



Proposed Childcare Centre

Corner Wanneroo Road & San Rosa Road, Wanneroo

Traffic Impact Study

PREPARED FOR:
WA Childcare Partners Unit
Trust

October 2018

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1.0 Introduction

This Traffic Impact Study (TIS) has been prepared by Transcore on behalf of WA Childcare Partners Unit Trust with regard to the proposed childcare centre to be located at Lots 4 San Rosa Road and 813 & 815 Wanneroo Road, which are situated at the northwest corner of the existing Wanneroo Road/San Rosa Road intersection in Wanneroo, City of Wanneroo as shown in **Figure 1**.

The TIS has been prepared in accordance with the WAPC *Transport Impact Assessment Guidelines 2016* and the City of Wanneroo “*Local Planning Policy 2.3 Child Care Centre*” policy.



Figure 1: Location of the subject site

The subject site (approximately 2,000m² in size) is bounded by Wanneroo Road to the east, San Rosa Road to the south, Wonyill Street to the west and the existing residential dwellings to the immediate north. Vehicle access and egress to the childcare centre is proposed via a single crossover on San Rosa Road.

It is advised that the childcare centre would cater for 83 children with a total of 14 staff.

2.0 Proposed Development

The development proposal is for a childcare centre (hereafter CCC) at the subject site – Lots 4 San Rosa Road and 813 & 815 Wanneroo Road in Wanneroo, City of Wanneroo.

A single-storey building is proposed to be constructed for the CCC which would cater for about 83 children between the hours of 6:30AM – 6:30PM, Monday to Friday. The centre is proposed to be serviced by 14 staff.

The development plan shows the CCC building located centrally and two outdoor play areas occupying the eastern portion of the subject site while the western portion is proposed to accommodate a 23-bay car park area inclusive of one ACROD bay.

The pedestrian access to the CCC is available directly from San Rosa Road frontage via existing path network on surrounding roads.

Refer to **Appendix A** for plans of the proposed development.

3.0 Vehicle Access and Parking

3.1 Access

According to the plans prepared by Woodman Architects the proposed open-air car park would be accessed via a single full-movement crossover on San Rosa Road located approximately 30m west of Wanneroo Road. The proposed crossover to the CCC is proposed to be 6.2m wide which is in accordance with the relevant AS 2890.1 standard.

The City of Wanneroo's *"Local Planning Policy 2.3 Child Care Centre"* policy states that, *"... these Centres should be located on Local Distributor roads in such a fashion that they would not conflict with traffic control devices and will not encourage the use of nearby Access Roads for turning movements."*

The vehicular access into the CCC is proposed off San Rosa Road, which is classified as a *Local Distributor* road, and as such is in accordance with the provisions of the City of Wanneroo's *"Local Planning Policy 2.3 Child Care Centre"* policy.

The proposed crossover and car park design enable ingress and egress to and from the site in forward gear and the site patrons do not require to use adjacent Access Roads for any of the turning movements (in or out of the site). This is also in line with the guidelines stipulated in *"Local Planning Policy 2.3 Child Care Centre"* policy.

3.2 Parking Demand and Supply

The City of Wanneroo's *"Local Planning Policy 2.3 Child Care Centre"* policy provides parking requirements for the CCC indicating that a total of 25 parking bays should be provided for the proposed CCC. The required parking provision includes:

- ✚ 14 bays for CCC staff;
- ✚ 11 bays for parents/carers.

The subject CCC provides for a total of 23 on-site car parking bays (including one ACROD bay), which represents a theoretical potential shortfall of two bays. The parking supply and demand is further discussed in the subsequent sections of this report.

3.3 Estimated Actual Parking Demand Based on Trip Generation

Transcore has undertaken a parking analysis based on the anticipated peak hour traffic generation of the proposed CCC, to estimate the actual anticipated peak parking demand of the centre.

Section **6.1** of this report details the anticipated peak hour traffic generation of the proposed CCC. It was established that the calculated morning peak hour trip generation of the proposed child care centre is 32 vehicles in and 30 vehicles out of the car park (afternoon peak hour is estimated to generate less trips).

This translates to 32 vehicles potentially using the child care centre car park during the peak morning hour.

The RTA NSW *“Guide to Traffic Generating Developments”* section on childcare centres provides commentary on childcare centre mode share, parking utilisation and parking length of stay. It should be noted that the commentary provided in the RTA guide is based on surveys of actual parking activity undertaken in New South Wales. The RTA guide indicates highest parking demand of 0.23 cars per child and the average recorded length of stay for all surveyed child care centres of 6.8 minutes.

Conservatively assuming that the average length of stay for pick-up/drop-off parking for the proposed child care centre is 10 minutes it is calculated that each parking bay can accommodate a turnover of up to 6 vehicles per hour.

It is therefore established that at least 7 bays should be reserved for pick-up and drop-off activities during peak hour periods. Accordingly, with 14 bays allocated to staff the remaining 9 parking bays for parents/carers dropping off or picking up children to and from the centre should be more than sufficient to meet the anticipated parking demand and turnover regardless of formal two bay shortfall.

4.0 Provision for Service Vehicles

No specific provision is made for service vehicles within the site as it is anticipated that the proposed development will only generate a small volume of service vehicle traffic, primarily associated with deliveries for the CCC.

It is anticipated that the rubbish collection would take place on-street with bins wheeled out from the bin store area on specified collection days. It is anticipated that waste collection will be scheduled maximum twice per week and outside the peak operating periods of the CCC.

Alternatively, the waste collection vehicle could access the bin storage area from within the site via San Rosa Road crossover and internal car park. The bin area is located adjacent to the crossover which facilitates easy and efficient rubbish collection operation. The waste collection should take place outside CCC operation hours so that the entire car park area is available for waster truck operation. In this case it is recommended that smaller vehicles such as vans be used for deliveries and all service vehicle activities to occur outside peak operating times so that parking bays are available for this purpose.

