TRANSPORT IMPACT ASSESSMENT

Lots 1006, 1007 & 1272 Baldivis Road &
Lot 1 Serpentine Road,

Baldivis

July 2020

Rev E

kctt

HISTORY AND STATUS OF THE DOCUMENT

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Rev B DRAFT	23.08.2018	M Kleyweg	M Kleyweg	16.08.2018	Issued for review
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Rev D	28.03.2019	M Kleyweg	M Kleyweg	28.03.2019	Appendix 3 added
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Appendices

1. Executive Summary

The subject site is situated on the east side of Baldivis Road between Serpentine Road and Sixty Eight Road, approximately 3km south of Safety Bay Road, under the jurisdiction of the City of Rockingham. The proposed subdivision area is expected to accommodate 445-460 lots. For this report, KCTT has assumed the higher lot yield for calculations.

In recent years the surrounding area has undergone a significant transformation from generally rural to a suburban area. The trend of suburbanisation will continue with several residential structure plans areas currently under construction to provide amenity and services which can be used by the subject site, such as schools and neighbourhood facilities. The PTA confirmed that given the growth, bus transit would be provided in the future. They provided information to say that this will likely be done by extending route 566 South to the corner of Sixty Eight Rd and Baldivis Rd.

Featuring in the analysis is the balance of vehicle transit with active transport (walking and cycling). When integrated with compatible land uses such as a residential development, quality provision of active transport network can improve overall site outcomes by:

- Reducing private car dependency for residents;
- Increasing accessibility to employment and other urban activities for residents;
- Reducing the adverse environmental impacts of vehicular and motorised transport;
- Increasing resource efficiency in a multi-modal transport system; and,
- Reducing transport-related crashes or injuries.

The objective of an active transport network is to provide for the convenient and safe movement of pedestrians and cyclists through and between urban developments. Having regard for the need to service schools, shops, recreation and other land uses as well as public transport access points, KCTT suggest providing pedestrian paths on one side of all proposed roads and shared paths on streets carrying more than 1,000 vehicles per day. Additionally, a shared path is proposed on Serpentine Road and Sixty Eight Road, which would connect the existing PSP path along Kwinana Freeway to Baldivis Road. Showering facilities and bicycle parking is assumed to be manageable within residential dwellings. Therefore, no additional cycling facilities would be required.

The predominant land use is residential and given the need to comply with the Residential Design Codes, KCTT's opinion is that every house would have a garage to provide parking for the owner and the front would act as parking for visitors. Access Street "C" has been identified as a location which could accommodate further on-street parking which would also serve to improve safety in the pedestrian environment by acting as a buffer and visually narrowing the road.

The proposed development is expected to generate a total of 4,140 vehicular trips per day and 368 in the peak hour. Having in mind the existing land uses the additional traffic to the road network would be 4,104 vehicular trips per day and 365 vehicular trips in the peak hour.

The calculated values are considered high traffic impact as per WAPC guidelines. However, considering the context of the surrounding road network and the building of new roads, KCTT's opinion is that there is the capacity to support the additional traffic in the area.

MRWA has provided most recent ROM24 data plots and in combination with DPHL's MLUFS estimates, it can be concluded that the subject structure plan area was included in traffic volumes forecasted for 2031 and 2041. SIDRA

analysis has confirmed that the proposed intersections are likely to function to LOSA and LOS B. The exception is the intersection of Baldivis Road and Serpentine Road where some delays can be expected in 2041 on Serpentine Road approach. Although this approach shows LOS F in 2041, delays are under 60s with maximum queue of 5 vehicles. This outcome is not unusual in urban setting, however given the timeframe for forecast (20 years from writing this report), estimation of performance should be repeated closer to this date to ensure that development and traffic growth assumptions are still relevant.

2. Transport Impact Assessment

2.1 Location

Lot Number	1006, 1007 & 1272
Road Name	Baldivis Road
Lot Number	1
Road Name	Serpentine Road
Suburb	Baldivis
Description of Site	The subject site is situated on the east side of Baldivis Road between Serpentine Road and Sixty Eight Road, approximately 3km south of Safety Bay Road, under jurisdiction of the City of Rockingham.

2.2 Technical Literature Used

Local Government Authority	City of Rockingham
Type of Development	Residential
Are the R-Codes referenced?	YES
If YES, nominate which:	State Planning Policy 3.1 Residential Design Codes 2018 R-Codes (incorporating amendments gazetted on 2/8/2013, 23/10/15 and 2/3/2018)
Is the NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses) referenced?	YES
Which WAPC Transport Impact Assessment Guideline should be referenced?	Volume 3 - Subdivision Volume 5 - Technical Guidance
Are there applicable LGA schemes for this type of development?	YES
If YES, Nominate:	
Name and Number of Scheme	Town Planning Scheme No.2
Is the Perth Transport Plan for 3.5 million and Beyond referenced?	YES

2.3 Land Uses

Are there any existing Land Uses?	YES
If YES, nominate:	4 single residential dwellings – to be demolished
What zone is the Subdivision included in according to the Metropolitan Region Scheme and LPS / TPS?	Urban

Proposed Land Uses

How many types of land uses are proposed?	One
Nominate land use type and yield	Residential – 445-460 lots
Is there any proposed staging?	YES - This development will be staged 40-50 lots at a time
Are the proposed land uses complimentary with the surrounding land-uses?	YES

2.4 Local Road Network Information

How many existing roads? 3

Name of Roads within the Subdivision Area / Road Classification and Description:

Road 1

Road Name	**Baldivis Road**
Number of Lanes	Two ways, one lane each direction, undivided
Road Reservation Width	80m
Road Pavement Width	8m
Classification	Rural Local Road / Regional Distributor SLK[0.00-3.71] Significant Urban Local Road / Distributor B SLK[3.71-6.74]
Speed Limit	80kph
Bus Route	YES
If YES Nominate Bus Routes	566 - Warnbro Station – Baldivis via Makybe Drive
On-street parking	NO

Road 2

Road Name	**Serpentine Road**
Number of Lanes	Two ways, one lane (no linemarking), undivided
Road Reservation Width	20m
Road Pavement Width	6m
Classification	Rural Local Road / Access Road
Speed Limit	50kph or State Limit
Bus Route	NO
On-street parking	NO

Road 2

Road Name	**Sixty Eight Road**
Number of Lanes	varies: Two ways, one lane each direction, undivided – west of Baldivis Road Two ways, one lane (no linemarking), undivided– east of Baldivis Road
Road Reservation Width	varies 20-22m
Road Pavement Width	7m
Classification	Rural Local Road / Regional Distributor SLK[0.00-4.54] Rural Local Road / Access Road SLK[4.54-4.72] Urban Local Road / Access Road SLK[4.72-4.97]
Speed Limit	70kph SLK[0.00-4.54] 50kph or State Limit SLK[4.54-4.72]
Bus Route	YES
If YES Nominate Bus Routes	565 - Warnbro Station – Baldivis via Nairn Drive
On-street parking	NO

Name of Other Roads within 2km radius of site, or roads likely to take increased traffic due to the development:

Road 1

Road Name	**Kwinana Freeway**
Number of Lanes	Two ways, two lanes each direction, divided
Road Reservation Width	100m
Road Pavement Width	7m on each side of the median
Classification	Urban Highway / Primary Distributor
Speed Limit	110kph
Bus Route	NO
On-street parking	NO

Road 2

Road Name	**Karnup Road**
Number of Lanes	Two ways, one lane each direction, undivided
Road Reservation Width	20m
Road Pavement Width	7m
Classification	Rural Local Road / Regional Distributor
Speed Limit	70kph
Bus Route	NO
On-street parking	NO

2.5 Traffic Volumes

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)		Heavy Vehicle %	Year	
			AM Peak Time - AM Peak VPH	PM Peak Time - PM Peak VPH	*If HV count is Not Available, are HV likely to be in higher volumes than generally expected?*	Date of Traffic Count	*If older than 3 years multiply with a growth rate of 3% GR*
Sixty Eight Road	West of Baldivis Road	2,218	07:45 – 219	14:45 – 202	11%	2017/ 2018	2,423
	East of Baldivis Road*	57	07:00 - 6	14:00 - 6	*N/A, HV not likely to be in higher volumes than generally expected*	Aug 2018	–
Baldivis Road	North of Sixty Eight Road	3,462	07:45 – 292	15:45 – 311	7.9%	2017/ 2018	3,783
	South of Sixty Eight Road	3,960	07:30 – 363	15:45 – 350	12.1%	2017/ 2018	4,327
	200m south of Karnup Road*	4,704	08:00 – 328	16:00 – 386	*N/A, HV not likely to be in higher volumes than generally expected*	Sep 2015	5,453
Serpentine Road	East of Young Road*	77	09:00 – 7	15:00 – 8	*N/A, HV not likely to be in higher volumes than generally expected*	Sep 2013	94
Karnup Road	East of Baldivis Road	6,464	07:15 – 536	16:30 – 605	6.3%	2018/ 2019	–
	East of Kwinana Freeway	3,837	07:45 – 299	15:15 – 353	15.1%	2017/ 2018	4,192
Kwinana Freeway	At Karnup Road Bridge	41,462	07:15 – 2,845	15:15 – 3,206	15.1%	2017/ 2018	45,306
	North of Karnup Road	47,218	07:00 – 3,153	15:45 – 3,897	11.0%	2018/ 2019	–
	North of Karnup Road (Northbound on to Kwinana Freeway)	2,456	06:15 – 290	15:15 – 148	16.7%	2014/ 2015	2,932
	North of Karnup Road (Southbound off to Kwinana Freeway)	2,443	08:15 – 132	16:00 – 280	19.9%	2014/ 2015	2,917
	South of Karnup Road (Northbound off to Kwinana Freeway)	914	06:00 – 85	16:45 – 104	16.3%	2014/ 2015	1,091
	South of Karnup Road (Southbound on to Kwinana Freeway)	1,048	07:30 – 112	15:15 – 103	17.8%	2014/ 2015	1,251

*Note * - These traffic volumes have been received from the City of Rockingham.*

2.6 Vehicular Crash Information

Is Crash Data Available on Main Roads WA website?	YES
If YES, nominate important survey locations:	
Location 1	Intersection of Baldivis Road and Sixty Eight Road
Location 2	Baldivis Road SLK [2.93 - 3.71] – no crashes
Location 3	Sixty Eight Road SLK [4.54 - 4.97] – no crashes
Period of crash data collection	01/01/2015 - 31/12/2019

Road Name	SLK	Functional Classification	Road Hierarchy	Speed Limit	Crash Statistics			
					No of KSI Crashes	No of Medical Attention Crashes	No of PDO Major Crashes	No of PDO Minor Crashes
Intersection of Baldivis Road and Sixty Eight Road	2.93	Rural Local Road / Rural Local Road	Regional Distributor / Access Road	80kph/ 70kph/ 50kph	0	0	1	1
No of MVKT Travelled at Location				≈6,500 VPD*365*5 years*0.4 km = 4.74 MVKT				
KSI Crash Rate				0 KSI crashes / 4.74 MVKT = 0 KSI crashes/MVKT				
All Crash Rate				2 crashes / 4.74 MVKT = 0.42 crashes/MVKT				
Comparison with Crash Density and Crash Rate Statistics				This rate of crashes is therefore lower than the network average of 1.83 crashes / MVKT over the 5-year period.				

