Unsatisfactory and requires additional capacity, Roundabouts require other control mode	At capacity, requires other control mode

Table 1: Intersection Level of Service

The Average Vehicle Delay (AVD) provides a measure of the operational performance of an intersection as indicated below, which relates AVD to LOS. The AVD's should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner-city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route). For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (sign control) the critical movement for level of service assessment should be that movement with the highest average delay.

LoS	Average Delay per Vehicles (seconds/vehicle)
A	Less than 14
B	15 to 28
C	29 to 42
D	43 to 56
E	57 to 70
F	>70

Table 2: Intersection Average Delay (AVD)

The degree of saturation (DS) is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals both queue length and delay increase rapidly as DS approaches 1. It is usual to attempt to keep DS to less than 0.9. Degrees of Saturation in the order of 0.7 generally represent sat intersection operation. When DS exceed 0.9 queues can be anticipated.

The results of the intersection analysis are as follows:

Intersection/ Performance criteria	AM Peak Hour Existing	PM Peak Hour Existing
First Avenue South/ Stuart Road		
LoS	NA (LOS A)	NA (LOS A)
AVD	1.3	1.3
DS	0.106	0.106
Margaret Street/Stuart Road		
LoS	NA (LOS A)	NA (LOS A)
AVD	2.8	2.8
DS	0.015	0.015

Table 3: Existing Intersection Performances

As presented in Table 3, the assessed intersections are currently operating at excellent conditions with spare capacity to accommodate additional traffic both AM and PM peak hours. The full intersection results are presented in Appendix A.

2.8. Conclusions on Existing Conditions

Vehicle access and egress to the proposed affordable housing carparking area is via two-way driveway that runs off Stuart Road.

The proposed affordable housing has unrestricted on-street parking available on its surrounding streets.

The nearby intersections perform well with sufficient spare capacity to accommodate additional traffic.

Overall, the proposed affordable housing has good access to public transport and the site is considered accessible to public transport.

3. PROPOSED AFFORDABLE HOUSING

3.1. Proposed affordable housing

The Proposed affordable housing comprises of:

- ➡ Four two bedroom and four one-bedroom units on Ground Floor
- ➡ Four two bedrooms and four one-bedrooms on first floor
- ➡ A total of eight two bedrooms and eight one-bedrooms units

3.2. Parking

Car parking is provided on ground floor level with vehicle access and egress via Stuart Road. The details of the carpark area are as follows:

- ➡ Eight car spaces including one disabled space

The site is within 150 metres of a bus stop on First Avenue and the site is considered “accessible” for public transport.

The proposed affordable housing is classified as "Development without consent" under Division 6, Chapter 2 of the State Environmental Planning Policy (Housing) 2021. Hence, the provisions of Section 42(e) within Division 6 apply to this development.

A full scaled plan of the proposed affordable housing is provided as part of the Development Application.

4. PARKING REQUIREMENTS

4.1. Car Parking

The *Wollongong Development Control Plan (2009)* stipulates the car parking requirements from *State Environmental Planning Policy (Housing 2021)* should be used for the assessment of affordable housing.

The car parking requirements for affordable housing are presented in *State Environmental Planning Policy 2021 (SEPP 21)* as Clause 19 Non-discretionary development standards—the Act, s 4.15 of the *SEPP 21* states

- (e) the following number of parking spaces for dwellings used for affordable housing—
 - (i) for each dwelling containing 1 bedroom—at least 0.4 parking spaces,
 - (ii) for each dwelling containing 2 bedrooms—at least 0.5 parking spaces,
 - (iii) for each dwelling containing at least 3 bedrooms—at least 1 parking space,

The car parking rates derived from the SEPP 21 are as follows:

- ➡ 0.4 parking spaces for each 1 bedroom
- ➡ 0.5 parking spaces for each 2 bedrooms

Table 4 below presents the minimum car parking requirement for the Proposed affordable housing based on the car parking rates listed above.

Land Use Type	No of Units	Car Parking Rate	Car Spaces Required	Car Spaces Provided
One Bedroom	8	0.4 parking space per room	3	8
Two Bedroom	8	0.5 space per room	4	
Total			7	8

Table 4: Summary of Car Parking Requirements

As presented in Table 4 above, the proposed affordable housing provides eight car spaces versus seven required. Therefore, the proposed affordable housing complies with the minimum parking requirement as per *State Environmental Planning Policy 2021 (SEPP 21)*.

Visitor car spaces are not required. Visitors will need to park on-street.

5. TRAFFIC GENERATION AND IMPACT

5.1. Proposed Traffic Generation

The NSW RTA Guide to Traffic Generating Development (2002) nor the Guide to Transport Impact Assessment (2024) does not stipulate the traffic generation for affordable housing. The trips generated will be based on the number of car spaces considering a worst-case scenario as peak parking demand.

Peak Hour	Use	Number of car spaces	Trip Generation Rate	Trip Generated
AM	Residential	8	1	8
PM		8	1	8

Table 6: Net Trips generated by the Proposed affordable housing in peak hours

5.2. Trip Distribution

The proposed affordable housing is a small trip generator in both AM and PM peak hours.

The predicted affordable housing trips are distributed as presented in Table 8. The proposed affordable housing is a small trip generator.

The predicted affordable housing generated trips are distributed to the road network assuming 20% origin trips 80% destination trips for the AM peak hour and 80% origin trips 20% destination trips for the PM peak hour, which results the following:

Peak Hour	Origin	Destination	Total
AM	6	2	8
PM	2	6	8

Table 8: Trip Distribution of the proposed affordable housing for the weekday peak hours

5.3. Existing with Affordable housing Traffic

The additional Affordable housing trips are assigned onto the local traffic network. The following figures present the future traffic volume with the affordable housing's trips (in red for origin trips and blue for destination trips) for the weekday AM and PM peak hours.