5.0 Hours of Operation

The proposed CCC is proposed to operate during weekdays between 6:30AM and 6:30PM with heaviest traffic movements during morning drop-off and afternoon pick-up hours, typically between 8:00-9:00AM and 4:30-5:30PM.

6.0 Daily Traffic Volumes and Vehicle Types

In order to assess the potential traffic impact from the proposed CCC, a traffic generation and distribution exercise was undertaken. The aim of this exercise was to estimate the traffic that would be generated by the proposed development and to establish the level of traffic increases on the surrounding road network.

6.1 Traffic Generation/Distribution

In order to establish an accurate traffic generation rate for this Centre, a number of traffic count surveys undertaken by Transcore at similar Centres in the Perth metropolitan area, were sourced.

Discussions with the respective centre managers revealed that the peak drop-offs and pick-ups for each of these centres occur between the hours of 7:00AM– 10:00AM and 3:00PM–6:00PM.

From the total number of children at each of the centres on the surveyed days, the following average generation rates were established for the morning and afternoon surveyed periods:

- ✚ 7:00AM–10:00AM: 1.58 trips per child (52% in/48% out); and,
- ✚ 3:00PM–6:00PM: 1.67 trips per child (47% in/53% out).

From this information, the traffic generation rate for the combined period of 7:00AM–10:00AM and 3:00PM–6:00PM was calculated as 3.25 trips per child. To convert this figure to a daily generation rate, this figure was increased to 3.5 trips per child to account for any trips outside of the surveyed times. It was assumed that the daily in and out split for vehicle trips was 50/50.

Furthermore, the following average peak hour generation rates were established from the surveys for the Child Care Centres:

- ✚ Morning peak hour: 8:00AM–9:00AM: 0.75 trips per child (52% in/48% out); and,
- ✚ Afternoon peak hour: 4:30PM–5:30PM: 0.49 trips per child (43% in/57% out).

Comparison of the six-hour generation rates and the peak hour generation rates confirms that the distribution of traffic from these Centres is spread over the peak periods and that full concentration of traffic does not occur in the peak hour. The AM peak hour represents 47% of the 3-hour AM peak period traffic generation and the typical school PM and road network PM peak hours represent 36% and 29% of the 3-hour PM peak period traffic generation, respectively. As such, childcare centres operate quite differently to schools as their peak period is spread out.

Accordingly, assuming a maximum of 83 children being present at the Centre (i.e. Centre operating at full capacity), the following number of trips was estimated for the proposed Centre:

- ✚ AM road network peak hour: 62 trips generated (32 in/30 out);
- ✚ PM road network peak hour: 40 trips generated (17 in/23 out);
- ✚ Daily traffic generation: 290 trips generated (145 in/145 out).

6.2 Traffic Flow

Considering that all access to the site is available solely via San Rosa Road it is concluded that all of the estimated development-generated traffic would arrive/depart to and from the site via San Rosa Road and then dissipate throughout the local road network.

As with similar centres, an overwhelming majority of patrons would originate from within the local area with only a marginal number of patrons arriving from afar.

Hence, based on the general spatial distribution of residential developments in the immediate area, permeability of the local road network and the assumption that all traffic attracted to the proposed Centre would arrive/depart via San Rosa Road, the Centre's traffic distribution adopted for this analysis is as follows:

- ✚ 30% to/from the residential areas east of Wanneroo Road; and,
- ✚ 70% to/from the residential areas west of Wanneroo Road.

Figure 2 illustrates trip generation and traffic distribution over the local road network for the proposed Centre.



Figure 2. Estimated traffic movements for the subject development – morning peak, afternoon peak and total daily trips

6.3 Impact on Surrounding Roads

The WAPC *Transport Impact Assessment Guidelines (2016)* provides guidance on the assessment of traffic impacts:

“As a general guide, an increase in traffic of less than 10 percent of capacity would not normally be likely to have a material impact on any particular section of road, but increases over 10 percent may. All sections of road with an increase greater than 10 percent of capacity should therefore be included in the analysis. For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10 percent of capacity. Therefore, any section of road where the development traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis.”

From **Figure 2** it can be seen that the largest traffic increases during the peak hour of operation will be in order of 42vph on San Rosa Road, west of the site, hence the anticipated impact on the surrounding road network will not be significant and would be well within the capacity and function of the relevant roads.

6.4 Impact on Local Intersection and Development Crossover

Approximately 30% of the development traffic is expected to traverse the Wanneroo Road/San Rosa Road intersection located immediately adjacent to the site. Wanneroo Road is a *Primary Regional Road* which carries a relatively high level of traffic with a notable proportion of heavy vehicles. As such a capacity assessment was undertaken for the existing and post-development stages to ascertain the impact of the development on the operation of this intersection.

For the purpose of this assessment turn count surveys were undertaken during the combined development peak traffic activity and peak road network morning and afternoon peak activity periods (8:00-9:00AM and 4:30PM-5:30PM) on 16th May 2018.

The capacity analysis of the Wanneroo Road/San Rosa Road intersection as well as the proposed development crossover on San Rosa Road for the AM and PM weekday peak hours was undertaken using the SIDRA computer software package.

SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- ✚ **Degree of Saturation:** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- ✚ **Level of Service:** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- ✚ **Average Delay:** is the average of all travel time delays for vehicles through the intersection.
- ✚ **95% Queue:** is the queue length below which 95% of all observed queue lengths fall.

The results of the analysis are presented in **Table 2** through to **Table 7** appended in **Appendix B** of this report and discussed in the following paragraphs.

Wanneroo Road/San Rosa Road

This intersection is currently operating satisfactorily and at about 42% capacity during the weekday morning peak hour. All but right-turn movement from the median break into Wanneroo Road south direction operate with a LoS A/B during this peak period. The critical movement in this situation is the right-turn from the median break which records delays of about 17sec and maximum queue of one vehicle. The left and right-turns from San Rosa Road operate at LoS A and B, respectively (refer **Table 2** in **Appendix B** for more details).