The following tables shows the Crash Density and Crash Rates on Metropolitan Local and Regional Roads as obtained from Main Roads WA on the 13th May 2020 by email request:

Crash Density and Crash Rate on Metropolitan Local Roads Network only

	All Crashes		Serious Injury Crashes (Fatal+Hospital)	
	Average Annual Crash Density (All Crashes/KM)	Average Annual Crash Rate (All Crashes/MVKT)	Average Annual Crash Density (Ser. Inj. Crashes/KM)	Average Annual Crash Rate (Ser. Inj. Crashes/MVKT)
Metro Local Road - Midblock	2.67	0.86	0.11	0.04
Metro Local Road - All	5.70	1.83	0.22	0.07

Note: Based on 5-years data for the period 2015 to 2019.

2.7 Public Transport Accessibility

How many bus routes are within 400 metres of the subject site?	None
How many rail routes are within 800 metres of the subject site?	None
Walk Score Rating for Accessibility to Public Transport	No rating
Is the development in a Greenfields area?	YES

In recent years the surrounding area has undergone a significant land use change from generally rural to suburban. PTA confirmed that it is reasonable to expect an upgrade in the existing bus service through the area given the growth of the population and the increased demand, providing us with information that route 566 will extend to the south to the Sixty Eight Road and Baldivis Road corner. Route 566 is proposed to commence in the North West corner of the intersection and travel to Warnbro Station. However, at the time of writing this report, no definite timeframes are known. The map of existing public transportation routes within a 2km radius is provided in Appendix 2.

2.8 Pedestrian Infrastructure

Describe existing local pedestrian infrastructure within a 400m radius of the site:

Classification	Road Name
" Principal Shared Path"	Kwinana Freeway
Does the site have existing pedestrian facilities	NO
Does the site propose to improve pedestrian facilities?	YES

If YES, describe the measures proposed.

Active transport modes such as walking, and cycling have an important role within the overall transportation system of an urban area. When integrated with compatible land uses, a quality walk/cycle network can:

- Reduce private car dependency for residents;
- Increase accessibility to employment and other urban activities for residents;
- Reduce the adverse environmental impacts of vehicular and motorised transport;
- Increase resource efficiency in a multi-modal transport system; and,
- Reduce transport-related crashes or injuries.

The objective of a pedestrian and cycle network is to provide for the convenient and safe movement of pedestrians and cyclists through and between urban developments, having regard for the need to service schools, shops, recreation and other land uses as well as public transport access points.
The Access Streets should provide footpaths or shared paths on at least one side of the road, in accordance with Liveable Neighbourhoods, as KCTT recommended in Section 2.21.
Additionally, a shared path is proposed on Serpentine Road and Sixty Eight Road, connecting the existing PSP path along Kwinana Freeway to the good road environment on Baldivis Road.

What is the Walk Score Rating?

0	Car-Dependent. Almost all errands require a car.

2.9 Cyclist Infrastructure

Are there any PBN Routes within an 800m radius of the subject site? YES

If YES, describe:

Classification	Road Name
" Principal Shared Path"	Kwinana Freeway
" Good Road Riding Environment"	Baldivis Road

Are there any PBN Routes within a 400m radius of the subject site? YES

If YES, describe:

Classification	Road Name
" Principal Shared Path"	Kwinana Freeway
" Good Road Riding Environment"	Baldivis Road
Does the site have existing cyclist facilities?	NO
Does the site propose to improve cyclist facilities?	YES

If YES, describe the measures proposed.

The Access Streets should provide footpaths or shared paths on at least one side of the road, in accordance with Liveable Neighbourhoods, as KCTT recommended in Section 2.21.
Additionally, a shared path is proposed on Serpentine Road and Sixty Eight Road, connecting the existing PSP path along Kwinana Freeway to the good road environment on Baldivis Road.

2.10 Vehicular Parking

Local Government	City of Rockingham
Local Government Document Utilised	Town Planning Scheme No.2 State Planning Policy 3.1 - R-Codes

Description of Parking Requirements in accordance with Scheme:

TPS:

" Residential - In accordance with the R-Codes"

R-Codes:

" The following minimum number of on-site car parking spaces is to be provided for each single house, grouped dwelling and special purpose dwelling comprising the following number of bedrooms:

- *1-bedroom dwellings – Location B – 1 bay per dwelling*
- *2+ bedroom dwellings – Location B – 2 bays per dwelling"*

Calculation of Parking

Land Use	Requirements	Yield	Total Parking
Residential	*2 bays per dwelling**	460 dwellings	920

*Note * - For the purposes of this report it is assumed that all dwellings will have 2+ bedrooms.*

Justification

The predominant use is residential and to comply with the R-Codes, it is expected that all residences will comply by providing a garage for each dwelling. KCTT believe that by having a garage for the owner, visitors are likely to park in the driveway space in front of the garage. Access Street "C" can accommodate on-street parking to provide additional bays but also to visually narrow the street and improve safety in the pedestrian environment.

Have Vehicle Swept Paths been checked for Parking?	NO

2.11 Bicycle Parking

Local Government	City of Rockingham
Reference Document Utilised	Planning Policy 3.3.14 Bicycle Parking and End-Of-Trip Facilities State Planning Policy 3.1 - R-Codes

Description of Parking Requirements:

Planning Policy 3.3.14 Bicycle Parking and End-Of-Trip Facilities does not offer ratios for residential parking requirements for the land uses proposed within the development.

Justification

KCTT's opinion is that there is no need for additional bicycle parking or showering facilities because residential properties have showering facilities included and provide flexible internal spaces which can accommodate the resident's bicycle parking requirements.

2.12 ACROD Parking

Class of Building	**Class 1a** - a detached house or one of a group of two or more dwellings separated by a fire resisting wall, including a row house, terrace house, town house or villa unit.
Does this building class require specific provision of ACROD Parking?	NO

2.13 Delivery and Service Vehicles

Guideline Document used as reference — NSW RTA Guide to Traffic Generating Developments

Requirements

*" **Residential flat buildings** (50% of spaces adequate for trucks > 200 flats or home units = 4 + 1 per 100 units over 200*

Justification

It is expected that delivery and service vehicles (such as waste removal vehicles) servicing the residential area will not require designated parking spaces given that they can operate safely within the road reserve.

2.14 Calculation of Development Generated / Attracted Trips

What are the likely hours of operation?	For residential land uses, the hours of operation are not applicable. The community centre is expected to be open in period 09:00-17:00.
What are the likely peak hours of operation?	AM 08:00 to 09:00 PM 17:00 to 18:00
Do the development generated peaks coincide with existing road network peaks?	YES
If YES, which:	Partially AM peak
Guideline Document Used	**WAPC Transport Assessment Guidelines for Developments**
Rates from above document:	***Residential** – 0.8 vehicle trips per dwelling for the AM and PM peak hours. A 25% IN / 75% OUT split has been adopted for the AM peak and a 67% IN / 33% OUT split for the PM peak hour;*
Guideline Document Used	**NSW RTA Guide to Traffic Generating Developments**
Rates from above document:	***3.3.1 Dwelling houses*** *Daily vehicle trips = 9.0 per dwelling*

Land Use Type	Rate above	Yield	Daily Traffic Generation	Peak Hour Traffic Generation
Residential	*9 VPD per unit* *Peak - 0.8 VPH per unit*	460 dwellings	**4,140**	**368**

Does the site have existing trip generation / attraction?	YES KCTT assume that a rate of 9 VPD, and 0.8 VPH per dwelling would be suitable for the calculation of the existing trip generation.
No of Daily Trips	4 residential dwellings* 9 VPD = 36 VPD
No of AM Peak Hour Trips	4 residential dwellings* 0.8 VPH = 3 VPH
No of PM Peak Hour Trips	4 residential dwellings* 0.8 VPH = 3 VPH
What is the total impact of the new proposed development?	The proposed development is expected to generate a total of 4,140 vehicular trips per day and 368 in the peak hour. Having in mind the existing land uses the additional traffic to the road network would be 4,104 vehicular trips per day and 365 vehicular trips in the peak hour KCTT's opinion is that there is sufficient capacity to support the additional traffic in the area.

2.15 Trip Purposes

Land Use Type	Employment	Shopping	Education	Social / Recreational
Residential	40%	17.5%	25%	17.5%

2.16 Expected Origin / Destination

Name the closest existing major residential generators and non-residential attractors of traffic and the distance from the boundaries of the Subdivision Area.

Residential

Employment (profile.id)

The majority of employment trips is expected to be external to the proposed Subdivision Plan Area. The ID website on the City of Rockingham's webpage suggests the following breakdown for employment destinations for residents of the City of Rockingham:

- Rockingham (C) - 38.6%
- Cockburn (C) - 8.2%
- Kwinana (C) - 7.1%
- Perth (C) - 6.3%
- No Fixed Address (WA) - 5.5%
- Mandurah (C) - 5.0%
- Canning (C) - 3.4%
- Melville (C) - 3.1%
- Fremantle (C) - 2.8%
- Ashburton (S) - 2.2%
- Belmont (C) - 1.9%
- Stirling (C) - 1.3%
- East Pilbara (S) - 1.2%
- Armadale (C) - 1.2%
- Victoria Park (T) - 1.1%
- Gosnells (C) - 1.1%
- Murray (S) - 1.0%
- Others - less than 1.0% each.

The City Rockingham i.d. site shows that up to 69.6% of all work trips are undertaken using a vehicle (i.e. vehicle as driver plus vehicle as passenger)

Given the predominant transport mode and distribution of destinations, which excluding working from home, shows that there is no source of employment in this Subdivision plan, the following roads in KCTT's opinion will be predominantly used for access/egress to the site: -

- Baldivis Road;
- Sixty Eight Road;
- Serpentine Road.

Shopping

The proposed Subdivision plan does not propose any local centre or shopping centre.

The nearest shopping centre is Baldivis Square located 1.5km northwest from the proposed development.

Stockland Baldivis Shopping Centre 3km to the northwest from the subject site.

Education	The proposed Subdivision plan does not propose any schools. It is expected that 100% of trips for education purposes will be external (tertiary education and attendance of private schools). The nearest existing schools are Ridge View Secondary College 900m to the west, Makybe Rise PS 1.5km northwest and Tuart Rise Primary School 1.5km to the northwest from the proposed Subdivision Plan.
Social / Recreational	It is deemed that a minimum of 80% of the trips for social and recreational purpose will be external.

2.17 Traffic Flow Distribution onto External Road Networks

How many routes are available for access / egress to the site?	Four routes 4,140 VPD / 368 VPH
Route 1	
Provide details for Route No 1	**To/from the south via Baldivis Road**
Percentage of Vehicular Movements via Route No 1	45% 1,863 VPD / 166 VPH
Route 2	
Provide details for Route No 2	**To/from the north via Baldivis Road**
Percentage of Vehicular Movements via Route No 2	40% 1,656 VPD / 147 VPH
Route 3	
Provide details for Route No 3	**To/from the west via Sixty Eight Road**
Percentage of Vehicular Movements via Route No 3	10% 414 VPD / 37 VPH
Route 4	
Provide details for Route No 4	**To/from the west via Solis Boulevard**
Percentage of Vehicular Movements via Route No 4	5% 207 VPD / 18 VPH

2.18 Road Safety

Are sight distances adequate at proposed intersections?	YES

Justification

Liveable Neighbourhoods guidelines state that junction spacing for access streets or laneway junctions are not to be located closer than 20m. The proposed road network complies with this requirement.