The additional Affordable housing trips represent a small proportion of the existing traffic volumes.

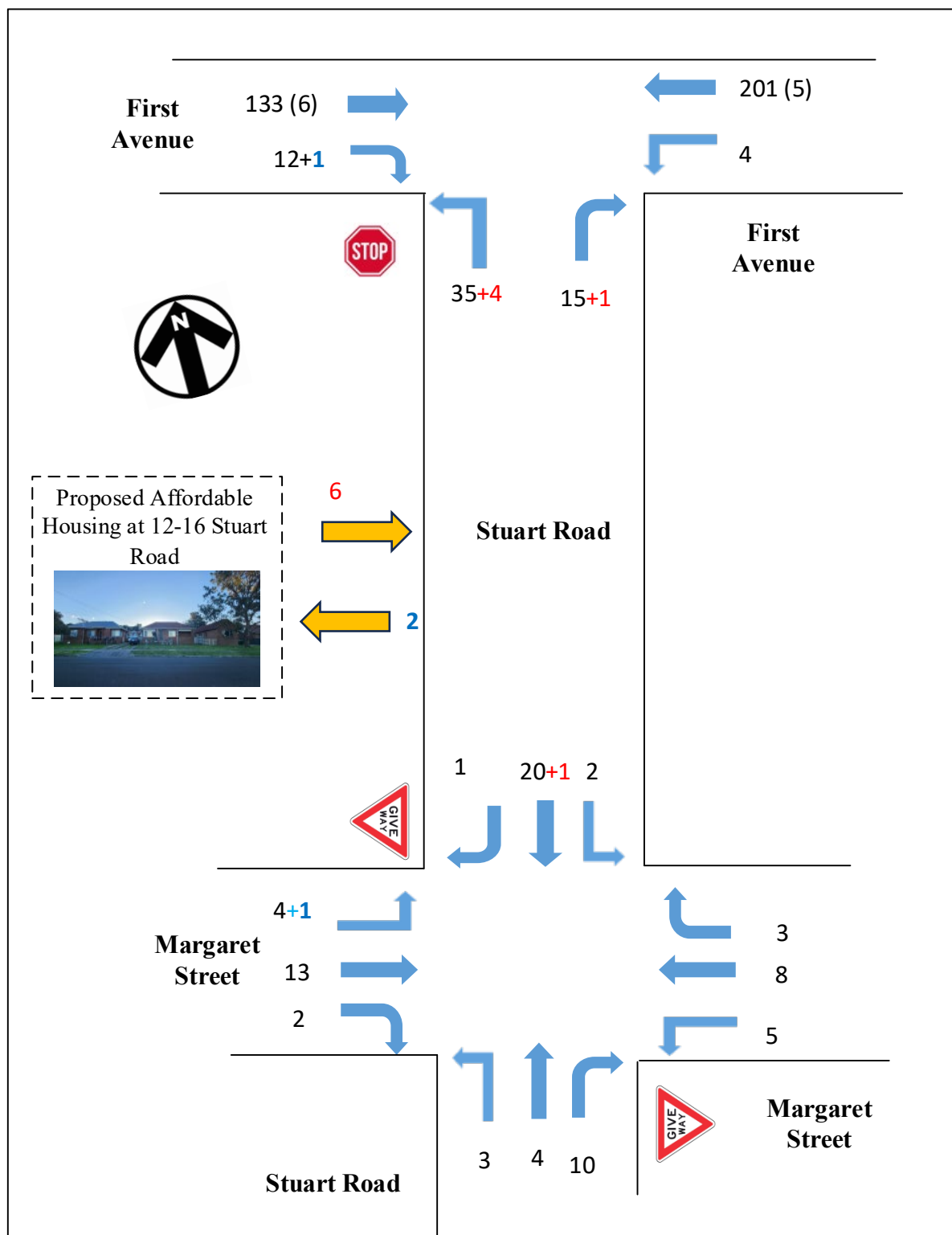


Figure 9a: Existing Weekday Traffic Volumes with Additional Affordable Housing traffic AM Peak Hour