The addition of development-generated traffic to the intersection is marginal and results in negligible increases in queues and delays. Spare capacity in order of 58% remains available in the post-development stage (refer **Table 4** in **Appendix B** for more details).

During the afternoon peak hour period the intersection operates at about 60% capacity. The most pronounced delays of about 84sec and queues of up to two vehicles are recorded for the right-turn movement from Wanneroo Road with the rest of the intersection movements exhibiting acceptable delays and queueing (refer **Table 3** in **Appendix B** for more details).

The addition of development-generating traffic increases the delay at the right-turn movement from Wanneroo Road by about 6sec with queueing occasionally increasing to three vehicles. The impact on the rest of the intersection movements is again marginal. Importantly, the intersection retains about 34% spare capacity for this stage (refer **Table 5** in **Appendix B** for more details).

Accordingly, the result of the SIDRA analysis for the post-development stage suggests that the development-generated traffic will not have a major impact on the current operation of the intersection mainly due to the low amount of additional traffic expected to use this intersection.

San Rosa Road Crossover

The capacity assessment of the proposed development crossover on San Rosa Road indicates that this crossover is expected to operate satisfactorily with moderate queues and delays during both morning and afternoon peak periods.

Importantly, the proposed crossover will have no practical impact on the current traffic operations along San Rosa Road and its intersection with Wanneroo Road.

7.0 Traffic Management on the Frontage Streets

San Rosa Road is a 10m wide single carriageway, boulevard-style road with a 1.5m wide painted median and intermittent on-street parking alternating on either side of the road and road deviation serving as a speed-control measure. There is a 1.5m wide pedestrian path along northern side of the road. Refer **Figure 3** and **Figure 4** for more details.



Figure 3. Westbound view along San Rosa Road in the vicinity of subject site



Figure 4. eastbound view along San Rosa Road towards Wanneroo Road intersection



Figure 5. Southbound view along Wanneroo Road from San Rosa Road intersection



Figure 6. Northbound view along Wanneroo Road from San Rosa Road intersection

San Rosa Road operates under a default built-up area speed limit of 50km/h. San Rosa Road is classified as *Local Distributor* in the *Main Roads WA Metropolitan Functional Road Hierarchy* document. This is a local road and as such it is under the care and control of the City of Wanneroo.

Based on the latest available traffic count data for this road, San Rosa Road (east of Nyunda Drive) carried approximately 1,000vpd during October 2015.

Wanneroo Road at this location is constructed to a dual divided carriageway standard with two lanes in each direction and a 12m wide landscaped median. Pedestrian footpath is in place along the eastern side of the road and along the western side of the road north of San Rosa Road. A shared path is also in place along the western side of the road south of San Rosa Road.

Wanneroo Road in the immediate vicinity of the subject site operates under a speed limit regime of 70km/h. Refer **Figure 7** and **Figure 8** for more details.



Figure 7. Southbound view along Wanneroo Road from San Rosa Road intersection



Figure 8. Northbound view along Wanneroo Road from San Rosa Road intersection

Wanneroo Road is classified as *Primary Distributor* in the Main Roads WA *Metropolitan Functional Road Hierarchy* document. This road is also identified as a *Primary Regional Road (Red Road)* in the *Metropolitan Region Scheme* and as such it is under the care and control of Main Roads WA.

Based on the latest available traffic data for this road sourced from Main Roads WA, Wanneroo Road (south of Dundebur Road) carried approximately 27,600vpd in 2016.

San Rosa Road forms a priority-controlled T-intersection at the eastern end with Wanneroo Road immediately adjacent to the subject site.

Main Roads WA Intersection *Crash Ranking Report* provides detailed crash data for the Wanneroo Road/San Rosa Road intersection over the 5-year period ending 31 December 2017. Crash report information for this intersection is presented in **Table 1**.

Table 1. Crash history for the Wanneroo Road/San Rosa Road intersection

| Intersection | | | | Total Crashes | Casualty |
|-----------------------------|----------|------------|-------|---------------|----------|
| Wanneroo Road/San Rosa Road | | | | 6 | 1 |
| Right Angle | Rear End | Pedestrian | Cycle | Wet | Night |
| 6 | 0 | 0 | 0 | 1 | 0 |

All of the crashes reported are of right angle type with one hospitalisation reported. Importantly, no crashes involved pedestrians or cyclists. The type and number of crashes reported are typical of these types of intersections and traffic volumes involved. None of the crash factors are denoted as “higher than expected” in *Intersection Crash Ranking* report.

8.0 Public Transport Access

Available nearby public transport services are shown in **Figure 7**. The closest existing bus services to the subject site are bus routes No. 389 and 468 operating along Wanneroo Road. Route 389 operates between Perth Busport and Wanneroo while route 468 links Whitfords Train Station and Joondalup Train Station. Hence, this bus service provides access to the greater Perth rail network via connection to the Joondalup train line.

The closest pair of bus stops is located on Wanneroo Road approximately 260m south of the subject site (route 389) and 120m to the north (route 468). These stops are easily accessible via the existing footpath network.