2.19 Proposed Internal Road Network

Guideline Document used as reference	Liveable Neighbourhoods
How many proposed roads are there within the Subdivision Area?	17 proposed roads

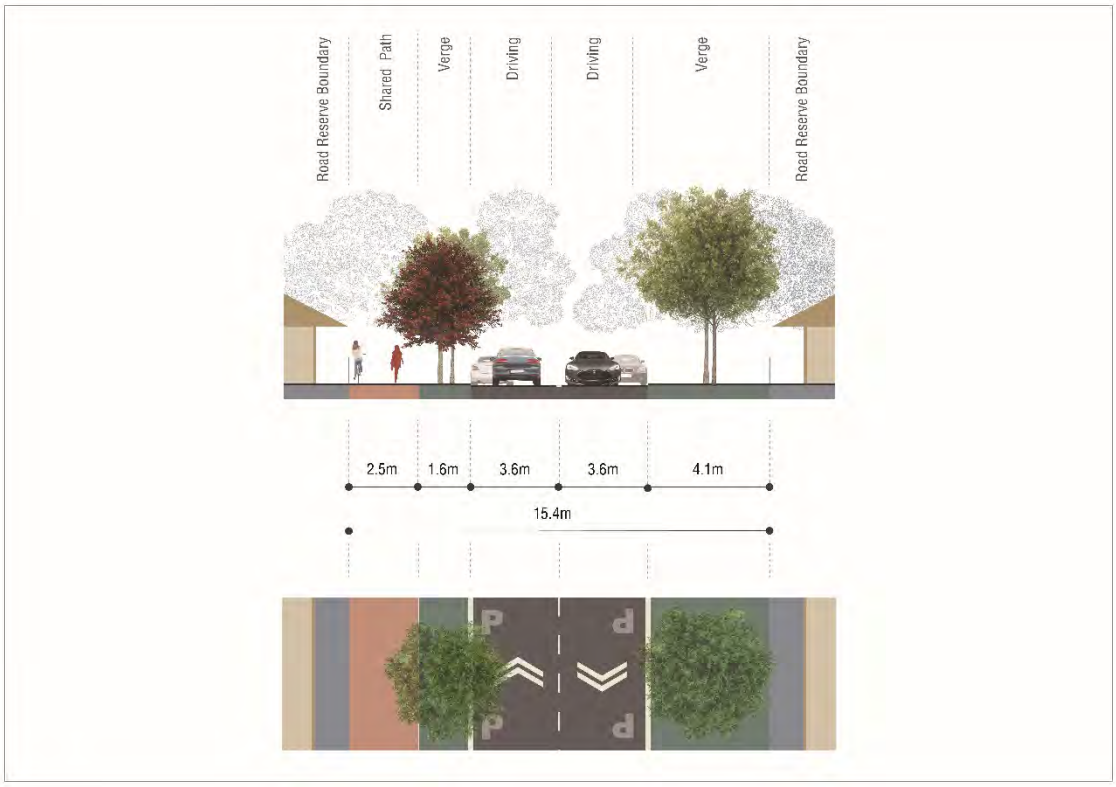
The classification below is reflective of minimal traffic requirements. The road reservation widths can be expanded and re-organised to satisfy different types of requirements (e.g. civil engineering, environmental, conservational, urban design etc.), therefore roads that have lower order hierarchy according to traffic engineering requirements might have wider road reservations if required.

Name of Roads / Road Classification and Description:

Road 01-02, Sixty Eight Road (east of Baldivis Road)

Projected Traffic Volumes	less than 3,000 VPD
Proposed Number of Lanes	two
Proposed Road Reservation Width	15.4m
Proposed Road Pavement Width	7.2m
Proposed Median Width	no median
Proposed Pedestrian / Cyclist / Shared Path Width	2.5m shared path on one side of the road reservation
Proposed Classification	Access Street "C"
Proposed Speed Limit	40 km/h
Proposed Bus Route Extension / Introduction	NO
Proposed On-street parking	NO

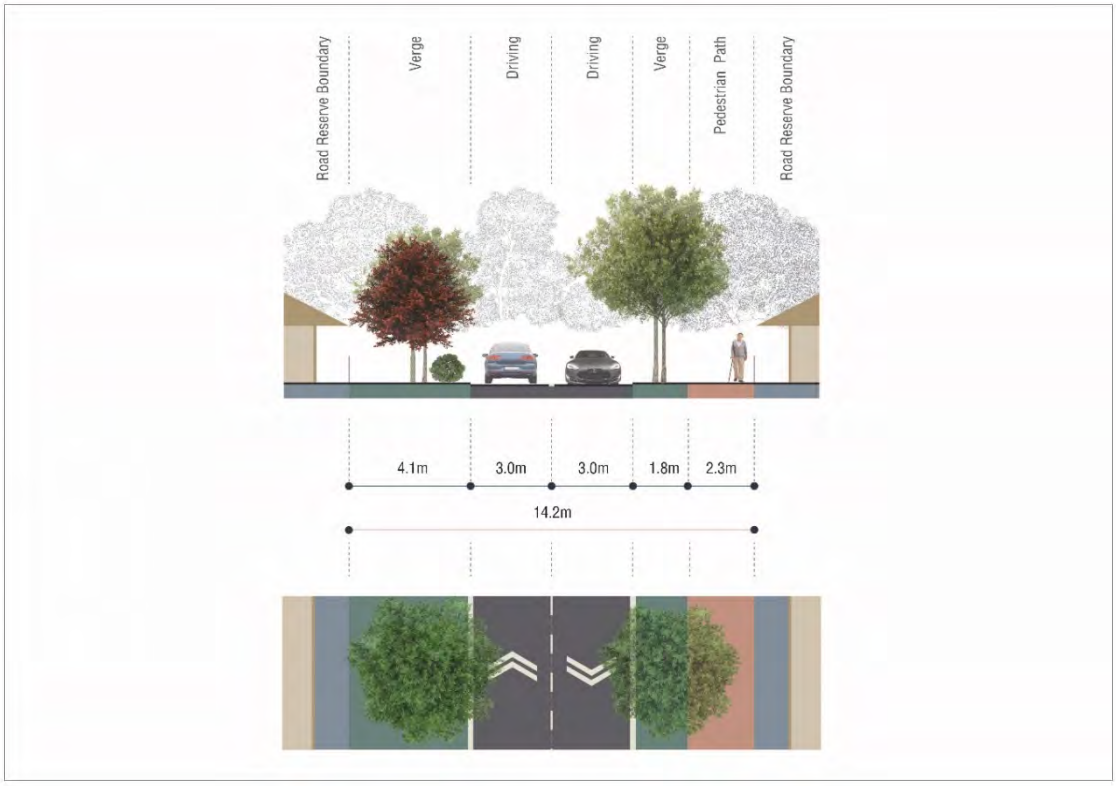
Provide graphics of the proposed internal road cross section



Road 03-16

Projected Traffic Volumes	less than 1,000 VPD
Proposed Number of Lanes	two
Proposed Road Reservation Width	14.2m
Proposed Road Pavement Width	6.0m
Proposed Median Width	no median
Proposed Pedestrian / Cyclist / Shared Path Width	2.3m pedestrian path on one side of the road reservation
Proposed Classification	Access Street "D"
Proposed Speed Limit	40km/h
Proposed Bus Route Extension / Introduction	NO
Proposed On-street parking	NO

Provide graphics of the proposed internal road cross section



2.20 Proposed Intersection Controls

How many proposed intersections have been analysed?	29

Name of Intersections within the Subdivision Area / Road Classification and Description:

Intersection 1

Name	Sixty Eight Road – Baldivis Road
Proposed Intersection Control	Roundabout, interim Sign Controlled – to be constructed by the development to the west (Brightwood Estate)

Intersection 2

Name	Road 01 – Baldivis Road – Solis Boulevard
Proposed Intersection Control	Roundabout – to be constructed by the development to the west (Brightwood Estate)

Intersection 3

Name	Road 01 – Road 04
Proposed Intersection Control	Left-in / Left Out

Name additional recommendations

All other intersections within the subject site are to be Sign Controlled / Yield.

2.21 Proposed Internal Transport Networks

Are there any changes / additions to the existing road network?	YES • 17 proposed roads • Roundabout at the intersection of Road 01 – Baldivis Road – Solis Boulevard – to be constructed by the development to the west (Brightwood Estate)
Were there any discussions / agreements with MRWA regarding intersections with, or direct access onto roads under their jurisdiction?	Not at this stage
Are there any pedestrian / cycle networks and crossing facilities proposed for the roads within the Subdivision Area?	YES • Proposed pedestrian path on one side of all proposed streets within the subject area • Proposed shared path on one side of Road 01 and Road 02 • Proposed shared path on Serpentine Road, connecting the existing PSP path along Kwinana Freeway to the good road environment on Baldivis Road.
Were there any discussions / agreements with the local authority over local road networks and pedestrian and cycle facilities?	Not at this stage
Were there any discussions / agreements with PTA / Transperth on new bus services or extensions / alterations to existing bus services to serve the area?	NO

2.22 Changes to External Transport Networks

Are there any proposed changes of the road network?	YES • **Perth and Peel**: *" Kwinana–Rockingham–Karnup The following new connections will complete the existing network in this sector:* o *Nairn Drive will connect to Wellard Road — via Kerosene Lane and Baldivis Road with a direct grade-separated crossing over the railway;* o *Stakehill Road will be extended west to Warnbro Sound Avenue and upgraded east of Nairn Drive;* o *Dampier Drive will be extended east of Ennis Avenue to Nairn Drive; and* o *Baldivis Road will be extended south to join Anstey Road."* • Baldivis Road – to be upgraded to Integrator B standard (dual carriageway) – timing currently unknown • Sixty Eight Road – to be upgraded to Neighbourhood Connector A standard (approximately by 2021), west of Baldivis Road • Serpentine Road - to be reclassified as a Neighbourhood Connector B as part of the Heritage Park Phase 2 LSP
Are there any proposed changes of the intersection controls?	YES • Roundabout at the intersection of Baldivis Road and Sixty Eight Road • Roundabout at the intersection of Baldivis Road and the main access point to the structure plan Lots 635, 739 & 740 Baldivis Road, Baldivis
Are there any proposed changes of the pedestrian / cycle networks and crossing facilities?	NO
Are there any proposed changes of the public transport services?	YES • PTA confirmed that it is reasonable to expect an upgrade in the existing bus service through the area given the growth of the population and the increased demand, providing KCTT with information that route 566 will extend south to the corner of Sixty Eight Road and Baldivis Road. Route 566 is proposed to commence in the North West corner of the intersection and travel to Warnbro Station. However, at the time of writing this report, no definite timeframes are known. For further information, Appendix 2 shows the map of existing public transportation routes within a 2km radius. • High Frequency Public Transit Corridor along Baldivis Road is planned under the Perth and Peel 3.5 million framework

These changes could be those committed or proposed by others, MRWA or local authority, or by the proponent as part of the subdivision plan.