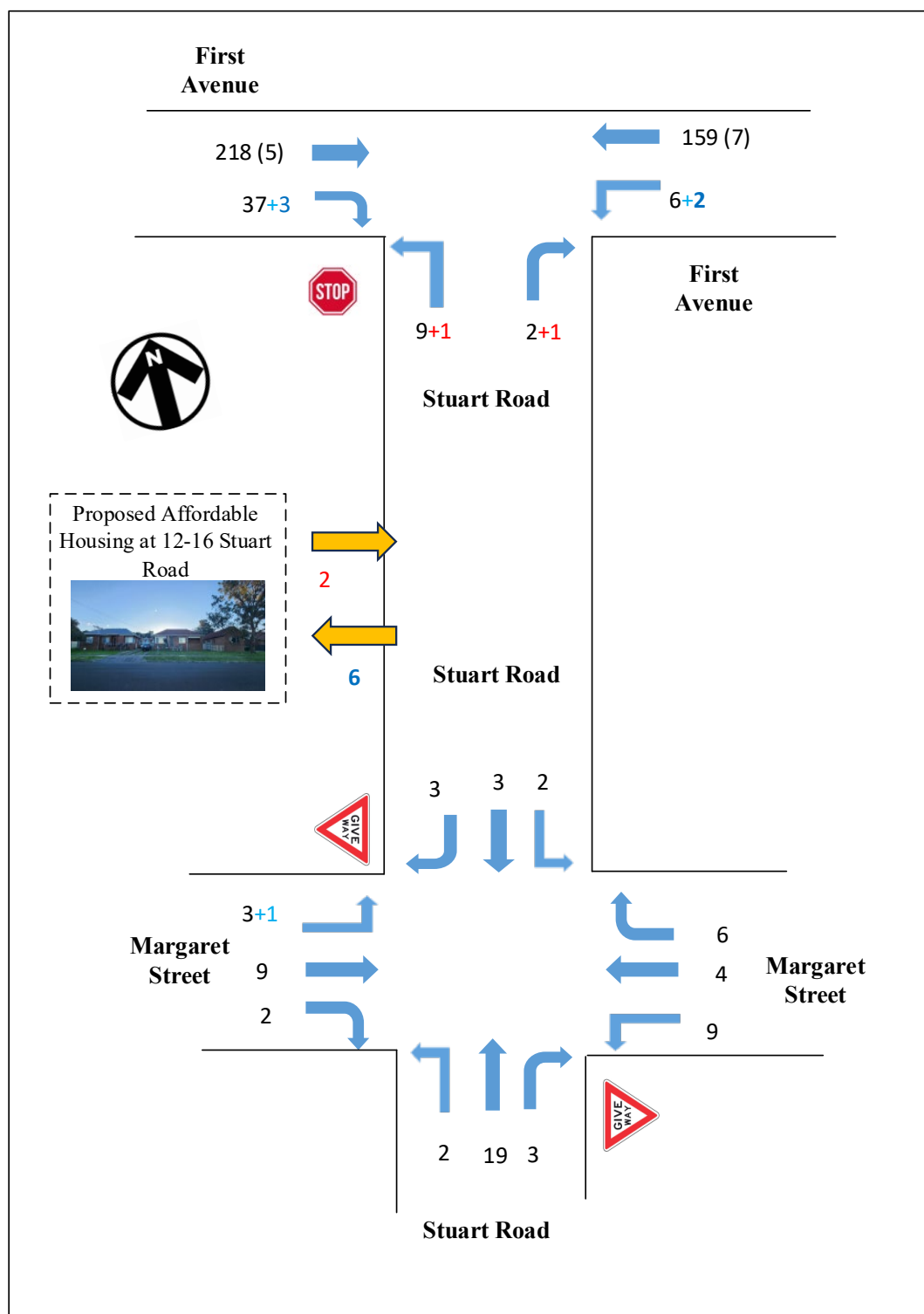


Figure 9b: Existing Weekday Traffic Volumes with Additional Affordable housing traffic PM Peak Hour

5.4. Traffic Impact

This section assesses the following intersections for the existing traffic with the affordable housing traffic. The results of the intersection assessment are as follows noting that all the intersection for the existing with Affordable housing traffic.

Intersection/ Performance criteria	Performance with Existing Traffic		Projected Performance with Existing and Affordable housing traffic	
	AM Peak Hour Existing	PM Peak Hour Existing	AM Peak Hour Projected	PM Peak Hour Projected
First Avenue South/ Stuart Road				
LoS	NA (LOS A)	NA (LOS A)	NA (LOS A)	NA (LOS A)
AVD	1.3	0.7	1.4	0.8
DS	0.106	0.138	0.106	0.140
Margaret Street/Stuart Road				
LoS	NA (LOS A)	NA (LOS A)	NA (LOS A)	NA (LOS A)
AVD	2.8	2.8	2.8	2.8
DS	0.015	0.015	0.016	0.016

Table 9: Projected intersection performance with traffic

As presented in Table 9 above, the additional trips generated by the Proposed affordable housing have minimum impact on the intersection performances in both AM and PM peak hours. The LoS, AVD and DS of each intersection are not significantly affected by the addition of Affordable housing traffic.

The traffic impacts of the proposed affordable housing are therefore considered acceptable.

The full SIDRA results are presented in Appendix B for the proposed conditions with the Affordable housing traffic.

6. CONCLUSIONS

This traffic impact assessment reports relates to a proposed affordable housing at 12-16 Stuart Road, Warrawong. Based on the analysis and discussions presented in this report, the following conclusions are made:

- ➔ The proposed affordable housing is located in a residential area with good access to local public transport service.
- ➔ The surrounding intersections currently operates at a good level of services with overall spare capacity available.
- ➔ The Proposed affordable housing premises comply with the car parking requirements in *State Environmental Planning Policy 2021 (Housing SEPP 21)*.
- ➔ The proposed affordable housing is expected to generate a small number of additional trips in both AM and PM peak hours.
- ➔ According to the intersection assessment, the additional trips can be accommodated in the nearby intersections without significantly affecting the performance of any turn movement, approach arm or the overall intersection. The traffic impacts of the Proposed affordable housing are therefore considered acceptable.

There are no traffic engineering reasons why a development consent for the proposed affordable housing at 12-16 Stuart Road in Warrawong, should be refused.