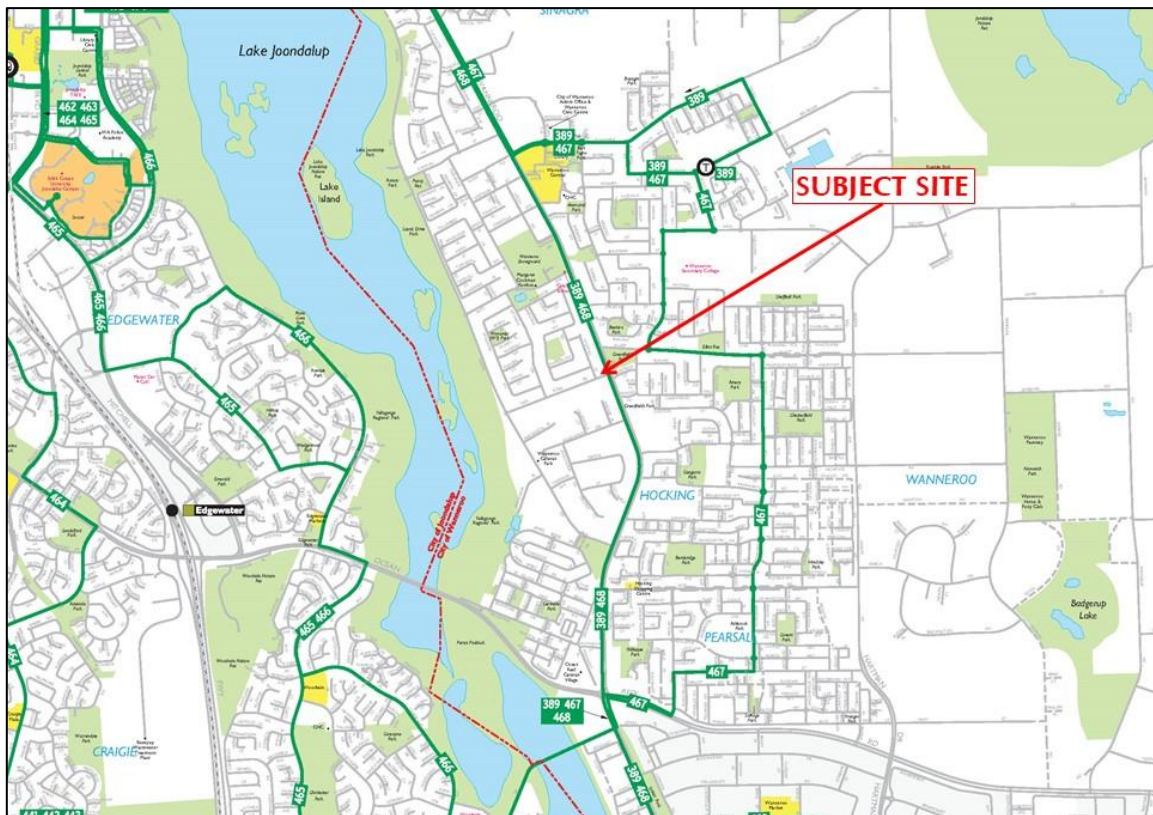


Figure 9: Existing bus services (source: TransPerth)

9.0 Pedestrian Access

Pedestrian access to the subject site is available directly from San Rosa Road via the existing footpaths on surrounding roads.

Pedestrian crossing opportunities on San Rosa Road are available at the Wanneroo Road intersection while the closes formal crossing on Wanneroo Road is in place some 65m north of the site.

10.0 Cycle Access

The subject site has direct cycle access to the local shared path network via a shared path which is in place along the western side of Wanneroo Road and indirectly via San Rosa Road classified as “good road riding environment” and the shared path along Scenic Drive, some 600m west from the site as shown in Perth’s Bicycle Network map illustrated in **Figure 10**.

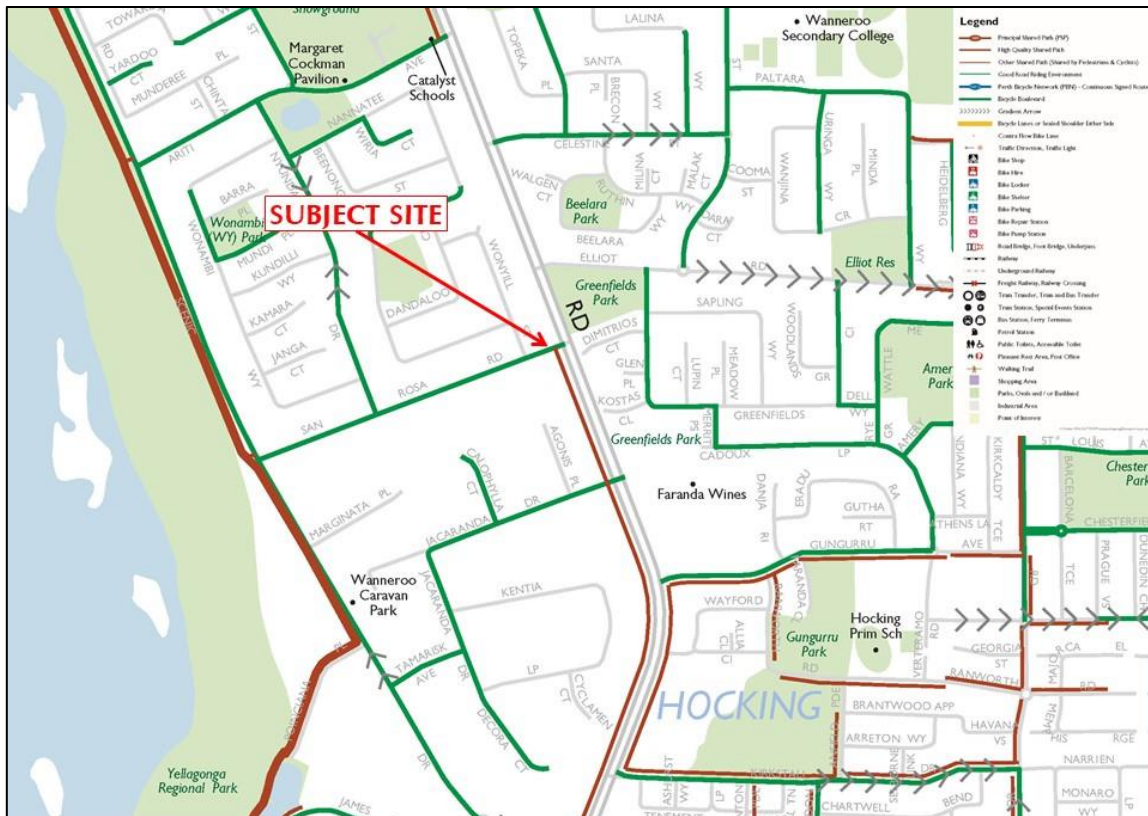


Figure 10: Extract from Perth Bicycle Network (Department of Transport)

11.0 Site Specific Issues

No particular site specific issues have been identified for this proposed childcare centre.