2.23 Integration with Surrounding Area

Are there any existing major residential generators of traffic within a minimum of 800 metres from the boundaries of the Subdivision?	YES
If YES, nominate:	Several residential areas to the west and north-west of the proposed development.
Are there any existing major non-residential attractors of traffic within a minimum of 800 metres from the boundaries of the Subdivision?	YES
If YES, nominate:	• Ridge View Secondary College 900m to the west from the subject site • Makybe Rise Primary School 1.5km to the northwest from the subject site • Tuart Rise Primary School 1.5km to the west from the subject site • Rivergums Primary School 2.2km to the north from the subject site • Baldivis Secondary College 2.4km to the north from the subject site • Stockland Baldivis Shopping Centre 3km to the northwest from the subject site
Identify any proposals for major changes to the land uses within 800 metres of the boundaries of the Subdivision.	• Several residential structure plans are located in the vicinity of the subject site, some of them are: o Heritage Park Phase Two (Lots 986 and 993 Baldivis Road, Baldivis) o Lots 635, 739 and 740 Baldivis Road o Brightwood Estate (Lots 569 & 1263 Baldivis Road and Lot 21 Sixty Eight Road) o Lot 20 Sixty Eight Road o Lot 19 Sixty Eight Road o Parkland Heights (Lot 1507 Eighty Road, Baldivis) • Most of these structure plans will include a school and a neighbourhood centre facility.
What are the main desire lines between the structure plan land uses and these external attractors / generators?	Via Baldivis Road, Kwinana Freeway and Sixty Eight Road.
Will the existing transport networks, plus any proposed changes, adequately match these desire lines, particularly for pedestrians, cyclist and public transport users?	YES After the subject site and the surrounding planned structure plans are completed the area will be well connected to the existing and future surrounding major attractors / generators.
Identify any deficiencies or areas for improvement in the surrounding transport networks and/or areas where improvements could be made.	N/A The area is well planned, when all infrastructure is completed, it is expected that the network will function without any major issues.

2.24 Analysis of Transport Networks

Determine the year(s) for assessment and the time period(s) for the traffic flow analysis.	2031 (final year of development completion) 2041 (10 years after completion)
Determine structure plan generated traffic.	4,140 VPD
Annual traffic growth rate used for analysis	
Growth rates 2031: • 8% - Sixty Eight Road • 11.5% - Baldivis Road (north of Sixty Eight Road) • 6% - Baldivis Road (south of Sixty Eight Road)	Growth rates 2041: • 2% - Sixty Eight Road • 2.5% - Baldivis Road (north of Sixty Eight Road) • 3.5% - Baldivis Road (south of Sixty Eight Road)

These growth rates have been derived and adjusted to reflect ROM24 Multi-Modal Model V4.40 for years 2031 and 2041 data for Baldivis Road and Sixty Eight Road provided by MRWA (July 2020). Having in mind that traffic growth is not uniform throughout the 20 year period, separate growth rates have been provided for years 2031 and 2041.

DPHL have also provided corresponding MLUFS data showing estimated population growth. This data was used for preparation of ROM24 model. The subject structure plan area is a part of MLUFS Zone 995 which is bound by Baldivis Road, Karnup Road, Kwinana Freeway and Safety Bay Road. MLUFS models envisage additional 588 dwellings in zone 995 by 2031, and further 183 dwellings to be constructed between 2031 and 2041. The only structure plans proposed within the zone 995 are Heritage Park Phase 2 and this subject structure plan area. Remnant land within MLUFS Zone 995 is Crown land and is not likely to be developed as any intensive land use in foreseeable future.

Projected volume of dwellings between Heritage Park Phase 2 and subject structure plan area (Baldivis East) correspond estimated increase in dwelling stock by 2041 (total of 771 additional dwellings in Zone 995). Therefore, this subject structure plan area has already been accounted for by MRWA and DPLH in forward network planning.

It should be noted that the Sixty Eight Road traffic volumes have been derived from the expected number of dwellings in MLUFS Zone 1001 and are based on the assumption that approximately 40% of total Zone 1001 traffic will use the section of Sixty Eight Road east of Baldivis Road.

Growth rates on Sixty Eight Road and Baldivis Road have been adjusted to suit the above assumptions.

Road Name	Location	Traffic generated by the subject site (VPD)	Estimated passing traffic 2031(VPD)	Total VPD (2031)	Estimated passing traffic 2041(VPD)	Total VPD (2041)
Baldivis Road	North of Sixty Eight Road	2,070	14,253	16,323	18,245	20,315
	South of Sixty Eight Road	1,863	8,446	10,309	11,914	13,777
Sixty Eight Road	West of Baldivis Road	414	6,032	6,446	7,353	7,767
	East of Baldivis Road	870	155	1,025	189	1,059
Serpentine Road	East of Baldivis Road	1,200	916	2,116	916	2,116
Solis Boulevard	West of Baldivis Road	207	2,340	2,547	2,340	2,547

Note - For more detailed information refer to Appendix 3 – SIDRA Intersection Analysis*

Identify all schools within the Subdivision and those within 800 metres of the Subdivision.

No schools are proposed in the Subdivision plan. It is expected that 100% of trips for educational purposes will be external (tertiary education and attendance of private schools). The nearest existing schools are Ridge View Secondary College 900m to the west, Makybe Rise PS 1.5km northwest and Tuart Rise Primary School 1.5km to the west from the proposed Subdivision Plan.

Identify the most likely walk and cycle routes to each school from the catchment areas.

The main walk and cycle routes will include the pedestrian and shared paths leading to Ridge View Secondary College.

2.25 Site Specific Issues and Proposed Remedial Measures

How many site-specific issues need to be discussed?	One
Site Specific Issue No 1	**Traffic impact of the new proposed development**
Remedial Measure / Response	The proposed development is expected to generate a total of 4,140 vehicular trips per day and 368 in the peak hour. Having in mind the existing land uses the additional traffic to the road network would be 4,104 vehicular trips per day and 365 vehicular trips in the peak hour KCTT's opinion is that there is sufficient capacity to support the additional traffic in the area.

Appendix 1

The layout of the proposed development

HERITAGE PARK (BY OTHERS)

FUTURE ROUNDABOUT (BY OTHERS)

SERPENTINE ROAD

ROAD INTERFACE TO TRAMWAY RESERVE

COTTAGE LOTS FRONTING ONTO POS

MATURE TREES RETAINED IN RESERVE AS ENTRY STATEMENT

CONSOLIDATED ROUNDABOUT TO "BRIGHTWOOD" ESTATE & BALDIVIS ROAD

FUTURE ROUNDABOUT (BY OTHERS)

ACOUSTIC WALL TO KWINANA FREEWAY

"PICNIC" NODE (OUTSIDE PIPELINE EASEMENT)

POS TO SERVE DRAINAGE FUNCTION

SOLIS BVD

BALDIVIS ROAD

TRAMWAY RESERVE

BALDIVIS ROAD

SIXTY EIGHT ROAD

KWINANA FREEWAY

1272

1

503

313

1006

1524

1007

5

201

14.02.2018 nearmap.com

CLE Town Planning + Design
www.cleplan.com.au

DEVELOPMENT CONCEPT PLAN DRAFT

Lots 1006, 1007 & 1272 Baldivis Road & Lots 1 & 503 Serpentine Road, Baldivis

plan no: **3407-37-01**
date: 11 November 2018
scale: 1:2,500 @ A3, 1:1,250 @A1

N

Appendix 2

Transport Planning and Traffic Plans

CITY OF ROCKINGHAM

Clyde Avenue
Nairn Drive
BALDIVIS SECONDARY COLLEGE
RIVERGUMS PS
BARI BARI PARK
Baldivis Road
MAKYBE RISE PS
Highbury Boulevard
Kwinana Freeway
2km
800m
TUART RISE PS
Smirk Road
CARNARVON PARK
Serpentine Road
Serpentine Road
Solis Boulevard
Sixty Eight Road
BALDIVIS
Baldivis Road
KARNUP NATURE RESERVE
Karnup Road
Karnup Road
Kwinana Freeway

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street — STREET NAME
LOCATION BOUNDARY
DISTANCE FROM LOCATION
CITY OF ROCKINGHAM — LOCAL GOVERNMENT NAME
BALDIVIS — SUBURB

LEGEND

No	DATE	AMENDMENT
C	22-04-2020	INFORMATION UPDATED
B	22-08-2018	PROPOSED LAYOUT AMENDED
A	14-10-2015	ISSUED FOR REVIEW

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: LOCALITY PLAN - 2KM RADIUS

DRAWING NUMBER: KC00393.000_ S01

DRAWN BY: A.M.

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CITY OF ROCKINGHAM

Clyde Avenue
Nairn Drive
Baldivis Road
Kwinana Freeway
Highbury Boulevard
Smirk Road
Solis Boulevard
Sixty Eight Road
Serpentine Road
Karnup Road
PSP
2km
800m
BALDIVIS SECONDARY COLLEGE
RIVERGUMS PS
BARI BARI PARK
MAKYBE RISE PS
TUART RISE PS
CARNARVON PARK
KARNUP NATURE RESERVE
BALDIVIS

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street — STREET NAME
LOCATION BOUNDARY
DISTANCE FROM LOCATION
CITY OF ROCKINGHAM — LOCAL GOVERNMENT NAME
BALDIVIS — SUBURB
PSP — PRINCIPAL SHARED PATH (PSP)
OTHER SHARED PATH (SHARED BY PEDESTRIANS & CYCLISTS)
GOOD ROAD RIDING ENVIRONMENT
TRAFFIC LIGHT
BICYCLE LANES OR SEALED SHOULDER EITHER SIDE

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
C	22-04-2020	INFORMATION UPDATED
B	22-08-2018	PROPOSED LAYOUT AMENDED
A	14-10-2015	ISSUED FOR REVIEW

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: BICYCLE NETWORK PLAN - 2KM RADIUS

DRAWING NUMBER: KC00393.000_ S02

DRAWN BY: A.M.

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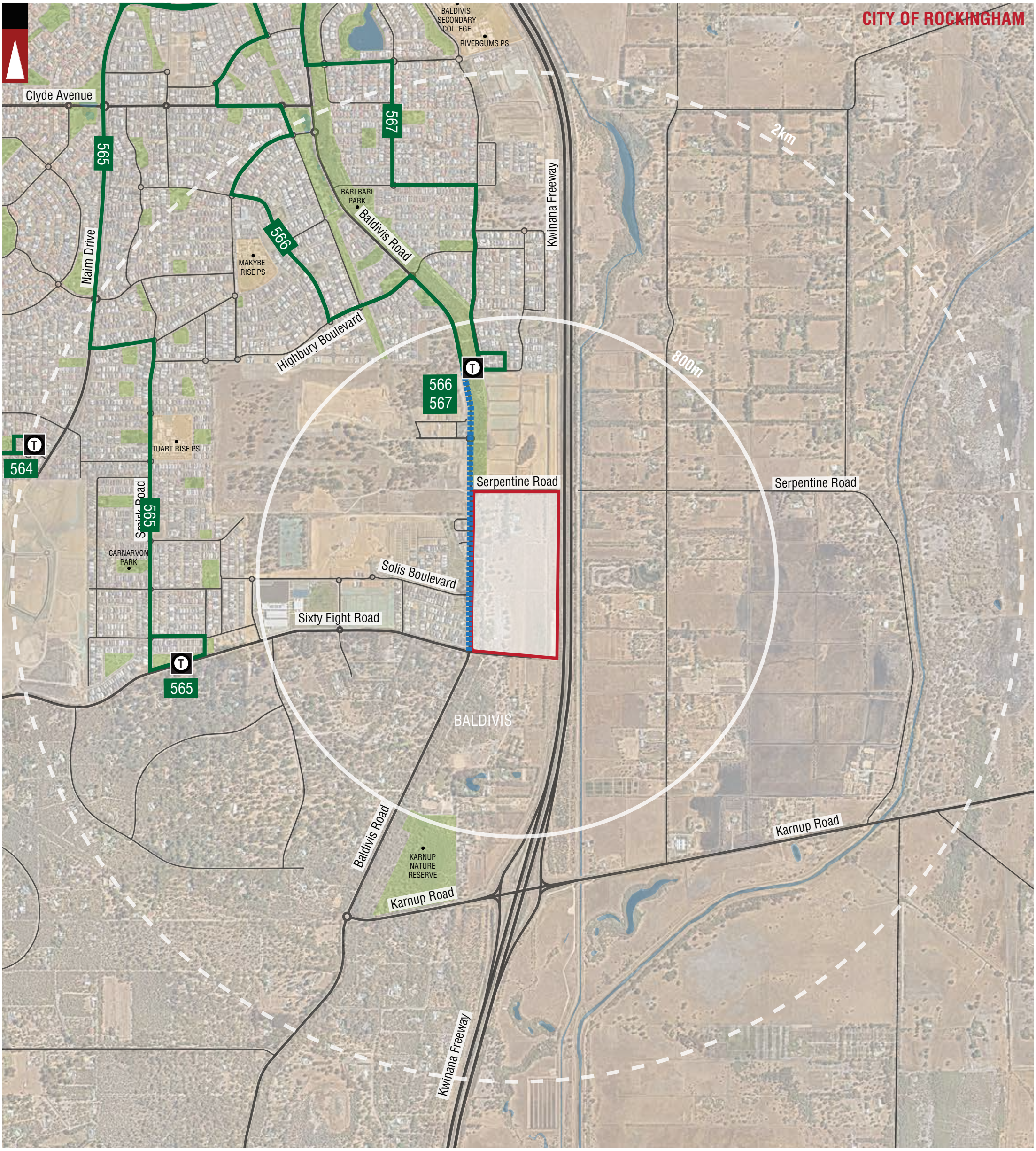