APPENDIX A

INTERSECTION ASSESSMENT FOR EXISTING TRAFFIC

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Stop Rate	Eff. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: First Avenue															
1b	L3	All MCs	4	0.0	4	0.0	0.106	5.4	LOS A	0.0	0.0	0.00	0.01	0.00	48.7
2	T1	All MCs	217	2.4	217	2.4	0.106	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach			221	2.4	221	2.4	0.106	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.9
North: First Avenue															
8	T1	All MCs	146	4.3	146	4.3	0.079	0.1	LOS A	0.1	0.7	0.07	0.07	0.07	49.6
9a	R1	All MCs	13	0.0	13	0.0	0.079	4.1	LOS A	0.1	0.7	0.07	0.07	0.07	48.8
Approach			159	4.0	159	4.0	0.079	0.4	NA	0.1	0.7	0.07	0.07	0.07	49.6
SouthWest: Stuart Road															
30a	L1	All MCs	37	0.0	37	0.0	0.052	8.3	LOS A	0.2	1.3	0.34	0.96	0.34	44.2
32b	R3	All MCs	16	0.0	16	0.0	0.052	9.8	LOS A	0.2	1.3	0.34	0.96	0.34	44.0
Approach			53	0.0	53	0.0	0.052	8.7	LOS A	0.2	1.3	0.34	0.96	0.34	44.1
All Vehicles			433	2.7	433	2.7	0.106	1.3	NA	0.2	1.3	0.07	0.15	0.07	49.0

Table A1: Weekday Stop Intersection Performance of First Avenue South with Stuart Road for the Weekday AM Peak Hour

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Stop Rate	Eff. Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]					
			veh/h	%	veh/h	%				v/c	sec					
South: Stuart Road																
1	L2	All MCs	3	0.0	3	0.0	0.010	4.6	LOS A	0.0	0.3	0.08	0.41	0.08	0.08	46.4
2	T1	All MCs	4	0.0	4	0.0	0.010	0.0	LOS A	0.0	0.3	0.08	0.41	0.08	0.08	47.5
3	R2	All MCs	11	0.0	11	0.0	0.010	4.6	LOS A	0.0	0.3	0.08	0.41	0.08	0.08	46.2
Approach			18	0.0	18	0.0	0.010	3.5	NA	0.0	0.3	0.08	0.41	0.08	0.08	46.5
East: Margaret Street																
4	L2	All MCs	5	0.0	5	0.0	0.013	4.6	LOS A	0.0	0.3	0.10	0.48	0.10	0.10	46.1
5	T1	All MCs	8	0.0	8	0.0	0.013	3.3	LOS A	0.0	0.3	0.10	0.48	0.10	0.10	46.4
6	R2	All MCs	3	0.0	3	0.0	0.013	4.8	LOS A	0.0	0.3	0.10	0.48	0.10	0.10	45.9
Approach			17	0.0	17	0.0	0.013	4.0	LOS A	0.0	0.3	0.10	0.48	0.10	0.10	46.3
North: Stuart Road																
7	L2	All MCs	2	0.0	2	0.0	0.013	4.6	LOS A	0.0	0.1	0.01	0.07	0.01	0.01	48.4
8	T1	All MCs	21	0.0	21	0.0	0.013	0.0	LOS A	0.0	0.1	0.01	0.07	0.01	0.01	49.6
9	R2	All MCs	1	0.0	1	0.0	0.013	4.6	LOS A	0.0	0.1	0.01	0.07	0.01	0.01	48.1
Approach			24	0.0	24	0.0	0.013	0.6	NA	0.0	0.1	0.01	0.07	0.01	0.01	49.4
West: Margaret Street																
10	L2	All MCs	4	0.0	4	0.0	0.015	4.6	LOS A	0.1	0.4	0.06	0.47	0.06	0.06	46.4
11	T1	All MCs	14	0.0	14	0.0	0.015	3.3	LOS A	0.1	0.4	0.06	0.47	0.06	0.06	46.7
12	R2	All MCs	2	0.0	2	0.0	0.015	4.7	LOS A	0.1	0.4	0.06	0.47	0.06	0.06	46.2
Approach			20	0.0	20	0.0	0.015	3.7	LOS A	0.1	0.4	0.06	0.47	0.06	0.06	46.6
All Vehicles			79	0.0	79	0.0	0.015	2.8	NA	0.1	0.4	0.06	0.33	0.06	0.06	47.3

Table A2: Weekday Priority Intersection Performance of Margaret Street with Stuart Road for the Weekday AM Peak Hour

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Stop Rate	Eff. Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]					
			veh/h	%	veh/h	%				v/c	sec					
South: First Avenue																
1b	L3	All MCs	6	0.0	6	0.0	0.088	5.4	LOS A	0.0	0.0	0.00	0.02	0.00	48.6	
2	T1	All MCs	175	4.2	175	4.2	0.088	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	49.8	
Approach			181	4.1	181	4.1	0.088	0.2	NA	0.0	0.0	0.00	0.02	0.00	49.8	
North: First Avenue																
8	T1	All MCs	235	2.2	235	2.2	0.138	0.1	LOS A	0.3	2.0	0.11	0.11	0.11	49.4	
9a	R1	All MCs	39	0.0	39	0.0	0.138	4.0	LOS A	0.3	2.0	0.11	0.11	0.11	48.5	
Approach			274	1.9	274	1.9	0.138	0.7	NA	0.3	2.0	0.11	0.11	0.11	49.2	
SouthWest: Stuart Road																
30a	L1	All MCs	9	0.0	9	0.0	0.011	8.0	LOS A	0.0	0.3	0.30	0.95	0.30	44.3	
32b	R3	All MCs	2	0.0	2	0.0	0.011	10.1	LOS A	0.0	0.3	0.30	0.95	0.30	44.1	
Approach			12	0.0	12	0.0	0.011	8.4	LOS A	0.0	0.3	0.30	0.95	0.30	44.3	
All Vehicles			466	2.7	466	2.7	0.138	0.7	NA	0.3	2.0	0.07	0.09	0.07	49.3	

Table A3: Weekday Stop Intersection Performance of First Avenue South with Stuart Road for the Weekday PM Peak Hour