12.0 Safety Issues

No specific safety issues have been identified for this development.

13.0 Conclusions

This Traffic Impact Study (TIS) provides information on the proposed CCC to be located at Lots 4 San Rosa Road and 813 & 815 Wanneroo Road, City of Wanneroo.

The site features good connectivity via the existing road network and has convenient and easy access to public transport services.

The site is well served by the existing pedestrian facilities and cyclist facilities which are presently in place along adjacent roads. A shared path is in place along Marmion Avenue accessible via a shared path link located in the vicinity of the subject site.

The Centre is proposed to cater for about 83 children with a total of 14 staff.

Vehicle access to and from the site will be via a single full movement crossover on San Rosa Road which leads to a 23-bay on-site car park inclusive of one ACROD bay. The proposed car park layout and design is in accordance with the recommended Type 2 parking layout stipulated in City of Wanneroo *“Local Planning Policy 2.3 Child Care Centre”*.

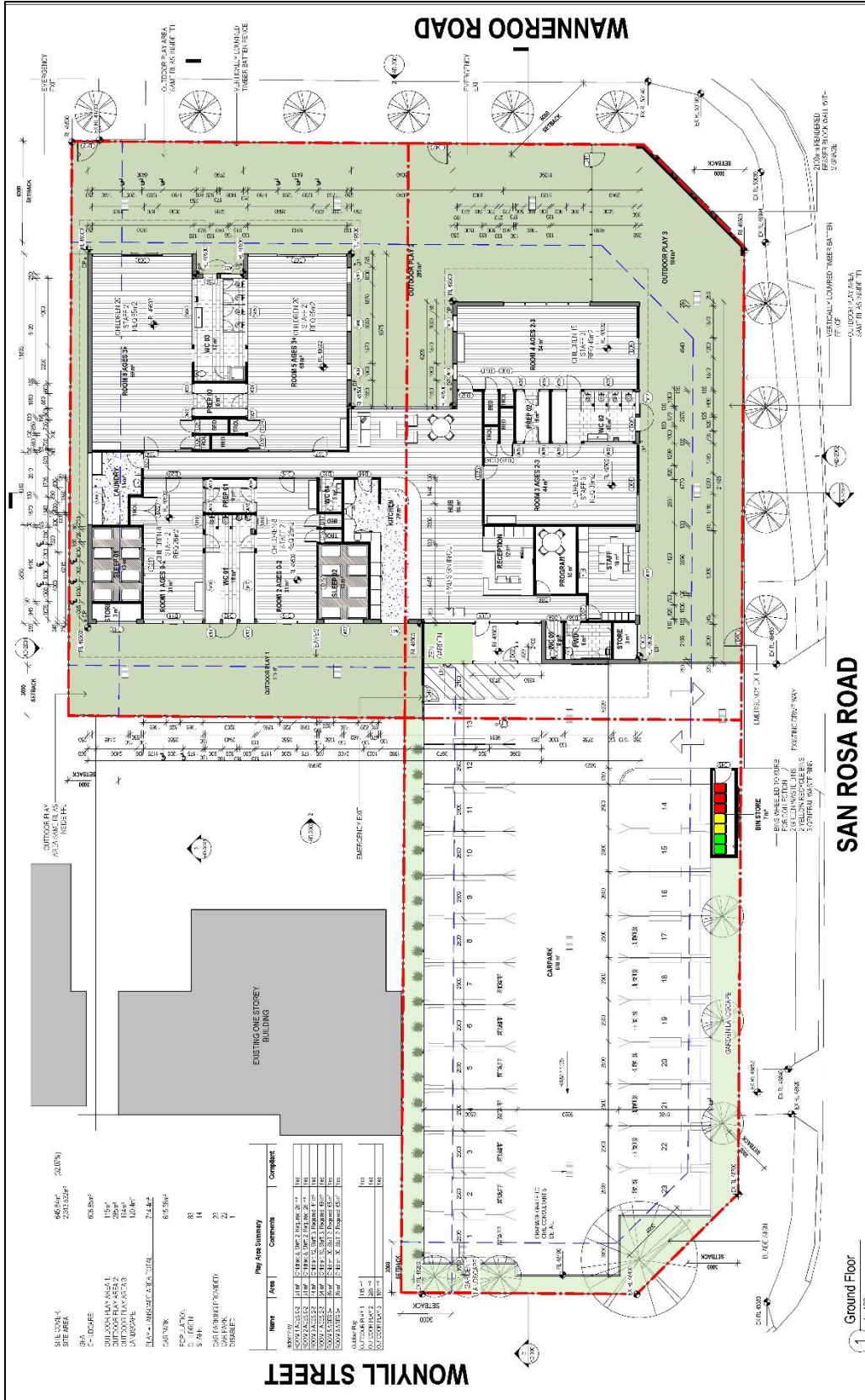
Based on the assessment undertaken in this report, the proposed total on-site parking supply of 23 bays is considered to be sufficient to cater for the needs of the proposed CCC.

The traffic generation and distribution documented in Section **6.0** of this report demonstrates that the traffic operations of the road network in the vicinity of the proposed CCC would not be adversely impacted by the additional development traffic.

Accordingly, it is concluded the traffic related issues should not form an impediment to the approval of this Childcare Centre.