PARKS AND RECREATION
WATERWAYS
PUBLIC PURPOSE
ROAD
Hay Street — STREET NAME

LOCATION BOUNDARY
DISTANCE FROM LOCATION
CITY OF ROCKINGHAM — LOCAL GOVERNMENT NAME
BALDIVIS — SUBURB

565 — BUS ROUTE NUMBER
BUS ROUTES
BUS TERMINUS
POTENTIAL EXTENSION OF BUS ROUTE 566

565 — WARNBRO STATION – BALDIVIS VIA NAIRN DRIVE
566 — WARNBRO STATION – BALDIVIS VIA MAKYBE DRIVE
567 — WARNBRO STATION - BALDIVIS VIA RIVERGUMS BOULEVARD

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
C	22-04-2020	INFORMATION UPDATED
B	22-08-2018	PROPOSED LAYOUT AMENDED
A	14-10-2015	ISSUED FOR REVIEW

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: PUBLIC TRANSPORT PLAN - 2KM RADIUS

DRAWING NUMBER: KC00393.000_ S03

DRAWN BY: A.M.

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CITY OF ROCKINGHAM

Clyde Avenue
Nairn Drive
BALDIVIS SECONDARY COLLEGE
RIVERGUMS PS
BARI BARI PARK
Baldivis Road
MAKYBE RISE PS
Highbury Boulevard
Kwinana Freeway
2km
800m
TUART RISE PS
Smirk Road
CARNARVON PARK
Serpentine Road
Solis Boulevard
Sixty Eight Road
BALDIVIS
KARNUP NATURE RESERVE
Karnup Road
PSP

LEGEND

- PARKS AND RECREATION
- WATERWAYS
- PUBLIC PURPOSE
- ROAD
- Hay Street — STREET NAME
- LOCATION BOUNDARY
- DISTANCE FROM LOCATION
- CITY OF ROCKINGHAM — LOCAL GOVERNMENT NAME
- BALDIVIS — SUBURB
- PSP — HIGH QUALITY SHARED PATH
- OTHER SHARED PATH (SHARED BY PEDESTRIANS & CYCLISTS)
- PEDESTRIAN PATH

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
C	22-04-2020	INFORMATION UPDATED
B	22-08-2018	PROPOSED LAYOUT AMENDED
A	14-10-2015	ISSUED FOR REVIEW

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: PEDESTRIAN PATHS PLAN - 2KM RADIUS

DRAWING NUMBER: KC00393.000_ S04

DRAWN BY: A.M.

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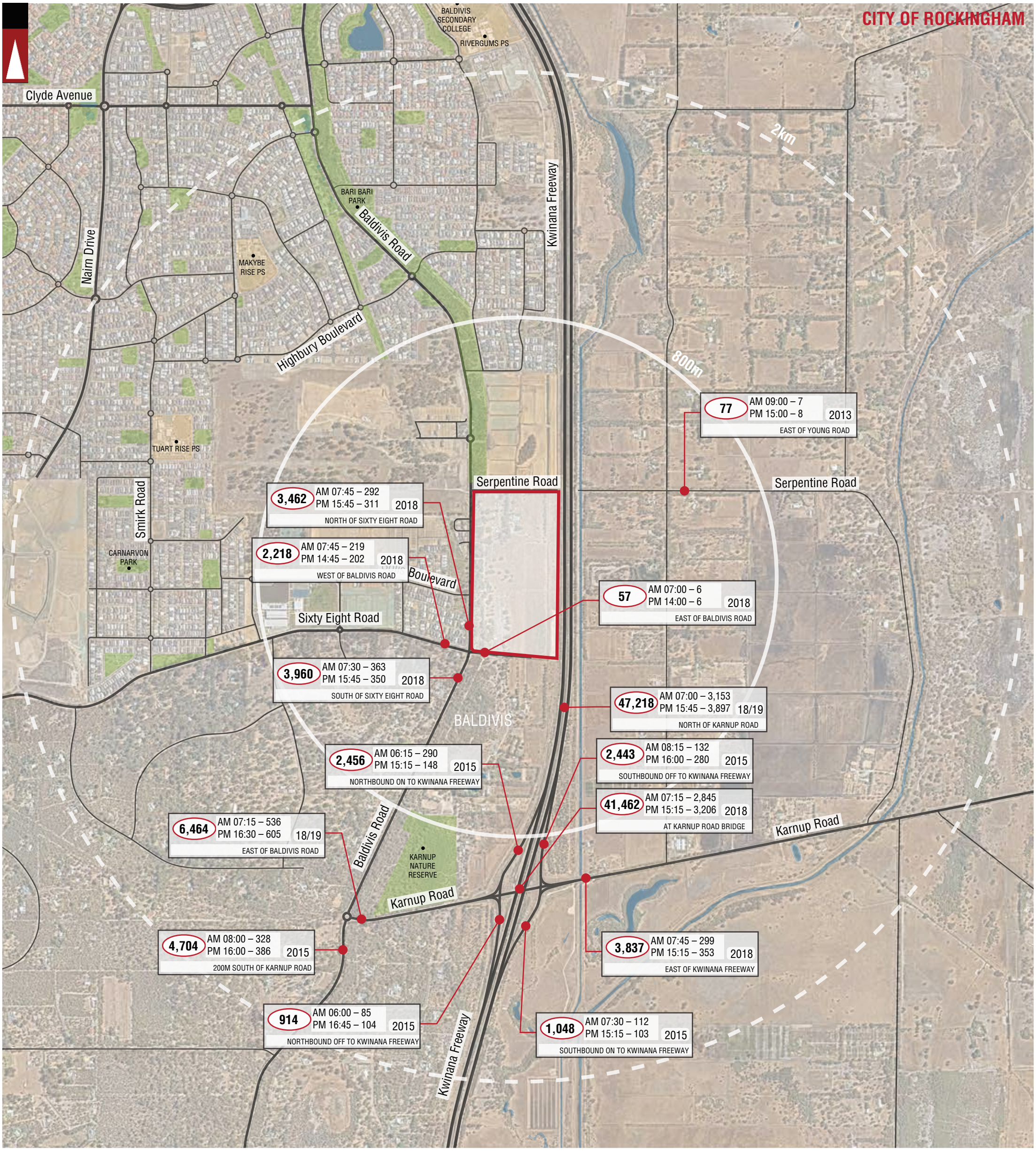
CITY OF ROCKINGHAM



LEGEND

- PARKS AND RECREATION
- WATERWAYS
- PUBLIC PURPOSE
- ROAD
- Hay Street — STREET NAME
- LOCATION BOUNDARY
- DISTANCE FROM LOCATION
- CITY OF ROCKINGHAM — LOCAL GOVERNMENT NAME
- BALDIVIS — SUBURB
- 5,512 — NUMBER OF VEHICLES PER DAY
- AM 1145 – 381 / PM 1630 – 480 — NUMBER OF VEHICLES PER AM PEAK HOUR / NUMBER OF VEHICLES PER PM PEAK HOUR
- 2014 — YEAR
- EAST OF HARLOW ROAD — LOCATION

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
C	22-04-2020	INFORMATION UPDATED
B	22-08-2018	PROPOSED LAYOUT AMENDED
A	14-10-2015	ISSUED FOR REVIEW

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: EXISTING TRAFFIC COUNTS - 2KM RADIUS

DRAWING NUMBER: KC00393.000_ S05a

DRAWN BY: A.M.

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CITY OF ROCKINGHAM

BALDIVIS SECONDARY COLLEGE

RIVERGUMS PS

Clyde Avenue

Nairn Drive

BARI BARI PARK

Baldivis Road

Kwinana Freeway

MAKYBE RISE PS

Highbury Boulevard

2km

800m

TUART RISE PS

Smirk Road

Serpentine Road

2,116

Serpentine Road

CARNARVON PARK

Solis Boulevard

2,547

Sixty Eight Road

7,991

4,208

967

7,959

BALDIVIS

Baldivis Road

KARNUP NATURE RESERVE

Karnup Road

Karnup Road

Kwinana Freeway

PARKS AND RECREATION

WATERWAYS

PUBLIC PURPOSE

ROAD

Hay Street — STREET NAME

LOCATION BOUNDARY

DISTANCE FROM LOCATION

CITY OF ROCKINGHAM — LOCAL GOVERNMENT NAME

BALDIVIS — SUBURB

7,418 — FORECASTED TRAFFIC VOLUMES ON EXISTING ROADS INCLUDING DEVELOPMENT TRAFFIC

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
C	22-04-2020	INFORMATION UPDATED
B	22-08-2018	PROPOSED LAYOUT AMENDED
A	14-10-2015	ISSUED FOR REVIEW

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: FUTURE TRAFFIC COUNTS - YEAR 2029

DRAWING NUMBER: KC00393.000_ S05b

DRAWN BY: A.M.

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CITY OF ROCKINGHAM

BALDIVIS SECONDARY COLLEGE

RIVERGUMS PS

Clyde Avenue

Nairn Drive

BARI BARI PARK

Baldivis Road

Kwinana Freeway

MAKYBE RISE PS

Highbury Boulevard

2km

800m

TUART RISE PS

Smirk Road

Serpentine Road

2,116

Serpentine Road

CARNARVON PARK

Solis Boulevard

2,547

Sixty Eight Road

11,715

6,593

1,029

10,887

BALDIVIS

Baldivis Road

KARNUP NATURE RESERVE

Karnup Road

Karnup Road

Kwinana Freeway

PARKS AND RECREATION

WATERWAYS

PUBLIC PURPOSE

ROAD

Hay Street — STREET NAME

LOCATION BOUNDARY

DISTANCE FROM LOCATION

CITY OF ROCKINGHAM — LOCAL GOVERNMENT NAME

BALDIVIS — SUBURB

7,418 — FORECASTED TRAFFIC VOLUMES ON EXISTING ROADS INCLUDING DEVELOPMENT TRAFFIC

Certified System Quality ISO 9001 SAI GLOBAL

LEGEND

No	DATE	AMENDMENT
C	22-04-2020	INFORMATION UPDATED
B	22-08-2018	PROPOSED LAYOUT AMENDED
A	14-10-2015	ISSUED FOR REVIEW

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: FUTURE TRAFFIC COUNTS - YEAR 2039

DRAWING NUMBER: KC00393.000_ S05c

DRAWN BY: A.M.