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Stop Rate	Eff. Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]					
			veh/h	%	veh/h	%				v/c	sec					
South: Stuart Road																
1	L2	All MCs	2	0.0	2	0.0	0.013	4.6	LOS A	0.0	0.1	0.01	0.12	0.01	0.01	48.1
2	T1	All MCs	20	0.0	20	0.0	0.013	0.0	LOS A	0.0	0.1	0.01	0.12	0.01	0.01	49.3
3	R2	All MCs	3	0.0	3	0.0	0.013	4.6	LOS A	0.0	0.1	0.01	0.12	0.01	0.01	47.9
Approach			25	0.0	25	0.0	0.013	1.0	NA	0.0	0.1	0.01	0.12	0.01	0.01	49.0
East: Margaret Street																
4	L2	All MCs	9	0.0	9	0.0	0.015	4.6	LOS A	0.1	0.4	0.04	0.51	0.04	0.04	46.0
5	T1	All MCs	4	0.0	4	0.0	0.015	3.2	LOS A	0.1	0.4	0.04	0.51	0.04	0.04	46.3
6	R2	All MCs	6	0.0	6	0.0	0.015	4.6	LOS A	0.1	0.4	0.04	0.51	0.04	0.04	45.8
Approach			20	0.0	20	0.0	0.015	4.3	LOS A	0.1	0.4	0.04	0.51	0.04	0.04	46.0
North: Stuart Road																
7	L2	All MCs	2	0.0	2	0.0	0.005	4.6	LOS A	0.0	0.1	0.07	0.33	0.07	0.07	46.8
8	T1	All MCs	3	0.0	3	0.0	0.005	0.0	LOS A	0.0	0.1	0.07	0.33	0.07	0.07	48.0
9	R2	All MCs	3	0.0	3	0.0	0.005	4.6	LOS A	0.0	0.1	0.07	0.33	0.07	0.07	46.6
Approach			8	0.0	8	0.0	0.005	2.9	NA	0.0	0.1	0.07	0.33	0.07	0.07	47.2
West: Margaret Street																
10	L2	All MCs	3	0.0	3	0.0	0.011	4.6	LOS A	0.0	0.3	0.09	0.47	0.09	0.09	46.3
11	T1	All MCs	9	0.0	9	0.0	0.011	3.3	LOS A	0.0	0.3	0.09	0.47	0.09	0.09	46.6
12	R2	All MCs	2	0.0	2	0.0	0.011	4.7	LOS A	0.0	0.3	0.09	0.47	0.09	0.09	46.1
Approach			15	0.0	15	0.0	0.011	3.8	LOS A	0.0	0.3	0.09	0.47	0.09	0.09	46.4
All Vehicles			68	0.0	68	0.0	0.015	2.8	NA	0.1	0.4	0.04	0.33	0.04	0.04	47.3

Table A4: Weekday Priority Intersection Performance of Margaret Street with Stuart Road for the Weekday PM Peak Hour

APPENDIX B

INTERSECTION ASSESSMENT FOR PROPOSED CONDITION WITH AFFORDABLE HOUSING TRAFFIC

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Stop Rate	Eff. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]				
			veh/h	%	veh/h	%				v/c	sec				
South: First Avenue															
1b	L3	All MCs	4	0.0	4	0.0	0.106	5.4	LOS A	0.0	0.0	0.00	0.01	0.00	48.7
2	T1	All MCs	217	2.4	217	2.4	0.106	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach			221	2.4	221	2.4	0.106	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.9
North: First Avenue															
8	T1	All MCs	146	4.3	146	4.3	0.080	0.1	LOS A	0.1	0.7	0.07	0.07	0.07	49.6
9a	R1	All MCs	14	0.0	14	0.0	0.080	4.1	LOS A	0.1	0.7	0.07	0.07	0.07	48.8
Approach			160	3.9	160	3.9	0.080	0.4	NA	0.1	0.7	0.07	0.07	0.07	49.5
SouthWest: Stuart Road															
30a	L1	All MCs	41	0.0	41	0.0	0.057	8.3	LOS A	0.2	1.5	0.34	0.96	0.34	44.2
32b	R3	All MCs	17	0.0	17	0.0	0.057	9.8	LOS A	0.2	1.5	0.34	0.96	0.34	44.0
Approach			58	0.0	58	0.0	0.057	8.7	LOS A	0.2	1.5	0.34	0.96	0.34	44.1
All Vehicles			439	2.6	439	2.6	0.106	1.4	NA	0.2	1.5	0.07	0.16	0.07	48.9

Table B1: Weekday Stop Intersection Performance of First Avenue South with Stuart Road for the Weekday AM Peak Hour with affordable housing traffic