Appendix A

PROPOSED DEVELOPMENT PLAN



Ground Floor
1:100

Woodman Architects
architecture interiors

PROJECT: **WANNEROO CHILDCARE**
STREET ADDRESS: **813-815 WANNEROO ROAD & 4 SAN ROSA ROAD, WANNEROO 6085**

TITLE: **PRELIMINARY GROUND FLOOR PLAN**
JOB NO: **1714**
DRAWN BY: **JT**
CHECKED BY: **DW**

SCALE: **1:100 @ A1**

DATE: [REDACTED]
REV: [REDACTED]

INTIALS: [REDACTED]

REVISIONS: [REDACTED]

GREEN LEAVES

SOIL DATA

| SOIL DATA AREA | SOIL TYPE | SOIL CLASSIFICATION |
|---------------------|-----------------------|---------------------|
| 686.5m ² | 23H15.2M ² | 30.0(RN) |
| 603.5m ² | | |
| 150m ² | | |
| 150m ² | | |
| 150m ² | | |
| 150m ² | | |
| 7.44m ² | | |
| 615.5m ² | | |

Pay Area Summary

| Name | Area | Comments | Compliant |
|-----------------|-------------------|-------------------|-----------|
| ROOM 1 | 110m ² | 110m ² | YES |
| ROOM 2 | 110m ² | 110m ² | YES |
| ROOM 3 | 110m ² | 110m ² | YES |
| ROOM 4 | 110m ² | 110m ² | YES |
| ROOM 5 | 110m ² | 110m ² | YES |
| ROOM 6 | 110m ² | 110m ² | YES |
| ROOM 7 | 110m ² | 110m ² | YES |
| ROOM 8 | 110m ² | 110m ² | YES |
| ROOM 9 | 110m ² | 110m ² | YES |
| ROOM 10 | 110m ² | 110m ² | YES |
| RECEPTION | 110m ² | 110m ² | YES |
| PROGRAM | 110m ² | 110m ² | YES |
| STAFF | 110m ² | 110m ² | YES |
| STORE | 110m ² | 110m ² | YES |
| KITCHEN | 110m ² | 110m ² | YES |
| WC | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 1 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 2 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 3 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 4 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 5 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 6 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 7 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 8 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 9 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 10 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 11 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 12 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 13 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 14 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 15 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 16 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 17 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 18 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 19 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 20 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 21 | 110m ² | 110m ² | YES |
| OUTDOOR PLAY 22 | 110m ² | 110m ² | YES |

Appendix B

SIDRA OUTPUTS

Table 2. SIDRA results for the Wanneroo Road/San Rosa Road intersection – weekday AM peak period – existing situation

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---------------------------------|--------|--------------------|------------|---------------|-------------------|------------------|--------------------------------|------------|--------------|-----------------------------|--------------------|--|
| Mov ID | OD Mov | Demand Total veh/h | Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h | |
| South: Wanneroo Road | | | | | | | | | | | | |
| 4 | L2 | 28 | 0.0 | 0.293 | 6.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.34 | 63.8 | |
| 5 | T1 | 1014 | 8.0 | 0.293 | 2.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.34 | 66.6 | |
| Approach | | 1042 | 7.8 | 0.293 | 2.3 | NA | 0.0 | 0.0 | 0.00 | 0.34 | 66.5 | |
| North: Wanneroo Road | | | | | | | | | | | | |
| 12 | R2 | 39 | 0.0 | 0.100 | 14.8 | LOS B | 0.3 | 2.5 | 0.75 | 0.90 | 46.6 | |
| Approach | | 39 | 0.0 | 0.100 | 14.8 | NA | 0.3 | 2.5 | 0.75 | 0.90 | 46.6 | |
| West: San Rosa Road | | | | | | | | | | | | |
| 1 | L2 | 29 | 0.0 | 0.127 | 8.4 | LOS A | 0.4 | 3.2 | 0.60 | 0.80 | 49.6 | |
| 2 | T1 | 47 | 0.0 | 0.127 | 11.7 | LOS B | 0.4 | 3.2 | 0.60 | 0.80 | 49.4 | |
| Approach | | 77 | 0.0 | 0.127 | 10.4 | LOS B | 0.4 | 3.2 | 0.60 | 0.80 | 49.5 | |
| All Vehicles | | 1158 | 7.0 | 0.293 | 3.3 | NA | 0.4 | 3.2 | 0.07 | 0.39 | 64.5 | |
| North: Wanneroo Road | | | | | | | | | | | | |
| 11 | T1 | 1526 | 8.5 | 0.432 | 2.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.33 | 66.6 | |
| Approach | | 1526 | 8.5 | 0.432 | 2.2 | NA | 0.0 | 0.0 | 0.00 | 0.33 | 66.6 | |
| West: Median Storage Area | | | | | | | | | | | | |
| 3 | R2 | 47 | 0.0 | 0.199 | 16.7 | LOS C | 0.6 | 4.3 | 0.86 | 0.95 | 33.8 | |
| Approach | | 47 | 0.0 | 0.199 | 16.7 | LOS C | 0.6 | 4.3 | 0.86 | 0.95 | 33.8 | |
| All Vehicles | | 1574 | 8.2 | 0.432 | 2.6 | NA | 0.6 | 4.3 | 0.03 | 0.35 | 65.6 | |

Table 3. SIDRA results for the Wanneroo Road/San Rosa Road intersection – weekday PM peak period – existing situation