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CITY OF ROCKINGHAM

LOCATION BOUNDARY

ROAD

PROPOSED ROAD

Lewis Road — ROAD NAME

Road 00 — PROPOSED ROAD NAME

1,389 — Total Expected Traffic Generation from the proposed development

503 — Total Expected Traffic Generation from Subject Site on the specific section of road - **IN and OUT direction**

Traffic Flow IN Direction

Traffic Flow OUT Direction

NOTE: THE PLAN IS COURTEOUSY OF CLE TOWN PLANNING + DESIGN

LEGEND

No	DATE	AMENDMENT
E	22-04-2020	COMMENTS INCORPORATED & INFORMATION UPDATED
D	19-11-2018	COMMENTS INCORPORATED
C	14-11-2018	PROPOSED LAYOUT AMENDED
B	23-08-2018	PROPOSED LAYOUT AMENDED

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: TRAFFIC FLOW DIAGRAM

DRAWING NUMBER: KC00393.000_ S06

DRAWN BY: A.M.

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CITY OF ROCKINGHAM

LOCATION BOUNDARY

ROAD

PROPOSED ROAD

Lewis Road — ROAD NAME

Road 00 — PROPOSED ROAD NAME

1,389 — Total Expected Traffic Generation from the proposed development - Peak

503 — Total Expected Traffic Generation from Subject Site on the specific section of road - **IN and OUT direction - Peak**

Traffic Flow IN Direction

Traffic Flow OUT Direction

NOTE: THE PLAN IS COURTEOUSY OF CLE TOWN PLANNING + DESIGN

LEGEND

No	DATE	AMENDMENT
E	22-04-2020	COMMENTS INCORPORATED & INFORMATION UPDATED
D	19-11-2018	COMMENTS INCORPORATED
C	14-11-2018	PROPOSED LAYOUT AMENDED
B	23-08-2018	PROPOSED LAYOUT AMENDED

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: TRAFFIC FLOW DIAGRAM - PEAK

DRAWING NUMBER: KC00393.000_ S07

DRAWN BY: A.M.

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CITY OF ROCKINGHAM

BALDIVIS

Serpentine Road

SERPENTINE ROAD

Baldivis Road

Kwinana Freeway

Road 13

Road 14

Road 17

Road 11

Road 12

Road 15

Road 02

Road 11

Road 16

RESERVE

Road 09

Road 10

Road 17

Road 09

TRAMWAY

Road 08

Solis Boulevard

Road 01

Road 06

BALDIVIS

Road 04

Road 03

Road 02

Road 07

Sixty Eight Road

Road 05

LOCATION BOUNDARY

ROAD

PROPOSED ROAD

Lewis Road — ROAD NAME

Road 00 — PROPOSED ROAD NAME

ACCESS STREET "C"

ACCESS STREET "D"

NOTE: THE PLAN IS COURTEOUSY OF CLE TOWN PLANNING + DESIGN

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
E	22-04-2020	COMMENTS INCORPORATED & INFORMATION UPDATED
D	19-11-2018	COMMENTS INCORPORATED
C	14-11-2018	PROPOSED LAYOUT AMENDED
B	23-08-2018	PROPOSED LAYOUT AMENDED

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: ROAD HIERARCHIES SKETCH

DRAWING NUMBER: KC00393.000_ S09

DRAWN BY: A.M.

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CITY OF ROCKINGHAM

BALDIVIS

Serpentine Road

SERPENTINE ROAD

Baldivis Road

Kwinana Freeway

Road 13

Road 14

Road 17

Road 11

Road 12

Road 15

Road 02

Road 11

Road 16

RESERVE

Road 09

Road 10

Road 17

Road 09

TRAMWAY

Road 08

Solis Boulevard

Road 01

Road 06

BALDIVIS

Road 04

Road 03

Road 02

Road 07

Sixty Eight Road

Road 05

PSP

LOCATION BOUNDARY

ROAD

PROPOSED ROAD

Lewis Road ROAD NAME

Road 00 PROPOSED ROAD NAME

PROPOSED SHARED PATH

PROPOSED PEDESTRIAN PATH

PSP EXISTING PRINCIPAL SHARED PATH (PSP)

EXISTING GOOD ROAD RIDING ENVIRONMENT

NOTE: THE PLAN IS COURTEOUSY OF CLE TOWN PLANNING + DESIGN

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
E	22-04-2020	COMMENTS INCORPORATED & INFORMATION UPDATED
D	19-11-2018	COMMENTS INCORPORATED
C	14-11-2018	PROPOSED LAYOUT AMENDED
B	23-08-2018	PROPOSED LAYOUT AMENDED

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: PROPOSED PEDESTRIAN PATHS

DRAWING NUMBER: KC00393.000_ S10

DRAWN BY: A.M.

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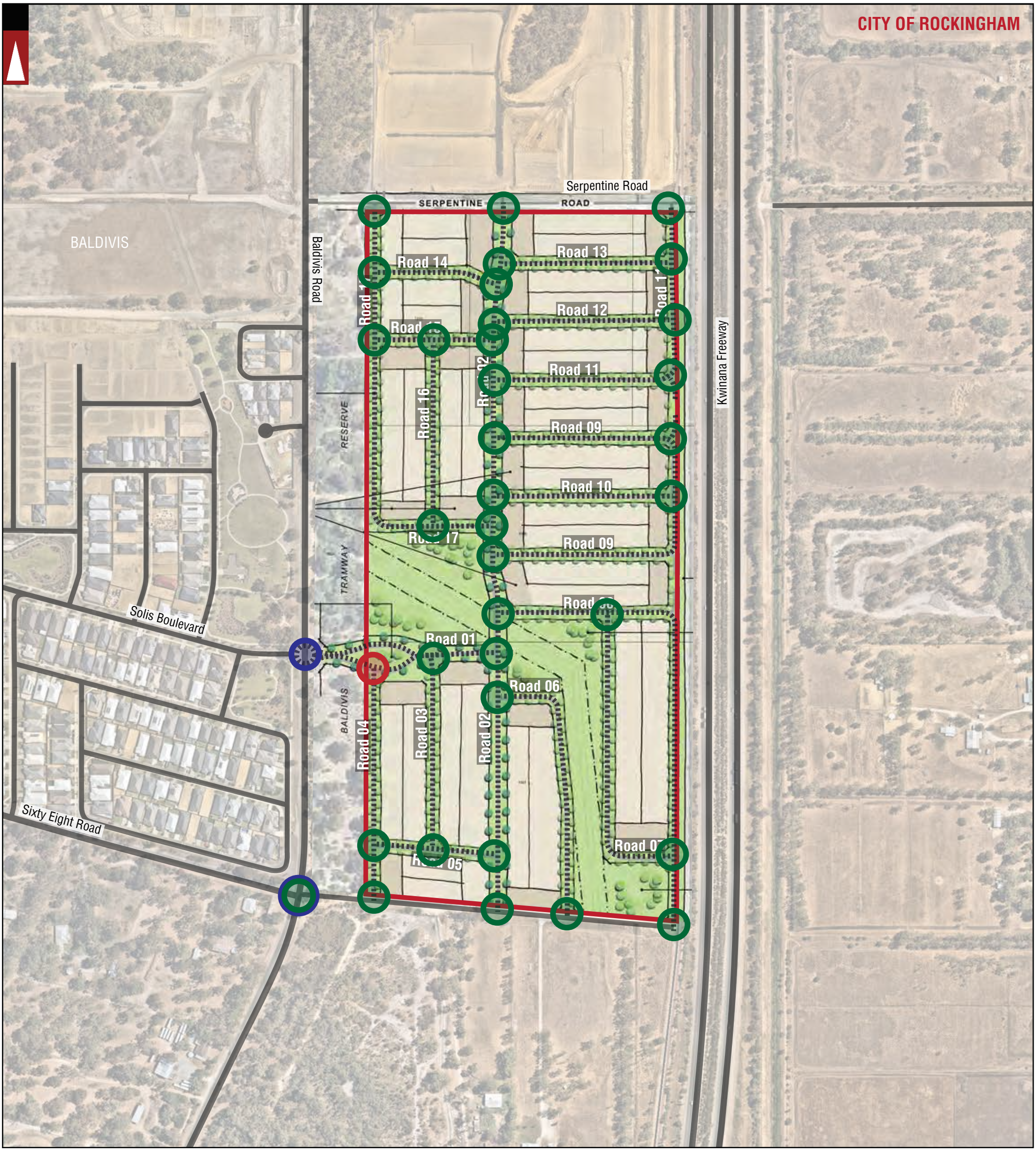
kctt

CITY OF ROCKINGHAM



LOCATION BOUNDARY

ROAD

PROPOSED ROAD

Lewis Road — ROAD NAME

Road 00 — PROPOSED ROAD NAME

ROUNDABOUT IN THE ULTIMATE CONFIGURATION, INTERIM SIGN CONTROLLED

ROUNDABOUT

LEFT-IN / LEFT-OUT (LILO)

SIGN CONTROLLED / YIELD

NOTE: THE PLAN IS COURTEOUSY OF CLE TOWN PLANNING + DESIGN

LEGEND

Certified System Quality ISO 9001 SAI GLOBAL

No	DATE	AMENDMENT
E	22-04-2020	COMMENTS INCORPORATED & INFORMATION UPDATED
D	19-11-2018	COMMENTS INCORPORATED
C	14-11-2018	PROPOSED LAYOUT AMENDED
B	23-08-2018	PROPOSED LAYOUT AMENDED

PROJECT: LOTS 1006, 1007 & 1272 BALDIVIS ROAD & LOT 1 SERPENTINE ROAD, BALDIVIS

TITLE: INTERSECTION CONTROL

DRAWING NUMBER: KC00393.000_ S11

DRAWN BY: A.M.

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Appendix 3

SIDRA Intersection Analysis

Table of Contents

List of Figures

1. Introduction

This short report provides details on the SIDRA Analysis conducted to support the findings of the report KC00393.000 Lots 1006 & 1007 Baldivis Road, Baldivis_Rev E.

The expected year of development completion is 2031. The following intersections have been modelled in AM and PM peak hours for the assessment years of 2031 (year of completion) and 2041 (10 years after completion):

- Serpentine Road / Baldivis Road / New Road (Paramount Estate)
- Solis Boulevard / Road 01 / Baldivis Road (roundabout)
- Sixty Eight Road / Baldivis Road (roundabout)
- Serpentine Road / Road 02 / New Road (Heritage Park)

The dimensions of the existing intersection elements have been scaled from aerial imagery which was obtained through our commercial arrangement with Nearmap and through publicly available Intramaps. These images are suitable for use in concept drafting applications with a level of accuracy to within +/- 10 centimetres. Proposed geometric upgrades were configured in accordance with the latest approved civil engineering drawings supplied by Prichard Francis.