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Stop Rate	Eff. Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]					
			veh/h	%	veh/h	%				v/c	sec					
South: Stuart Road																
1	L2	All MCs	3	0.0	3	0.0	0.010	4.6	LOS A	0.0	0.3	0.08	0.41	0.08	0.08	46.4
2	T1	All MCs	4	0.0	4	0.0	0.010	0.1	LOS A	0.0	0.3	0.08	0.41	0.08	0.08	47.5
3	R2	All MCs	11	0.0	11	0.0	0.010	4.6	LOS A	0.0	0.3	0.08	0.41	0.08	0.08	46.2
Approach			18	0.0	18	0.0	0.010	3.5	NA	0.0	0.3	0.08	0.41	0.08	0.08	46.5
East: Margaret Street																
4	L2	All MCs	5	0.0	5	0.0	0.013	4.6	LOS A	0.0	0.3	0.10	0.48	0.10	0.10	46.1
5	T1	All MCs	8	0.0	8	0.0	0.013	3.3	LOS A	0.0	0.3	0.10	0.48	0.10	0.10	46.4
6	R2	All MCs	3	0.0	3	0.0	0.013	4.8	LOS A	0.0	0.3	0.10	0.48	0.10	0.10	45.9
Approach			17	0.0	17	0.0	0.013	4.0	LOS A	0.0	0.3	0.10	0.48	0.10	0.10	46.3
North: Stuart Road																
7	L2	All MCs	2	0.0	2	0.0	0.013	4.6	LOS A	0.0	0.1	0.01	0.07	0.01	0.01	48.4
8	T1	All MCs	22	0.0	22	0.0	0.013	0.0	LOS A	0.0	0.1	0.01	0.07	0.01	0.01	49.6
9	R2	All MCs	1	0.0	1	0.0	0.013	4.6	LOS A	0.0	0.1	0.01	0.07	0.01	0.01	48.2
Approach			25	0.0	25	0.0	0.013	0.6	NA	0.0	0.1	0.01	0.07	0.01	0.01	49.4
West: Margaret Street																
10	L2	All MCs	5	0.0	5	0.0	0.016	4.6	LOS A	0.1	0.4	0.06	0.47	0.06	0.06	46.4
11	T1	All MCs	14	0.0	14	0.0	0.016	3.3	LOS A	0.1	0.4	0.06	0.47	0.06	0.06	46.7
12	R2	All MCs	2	0.0	2	0.0	0.016	4.7	LOS A	0.1	0.4	0.06	0.47	0.06	0.06	46.2
Approach			21	0.0	21	0.0	0.016	3.7	LOS A	0.1	0.4	0.06	0.47	0.06	0.06	46.5
All Vehicles			81	0.0	81	0.0	0.016	2.8	NA	0.1	0.4	0.05	0.33	0.05	0.05	47.3

Table B2: Weekday Priority Intersection Performance of Margaret Street with Stuart Road for the Weekday AM Peak Hour with affordable housing traffic

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Stop Rate	Eff. Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]					
			veh/h	%	veh/h	%				v/c	sec					
																km/h

South: First Avenue															
1b	L3	All MCs	8	0.0	8	0.0	0.089	5.4	LOS A	0.0	0.0	0.00	0.03	0.00	48.6
2	T1	All MCs	175	4.2	175	4.2	0.089	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	49.8
Approach			183	4.0	183	4.0	0.089	0.3	NA	0.0	0.0	0.00	0.03	0.00	49.7
North: First Avenue															
8	T1	All MCs	235	2.2	235	2.2	0.140	0.2	LOS A	0.3	2.2	0.12	0.11	0.12	49.3
9a	R1	All MCs	42	0.0	42	0.0	0.140	4.0	LOS A	0.3	2.2	0.12	0.11	0.12	48.5
Approach			277	1.9	277	1.9	0.140	0.7	NA	0.3	2.2	0.12	0.11	0.12	49.2
SouthWest: Stuart Road															
30a	L1	All MCs	11	0.0	11	0.0	0.013	8.0	LOS A	0.0	0.3	0.31	0.95	0.31	44.2
32b	R3	All MCs	3	0.0	3	0.0	0.013	10.2	LOS A	0.0	0.3	0.31	0.95	0.31	44.1
Approach			14	0.0	14	0.0	0.013	8.5	LOS A	0.0	0.3	0.31	0.95	0.31	44.2
All Vehicles			474	2.7	474	2.7	0.140	0.8	NA	0.3	2.2	0.08	0.10	0.08	49.2

Table B3: Weekday Stop Intersection Performance of First Avenue South with Stuart Road for the Weekday PM Peak Hour with affordable housing traffic

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Stop Rate	Eff. Rate	Aver. No. of Cycles	Aver. Speed
			[Total	HV]	[Total	HV]				[Veh.	Dist]					
			veh/h	%	veh/h	%				v/c	sec					

South: Stuart Road													
1	L2 All MCs	2	0.0	2	0.0 0.013	4.6	LOS A	0.0	0.1	0.01	0.12	0.01	48.1
2	T1 All MCs	20	0.0	20	0.0 0.013	0.0	LOS A	0.0	0.1	0.01	0.12	0.01	49.3
3	R2 All MCs	3	0.0	3	0.0 0.013	4.6	LOS A	0.0	0.1	0.01	0.12	0.01	47.9
Approach		25	0.0	25	0.0 0.013	1.0	NA	0.0	0.1	0.01	0.12	0.01	49.0
East: Margaret Street													
4	L2 All MCs	9	0.0	9	0.0 0.015	4.6	LOS A	0.1	0.4	0.04	0.51	0.04	46.0
5	T1 All MCs	4	0.0	4	0.0 0.015	3.2	LOS A	0.1	0.4	0.04	0.51	0.04	46.3
6	R2 All MCs	6	0.0	6	0.0 0.015	4.6	LOS A	0.1	0.4	0.04	0.51	0.04	45.8
Approach		20	0.0	20	0.0 0.015	4.3	LOS A	0.1	0.4	0.04	0.51	0.04	46.0
North: Stuart Road													
7	L2 All MCs	2	0.0	2	0.0 0.005	4.6	LOS A	0.0	0.1	0.07	0.33	0.07	46.8
8	T1 All MCs	3	0.0	3	0.0 0.005	0.0	LOS A	0.0	0.1	0.07	0.33	0.07	48.0
9	R2 All MCs	3	0.0	3	0.0 0.005	4.6	LOS A	0.0	0.1	0.07	0.33	0.07	46.6
Approach		8	0.0	8	0.0 0.005	2.9	NA	0.0	0.1	0.07	0.33	0.07	47.2
West: Margaret Street													
10	L2 All MCs	4	0.0	4	0.0 0.012	4.6	LOS A	0.0	0.3	0.09	0.47	0.09	46.2
11	T1 All MCs	9	0.0	9	0.0 0.012	3.3	LOS A	0.0	0.3	0.09	0.47	0.09	46.5
12	R2 All MCs	2	0.0	2	0.0 0.012	4.7	LOS A	0.0	0.3	0.09	0.47	0.09	46.0
Approach		16	0.0	16	0.0 0.012	3.8	LOS A	0.0	0.3	0.09	0.47	0.09	46.4
All Vehicles		69	0.0	69	0.0 0.015	2.8	NA	0.1	0.4	0.04	0.34	0.04	47.3