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---------------------------------|--------|--------------------|------------|---------------|-------------------|------------------|--------------------------------|------------|--------------|-----------------------------|--------------------|--|
| Mov ID | OD Mov | Demand Total veh/h | Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h | |
| South: Wanneroo Road | | | | | | | | | | | | |
| 4 | L2 | 64 | 0.0 | 0.510 | 6.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.35 | 63.7 | |
| 5 | T1 | 1749 | 8.0 | 0.510 | 2.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.34 | 66.4 | |
| Approach | | 1814 | 7.7 | 0.510 | 2.4 | NA | 0.0 | 0.0 | 0.00 | 0.34 | 66.3 | |
| North: Wanneroo Road | | | | | | | | | | | | |
| 12 | R2 | 44 | 0.0 | 0.592 | 83.5 | LOS F | 1.9 | 14.2 | 0.98 | 1.05 | 24.8 | |
| Approach | | 44 | 0.0 | 0.592 | 83.5 | NA | 1.9 | 14.2 | 0.98 | 1.05 | 24.8 | |
| West: San Rosa Road | | | | | | | | | | | | |
| 1 | L2 | 27 | 0.0 | 0.241 | 12.8 | LOS B | 0.8 | 5.6 | 0.86 | 0.96 | 42.5 | |
| 2 | T1 | 26 | 0.0 | 0.241 | 33.1 | LOS D | 0.8 | 5.6 | 0.86 | 0.96 | 37.4 | |
| Approach | | 54 | 0.0 | 0.241 | 22.7 | LOS C | 0.8 | 5.6 | 0.86 | 0.96 | 40.7 | |
| All Vehicles | | 1912 | 7.3 | 0.592 | 4.8 | NA | 1.9 | 14.2 | 0.05 | 0.37 | 63.0 | |
| North: Wanneroo Road | | | | | | | | | | | | |
| 11 | T1 | 1086 | 8.5 | 0.307 | 2.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.33 | 66.7 | |
| Approach | | 1086 | 8.5 | 0.307 | 2.2 | NA | 0.0 | 0.0 | 0.00 | 0.33 | 66.7 | |
| West: Median Storage Area | | | | | | | | | | | | |
| 3 | R2 | 26 | 0.0 | 0.055 | 8.0 | LOS A | 0.2 | 1.2 | 0.68 | 0.86 | 40.1 | |
| Approach | | 26 | 0.0 | 0.055 | 8.0 | LOS A | 0.2 | 1.2 | 0.68 | 0.86 | 40.1 | |
| All Vehicles | | 1113 | 8.3 | 0.307 | 2.3 | NA | 0.2 | 1.2 | 0.02 | 0.34 | 66.2 | |

**Table 4. SIDRA results for the Wanneroo Road/San Rosa Road intersection –
weekday AM peak period – post development**

| Movement Performance - Vehicles | | | | | | | | | | | |
|--|--------|--------------------|------------|---------------|-------------------|------------------|--------------------------------|------------|--------------|-----------------------------|--------------------|
| Mov ID | OD Mov | Demand Total veh/h | Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Wanneroo Road | | | | | | | | | | | |
| 4 | L2 | 34 | 0.0 | 0.294 | 6.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.35 | 63.8 |
| 5 | T1 | 1014 | 8.0 | 0.294 | 2.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.34 | 66.5 |
| Approach | | 1047 | 7.7 | 0.294 | 2.3 | NA | 0.0 | 0.0 | 0.00 | 0.34 | 66.4 |
| North: Wanneroo Road | | | | | | | | | | | |
| 12 | R2 | 44 | 0.0 | 0.115 | 14.9 | LOS B | 0.4 | 2.9 | 0.76 | 0.91 | 46.5 |
| Approach | | 44 | 0.0 | 0.115 | 14.9 | NA | 0.4 | 2.9 | 0.76 | 0.91 | 46.5 |
| West: San Rosa Road | | | | | | | | | | | |
| 1 | L2 | 35 | 0.0 | 0.144 | 8.4 | LOS A | 0.5 | 3.7 | 0.60 | 0.80 | 49.6 |
| 2 | T1 | 53 | 0.0 | 0.144 | 11.8 | LOS B | 0.5 | 3.7 | 0.60 | 0.80 | 49.3 |
| Approach | | 87 | 0.0 | 0.144 | 10.5 | LOS B | 0.5 | 3.7 | 0.60 | 0.80 | 49.5 |
| All Vehicles | | 1179 | 6.9 | 0.294 | 3.4 | NA | 0.5 | 3.7 | 0.07 | 0.39 | 64.2 |
| North: Wanneroo Road | | | | | | | | | | | |
| 11 | T1 | 1526 | 8.5 | 0.432 | 2.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.33 | 66.6 |
| Approach | | 1526 | 8.5 | 0.432 | 2.2 | NA | 0.0 | 0.0 | 0.00 | 0.33 | 66.6 |
| West: Median Storage Area | | | | | | | | | | | |
| 3 | R2 | 53 | 0.0 | 0.221 | 17.0 | LOS C | 0.7 | 4.9 | 0.87 | 0.96 | 33.6 |
| Approach | | 53 | 0.0 | 0.221 | 17.0 | LOS C | 0.7 | 4.9 | 0.87 | 0.96 | 33.6 |
| All Vehicles | | 1579 | 8.2 | 0.432 | 2.7 | NA | 0.7 | 4.9 | 0.03 | 0.35 | 65.5 |