The surrounding area is going through significant changes, therefore KCTT believe that the intersection analysis should be redone once more details are known. The following notes clarify the logic behind the assumptions made during SIDRA analysis:

- Roundabouts on Baldivis Road are to be constructed by 2021.
- Baldivis Road to be constructed as a dual carriageway with one lane per direction and a cycling lane per direction by 2031.
- Sixty Eight Road to be upgraded to Neighbourhood Connector “A” standard by 2021.
- Serpentine Road to be upgraded to Neighbourhood Connector “B” standard, timeframe unknown assumed by 2031.
- Assumption: all LSPs surrounding the proposed development will be fully completed by 2031. This is modelled as the worst case scenario (highest load on the network);
- Future Road (Heritage Park) to connect at the intersection of Road 02 and Serpentine Road by 2031 thus making it a four way intersection.
- Future Road (Paramount Estate) to connect at the intersection of Serpentine Road and Baldivis Road by 2031 thus making it a four way intersection.
- Since the roundabout on Sixty Eight Road / Baldivis Road is expected to be constructed well before the final year of development completion the interim four-way intersection has not been modelled in SIDRA. Roundabouts design and Baldivis Road upgrade drawings have been provided by Pritchard Francis.
- There are some indications that Baldivis Road could be upgraded to Integrator B standard in the long term, however since there are no additional details, this has not been modelled in SIDRA.
- The intersection of Serpentine Road and Baldivis Road has been modelled as a roundabout in the TIA for Heritage Park, Phase 2, undertaken by KCTT. However, it was not identified as such in the City of Rockingham request for SIDRA.
- *It should be noted that long-term projection of passing traffic is unreliable at this point due to significant changes in the area. KCTT have complied available information on anticipated changes in the surrounding area, however these can be volatile and will depend on the flux of real estate market and a number of other factors.*

2. Traffic Generation and Distribution Analysis

What are the likely peak hours of operation?	For residential land uses, the hours of operation are not applicable.	
Peak times traffic impact of the proposed development:	AM peak	PM peak
	08:00 to 09:00	17:00 to 18:00
How many routes are available for access / egress to the site?	Four routes 4,140 VPD / 368 VPH	
Route 1		
Provide details for Route No 1	**To/from the south via Baldivis Road**	
Percentage of Vehicular Movements via Route No 1	45% 1,863 VPD / 166 VPH	
Route 2		
Provide details for Route No 2	**To/from the north via Baldivis Road**	
Percentage of Vehicular Movements via Route No 2	40% 1,656 VPD / 147 VPH	
Route 3		
Provide details for Route No 3	**To/from the west via Sixty Eight Road**	
Percentage of Vehicular Movements via Route No 3	10% 414 VPD / 37 VPH	
Route 4		
Provide details for Route No 4	**To/from the west via Solis Boulevard**	
Percentage of Vehicular Movements via Route No 4	5% 207 VPD / 18 VPH	

A 25% IN / 75% OUT split has been adopted for the AM peak and a 67% IN / 33% OUT split for the PM peak hour.

3. Traffic Volumes

3.1 Traffic volumes used for SIDRA analysis

Nominate the source(s) for obtaining the traffic data	MRWA Traffic Map, City of Rockingham
Nominate the assessment year(s)	2031, 2041
Annual traffic growth rate used for analysis	
Growth rates 2031: • 8% - Sixty Eight Road • 11.5% - Baldivis Road (north of Sixty Eight Road) • 6% - Baldivis Road (south of Sixty Eight Road)	Growth rates 2041: • 2% - Sixty Eight Road • 2.5% - Baldivis Road (north of Sixty Eight Road) • 3.5% - Baldivis Road (south of Sixty Eight Road)

Abovementioned growth rates have been derived and adjusted with regards to ROM24 Multi-Modal Model V4.40 for years 2031 and 2041 data, for Baldivis Road and Sixty Eight Road provided by MRWA. Having in mind that the traffic growth is not uniform throughout the 20-year period, separate growth rates have been provided for years 2031 and 2041.

DPHL have also provided corresponding MLUFS data showing estimated population growth. This data was used for preparation of ROM24 model. The subject structure plan area is a part of MLUFS Zone 995 which is bound by Baldivis Road, Karnup Road, Kwinana Freeway and Safety Bay Road. MLUFS models envisage additional 588 dwellings in zone 995 by 2031, and further 183 dwellings to be constructed between 2031 and 2041. The only structure plans proposed within the zone 995 are Heritage Park Phase 2 and this subject structure plan area. Remnant land within MLUFS Zone 995 is Crown land and is not likely to be developed as any intensive land use in foreseeable future.

Projected volume of dwellings between Heritage Park Phase 2 and subject structure plan area (Baldivis East) correspond estimated increase in dwelling stock by 2041 (total of 771 additional dwellings in Zone 995). Therefore, this subject structure plan area has already been accounted for by MRWA and DPLH in forward network planning.

It should be noted that the Sixty Eight Road traffic volumes have been derived from the expected number of dwellings in MLUFS Zone 1001 and are based on the assumption that approximately 40% of total Zone 1001 traffic will use the section of Sixty Eight Road east of Baldivis Road.

Growth rates on Sixty Eight Road and Baldivis Road have been adjusted to suit the above assumptions.

Road Name	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)		Heavy Vehicle %	Year				
			SIDRA analysis Peak Times			Date of Traffic Count	*Estimated Peak Traffic Volumes in the Assessment Year(s) using the nominated annual traffic growth rate*			
							2031		*2041*	
			AM 08:00	PM 17:00			*AM Peak*	*PM Peak*	*AM Peak*	*PM Peak*
Baldivis Road	North of Sixty Eight Road	3,462	288	290	7.9	2018	1,186	1,194	1,518	1,528
	South of Sixty Eight Road	3,960	353	287	12.1	2018	753	612	1,062	863

Sixty Eight Road	West of Baldivis Road	2,218	219	162	11.9	2018	596	441	726	537
	East of Baldivis Road*	57	4	4	n/a	2018	11	11	13	13

Note - These traffic counts have been received from the City of Rockingham*

Traffic estimation for roads with no current traffic data

Serpentine Road	Other than development generated traffic, traffic on Serpentine Road includes future generated traffic from Heritage Park Phase 2. This additional traffic is estimated as 82 vehicular trips in the peak hour.
Solis Boulevard	Future traffic volumes sourced from Lots 569 & 1263 Baldivis Road, and Lot 21 Sixty Eight Road, Baldivis Transport Assessment Report (figure 7). Solis Boulevard is expected to carry 2,340 VPD. Assumed 10% of daily traffic for both AM and PM peaks (234 VPH).
New Road (Paramount Estate)	Future traffic volumes sourced from Lots 635, 739 and 740, Baldivis Road Structure Plan Transport Assessment (figure 4.2), for both AM and PM peaks. Total traffic on this road is estimated at 85 VPH.
New Road (Heritage Park)	Future traffic volumes sourced from KC00178.000 Heritage Park Phase 2 TIA. Total traffic on this road is estimated at 46 VPH.

Note – No additional traffic growth has been applied to the estimated values above.

3.2 Expected daily traffic on surrounding roads

Road Name	Location	Traffic generated by the subject site (VPD)	Estimated passing traffic 2031(VPD)	Total VPD (2031)	Estimated passing traffic 2041(VPD)	Total VPD (2041)
Baldivis Road	North of Sixty Eight Road	2,070	14,253	16,323	18,245	20,315
	South of Sixty Eight Road	1,863	8,446	10,309	11,914	13,777
Sixty Eight Road	West of Baldivis Road	414	6,032	6,446	7,353	7,767
	East of Baldivis Road	870	155	1,025	189	1,059
Serpentine Road	East of Baldivis Road	1,200	916	2,116	916	2,116
Solis Boulevard	West of Baldivis Road	207	2,340	2,547	2,340	2,547

4. Summary of Results

Nominate the analysed intersections and intersection controls	M01. Serpentine Road / Baldivis Road / New Road (Paramount Estate) M02. Solis Boulevard / Road 01 / Baldivis Road M03. Sixty Eight Road / Baldivis Road M04. Serpentine Road / Road 02 / New Road (Heritage Park)
Describe the models analysed in SIDRA	Intersections were analysed in AM and PM peak for the assessment years – 2031 and 2041. Input traffic volumes for SIDRA models were obtained using traffic data on Main Roads WA website and City of Rockingham, TIA report for the proposed development as well as the TIA reports for surrounding developments. The accumulated data have been adjusted to suit MRWA ROM24 models for 2031 and 2041. For 2041 traffic, annual growth rates were applied using Design Life compound growth model for the final year under Demand and Sensitivity option in SIDRA Intersection. Both roundabouts were modelled with one circular lane, and with one approach and exit lane for all roads. Note: Intersection performance in year 2041 should be considered with caution as it is 20 years from today and the growth rate of passing traffic is likely to oscillate in years to come – the most prudent approach is to monitor closely the speed of development in the subject area and assess intersection performances every several years to decide the most appropriate time for upgrade of infrastructure and whether early recommendations are still relevant.
Describe the Levels of Service and delay results	At intersection M01 Serpentine Road / Baldivis Road / New Road (Paramount Estate) three approaches would operate with LOS A for year 2031. Serpentine Road approach would operate with LOS C in the AM peak and LOS B in the PM peak with 17.9s and 15s delay respectively. In the year 2041, while other approaches continue to operate with LOS and B, Serpentine Road approach level of service is likely to deteriorate to LOS F (58.1s delay) for the AM peak and LOS D (32s delay) for the PM peak. This reduction in levels of service is caused by the increase of passing traffic on Baldivis Road, paired with relatively high number of right turns. It should be noted that the highest delay at Serpentine Road approach is just under a minute long, with an expected queue of 5 vehicles, which is deemed acceptable in urban setting. Moreover, there is potential for a roundabout to be constructed at this intersection. If approved the roundabout would significantly improve levels of service and reduce delays. Intersections M02, M03 and M04 operate with the highest levels of service LOS A, showing likely delays lower than 8.7s in the final year of development completion (2031). In the 10 years after development completion these intersections are expected to continue functioning at high levels of service (LOS A and B).

Conclusion	In summary no significant issues have been presented during SIDRA analysis. It can be concluded that with the planned upgrades in the surrounding area the road network can accommodate for the predicted traffic volumes. Intersection M01 Serpentine Road / Baldivis Road / New Road (Paramount Estate) exhibits LOS F with delays of 58.1s for Serpentine Road approach in year 2041. However having in mind the 5 vehicle queue and the timeframe of analysis it is not expected that this would cause any major congestion to the road network. It should be noted that this analysis contains many assumptions and should be reassessed once more details are known. Triggers for any required upgrades should be reassessed in regular time periods.

A summary of the results of the SIDRA analysis are shown on the following pages. For purposes of clarity we will provide intersection summaries below. The full SIDRA output report can be provided on request.