Table B4: Weekday Priority Intersection Performance of Margaret Street with Stuart Road for the Weekday PM Peak Hour with affordable housing traffic

CARPARK CERTIFICATION OF THE PROPOSED AFFORDABLE HOUSING

12-16 Stuart Road, Warrawong

Prepared for: SARM Architects

N244186A (Version 1b)

February 2025

Motion Traffic Engineers Pty Ltd
Telephone:
940 33588
sydney@motiontraffic.com.au

ACN 600201583

1. INTRODUCTION

Motion Traffic Engineers was commissioned by SARM Architects to prepare a car parking certification report of the proposed affordable housing units at 12-16 Stuart Road, Warrawong.

The car park is provided on the ground level with vehicle access and egress via Stuart Road.

Reference is made to AS2890.1 (2004) AS2890.6 (2006) and Council's Development Control Plan for compliance.

2. DRIVEWAY/RAMP

The details of the driveways from Stuart Road into the ground level parking area from the perspective of the inbound movement for description purposes are as follows:

- The driveway at the property line is 3.6 metres wide and 30 metres long
- The gradients along the centre line of the driveway/ramp are as follow:
 - The gradient is less than five percent

The proposed affordable housing fall under Class 1a for car parking (Table 1.1 of AS2890.1 (2004)).

Clause 3.2.2 states that "On long driveways, passing opportunities should be provided at least every 30 m". In this case there the parking aisle within the car park for a driver to give way to another car at the car park end and hence there is not need for an additional passing bay.

3. CAR SPACES

The details of the car parking areas are as follows:

- The parking aisles is 5.8 metres wide
- A clearance of 300mm is provided on car spaces adjacent to a wall
- The general 90-degree car spaces are 2.4 metres wide minimum with a length of 5.4 metres.
- The disabled car space is 2.4 metres wide and 5.4 long
 - A shared zone with the same dimensions has been provided
 - A bollard with a compliant setback is provided within the shared zone

4. SWEEP PATHS

A swept turning path analysis is performed using a B85 car with 4.9 metres in length as set in the Australian Standards to confirm that vehicle movements are adequate.

All swept paths show adequate manoeuvrability.

The swept paths are provided in the Appendix A of this report.

5. SIGHT DISTANCE

The car driver's sight distance requirement to enter the external road is stated in Figure 3.2 of AS2890.1.

The sight distance varies according to the speed of the external road. Stuart Road has a default speed limit of 50km/hr.

The minimum sight distance required is 45 metres. The minimum vehicle sight distance is met.

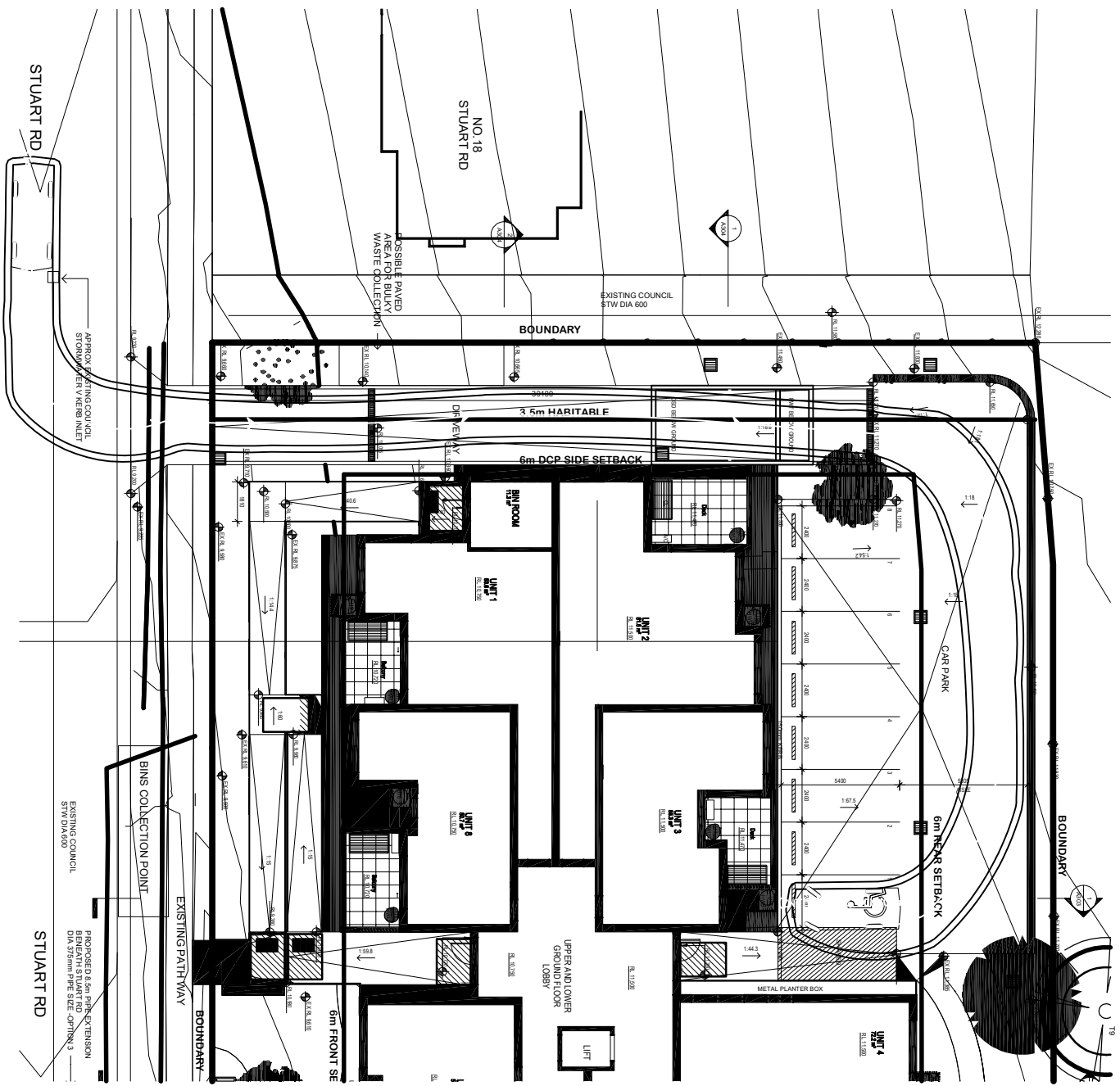
The pedestrian sight distance triangle as set out in Figure 3.3 is met as well.