**Table 5. SIDRA results for the Wanneroo Road/San Rosa Road intersection –
weekday PM peak period – post development**

| Movement Performance - Vehicles | | | | | | | | | | | |
|--|--------|--------------------|------------|---------------|-------------------|------------------|--------------------------------|------------|--------------|-----------------------------|--------------------|
| Mov ID | OD Mov | Demand Total veh/h | Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Wanneroo Road | | | | | | | | | | | |
| 4 | L2 | 67 | 0.0 | 0.511 | 6.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.35 | 63.6 |
| 5 | T1 | 1749 | 8.0 | 0.511 | 2.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.34 | 66.4 |
| Approach | | 1817 | 7.7 | 0.511 | 2.4 | NA | 0.0 | 0.0 | 0.00 | 0.34 | 66.3 |
| North: Wanneroo Road | | | | | | | | | | | |
| 12 | R2 | 47 | 0.0 | 0.640 | 89.5 | LOS F | 2.1 | 15.7 | 0.98 | 1.07 | 23.8 |
| Approach | | 47 | 0.0 | 0.640 | 89.5 | NA | 2.1 | 15.7 | 0.98 | 1.07 | 23.8 |
| West: San Rosa Road | | | | | | | | | | | |
| 1 | L2 | 31 | 0.0 | 0.271 | 13.3 | LOS B | 0.9 | 6.4 | 0.87 | 0.97 | 42.1 |
| 2 | T1 | 29 | 0.0 | 0.271 | 34.0 | LOS D | 0.9 | 6.4 | 0.87 | 0.97 | 36.8 |
| Approach | | 60 | 0.0 | 0.271 | 23.5 | LOS C | 0.9 | 6.4 | 0.87 | 0.97 | 40.2 |
| All Vehicles | | 1924 | 7.3 | 0.640 | 5.2 | NA | 2.1 | 15.7 | 0.05 | 0.37 | 62.6 |
| North: Wanneroo Road | | | | | | | | | | | |
| 11 | T1 | 1086 | 8.5 | 0.307 | 2.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.33 | 66.7 |
| Approach | | 1086 | 8.5 | 0.307 | 2.2 | NA | 0.0 | 0.0 | 0.00 | 0.33 | 66.7 |
| West: Median Storage Area | | | | | | | | | | | |
| 3 | R2 | 29 | 0.0 | 0.062 | 8.1 | LOS A | 0.2 | 1.4 | 0.68 | 0.86 | 40.1 |
| Approach | | 29 | 0.0 | 0.062 | 8.1 | LOS A | 0.2 | 1.4 | 0.68 | 0.86 | 40.1 |
| All Vehicles | | 1116 | 8.3 | 0.307 | 2.3 | NA | 0.2 | 1.4 | 0.02 | 0.34 | 66.1 |

Table 6. SIDRA results for the San Rosa Road crossover – weekday AM peak period – post development

| Movement Performance - Vehicles | | | | | | | | | | | |
|---------------------------------|--------|--------------------|------------|---------------|-------------------|------------------|--------------------------------|------------|--------------|-----------------------------|--------------------|
| Mov ID | OD Mov | Demand Total veh/h | Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| East: San Rosa Road | | | | | | | | | | | |
| 11 | T1 | 67 | 2.0 | 0.042 | 1.1 | LOS A | 0.1 | 0.5 | 0.06 | 0.34 | 49.8 |
| 12 | R2 | 11 | 0.0 | 0.042 | 4.2 | LOS A | 0.1 | 0.5 | 0.06 | 0.34 | 41.9 |
| Approach | | 78 | 1.7 | 0.042 | 1.5 | NA | 0.1 | 0.5 | 0.06 | 0.34 | 49.6 |
| North: CCC Crossover | | | | | | | | | | | |
| 1 | L2 | 11 | 0.0 | 0.028 | 2.6 | LOS A | 0.1 | 0.7 | 0.19 | 0.50 | 29.9 |
| 3 | R2 | 23 | 0.0 | 0.028 | 2.6 | LOS A | 0.1 | 0.7 | 0.19 | 0.50 | 45.7 |
| Approach | | 34 | 0.0 | 0.028 | 2.6 | LOS A | 0.1 | 0.7 | 0.19 | 0.50 | 44.1 |
| West: San Rosa Road | | | | | | | | | | | |
| 4 | L2 | 23 | 0.0 | 0.052 | 6.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.40 | 60.7 |
| 5 | T1 | 77 | 2.0 | 0.052 | 2.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.40 | 62.1 |
| Approach | | 100 | 1.5 | 0.052 | 3.1 | NA | 0.0 | 0.0 | 0.00 | 0.40 | 61.8 |
| All Vehicles | | 212 | 1.4 | 0.052 | 2.4 | NA | 0.1 | 0.7 | 0.05 | 0.39 | 54.3 |

Table 7. SIDRA results for the San Rosa Road crossover – weekday PM peak period – post development

| Movement Performance - Vehicles | | | | | | | | | | | |
|---------------------------------|--------|--------------------|------------|---------------|-------------------|------------------|--------------------------------|------------|--------------|-----------------------------|--------------------|
| Mov ID | OD Mov | Demand Total veh/h | Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| East: San Rosa Road | | | | | | | | | | | |
| 11 | T1 | 108 | 2.0 | 0.060 | 1.1 | LOS A | 0.0 | 0.3 | 0.02 | 0.33 | 50.2 |
| 12 | R2 | 6 | 0.0 | 0.060 | 4.1 | LOS A | 0.0 | 0.3 | 0.02 | 0.33 | 44.0 |
| Approach | | 115 | 1.9 | 0.060 | 1.2 | NA | 0.0 | 0.3 | 0.02 | 0.33 | 50.2 |
| North: CCC Crossover | | | | | | | | | | | |
| 1 | L2 | 6 | 0.0 | 0.020 | 2.5 | LOS A | 0.1 | 0.5 | 0.17 | 0.50 | 29.8 |
| 3 | R2 | 18 | 0.0 | 0.020 | 2.6 | LOS A | 0.1 | 0.5 | 0.17 | 0.50 | 45.7 |
| Approach | | 24 | 0.0 | 0.020 | 2.6 | LOS A | 0.1 | 0.5 | 0.17 | 0.50 | 44.4 |
| West: San Rosa Road | | | | | | | | | | | |
| 4 | L2 | 12 | 0.0 | 0.034 | 6.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.38 | 61.2 |
| 5 | T1 | 54 | 2.0 | 0.034 | 2.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.38 | 62.5 |
| Approach | | 65 | 1.6 | 0.034 | 2.9 | NA | 0.0 | 0.0 | 0.00 | 0.38 | 62.3 |
| All Vehicles | | 204 | 1.6 | 0.060 | 1.9 | NA | 0.1 | 0.5 | 0.03 | 0.37 | 53.0 |