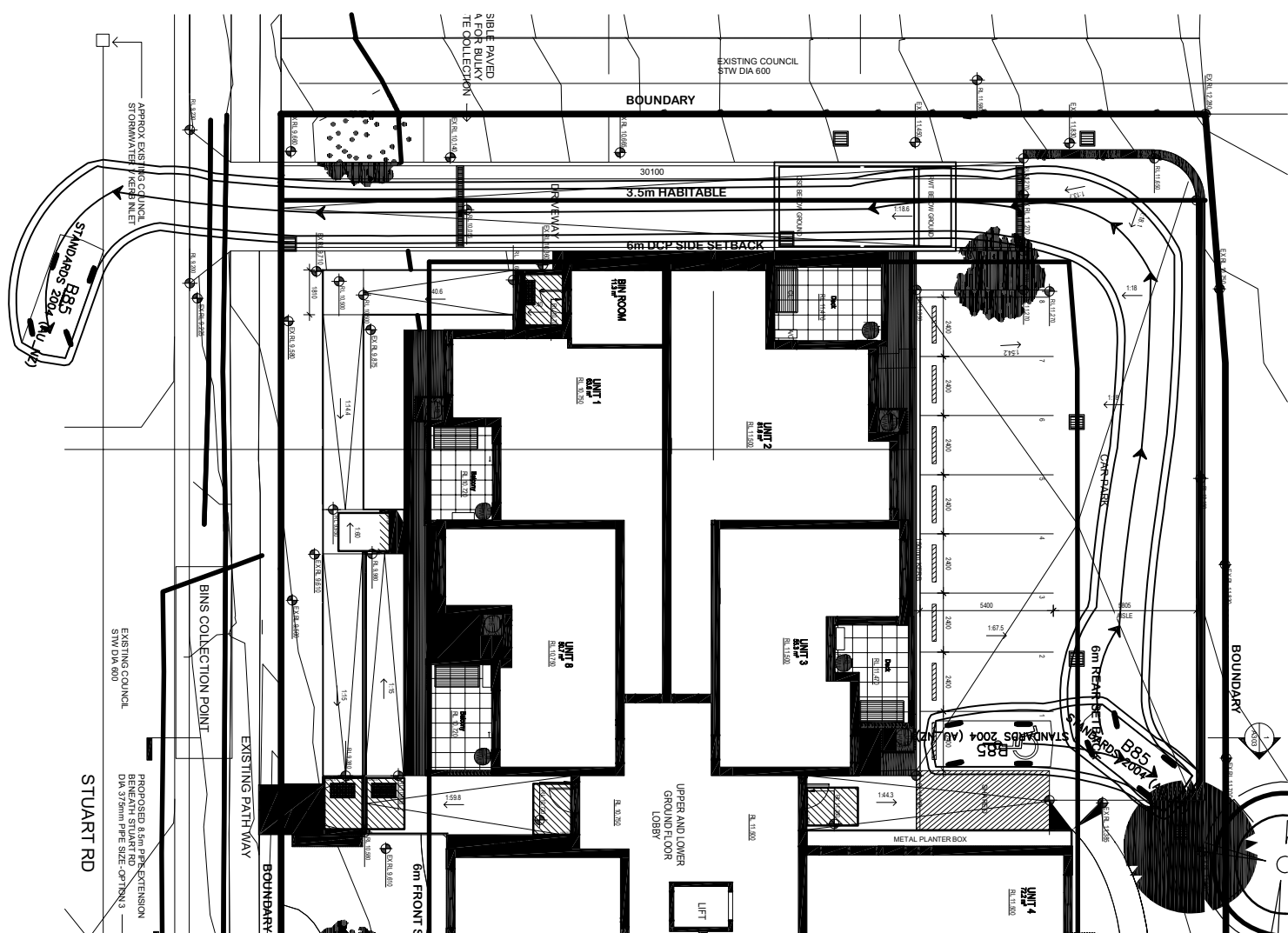
6. CONCLUSIONS

The car parking area and driveway are in compliance with Australian Standards and Council's DCP.

APPENDIX A

Swept Paths







STUART RD