Note - SIDRA graphic is not an accurate representation of the intersection geometry. It is a simplified tool and its main purpose is to roughly illustrate main intersection elements. The graphic might show median breaks where there are none, oversized splitter islands and central islands for roundabouts etc. The graphic representation does not influence the calculations nor any other output.*

5. SIDRA Intersection Analysis – Output

5.1 M01 Serpentine Road / Baldivis Road / New Road (Paramount Estate)

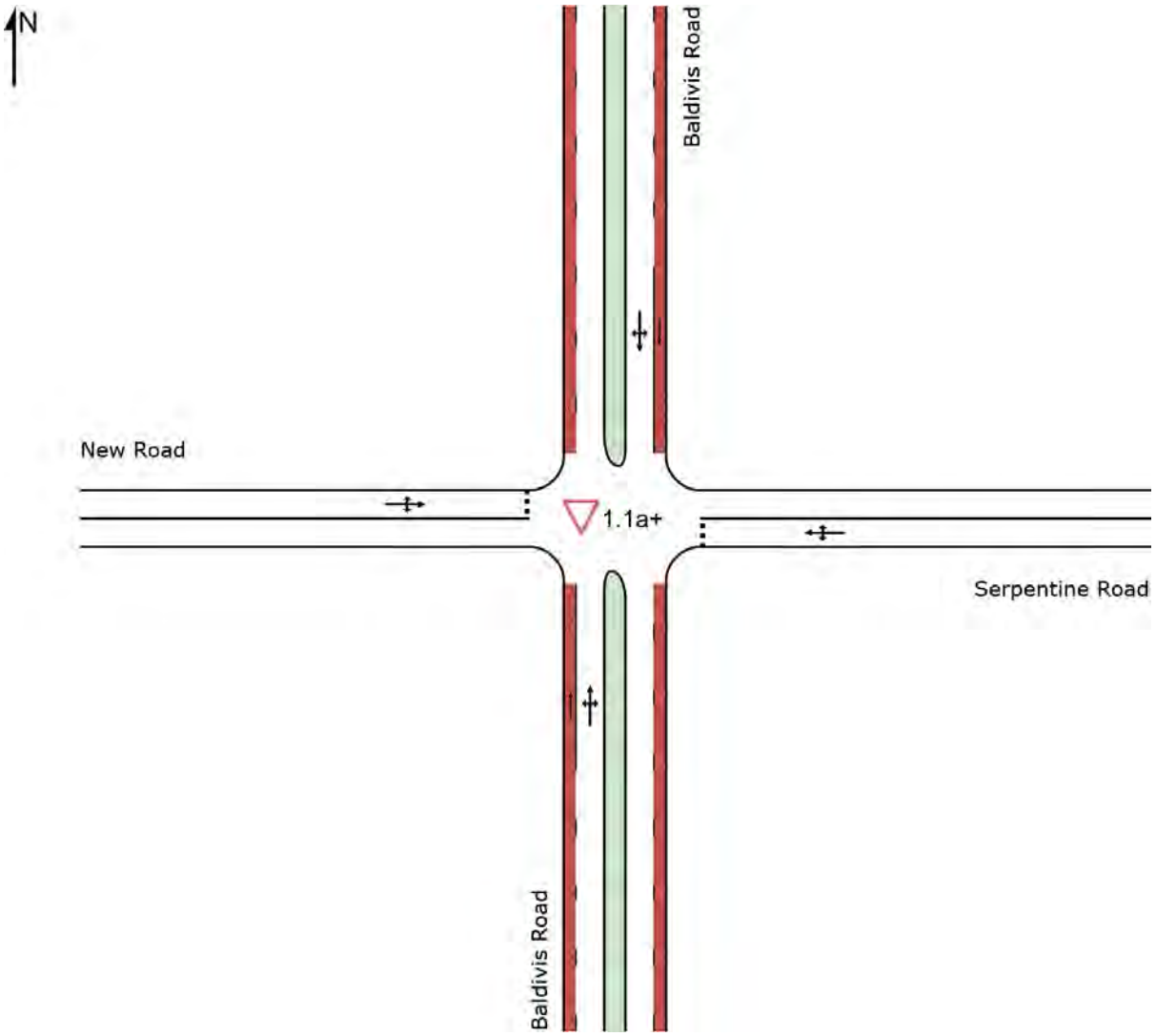

Figure 1 – M01 Serpentine Road / Baldivis Road / New Road (Paramount Estate) – SIDRA Schematic Geometry

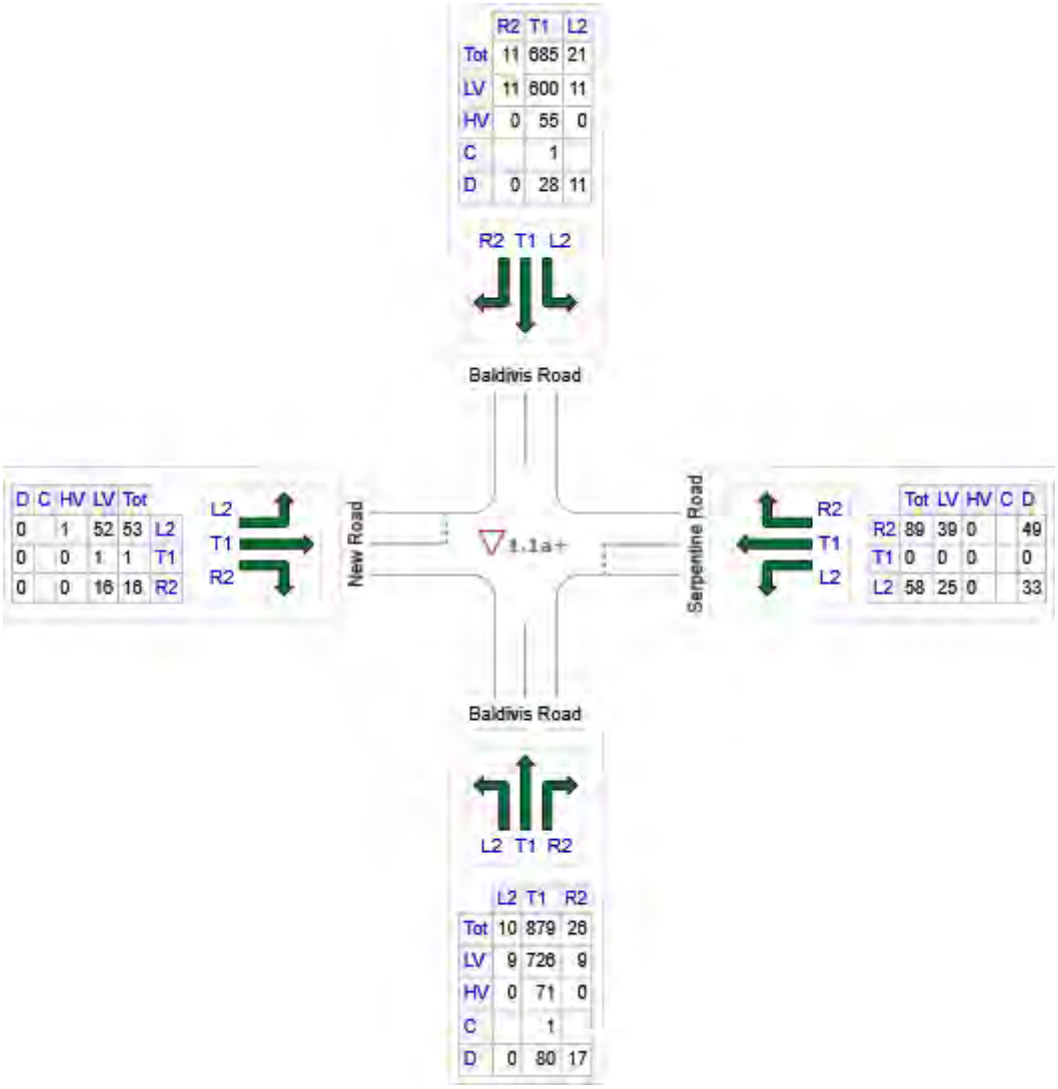

Figure 2 - M01 Serpentine Road / Baldivis Road / New Road (Paramount Estate) – Demand flows AM peak 2031

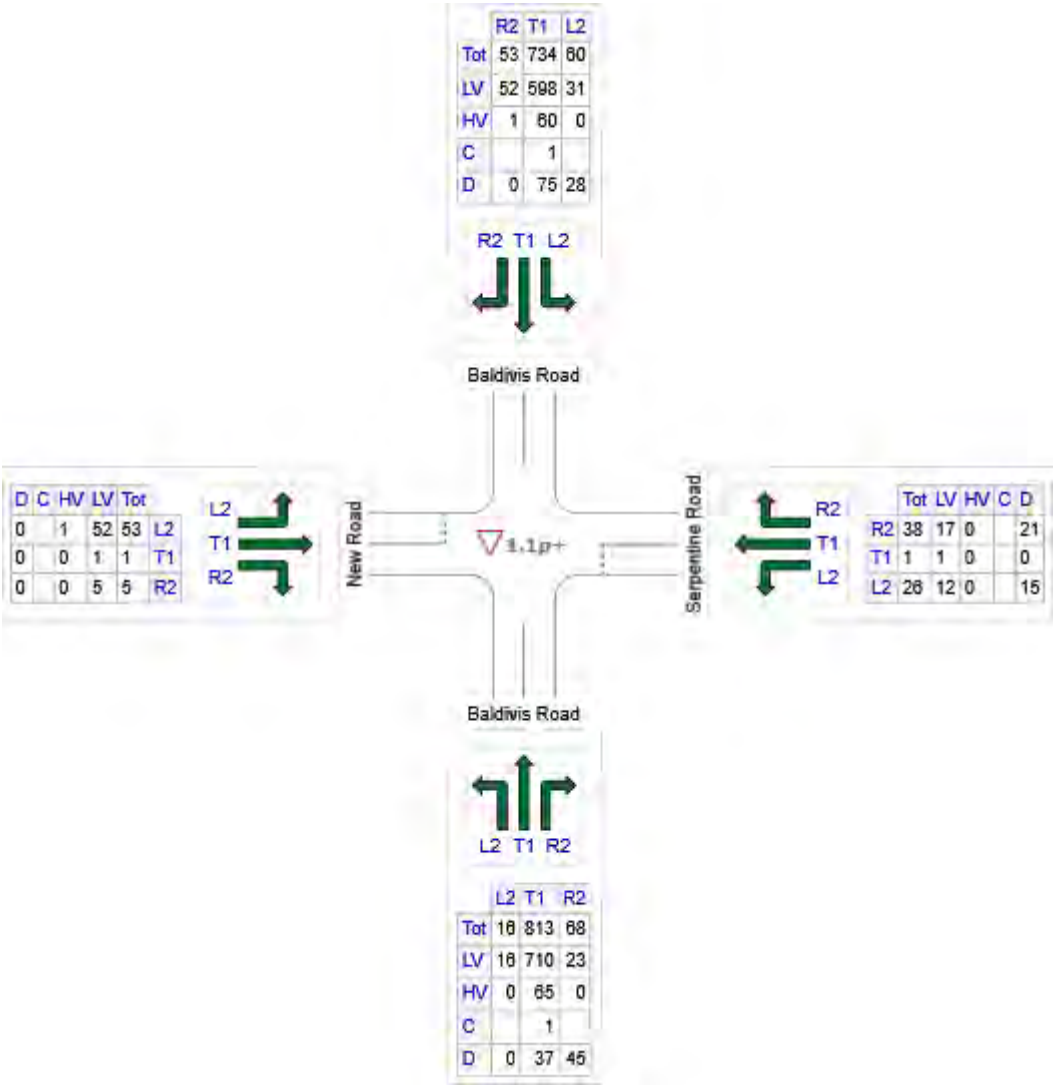

Figure 3 - M01 Serpentine Road / Baldivis Road / New Road (Paramount Estate) – Demand flows PM peak 2031

5.1.1 1.1a+ Serpentine Road / Baldivis Road / New Road (Paramount Estate) – 2031 AM

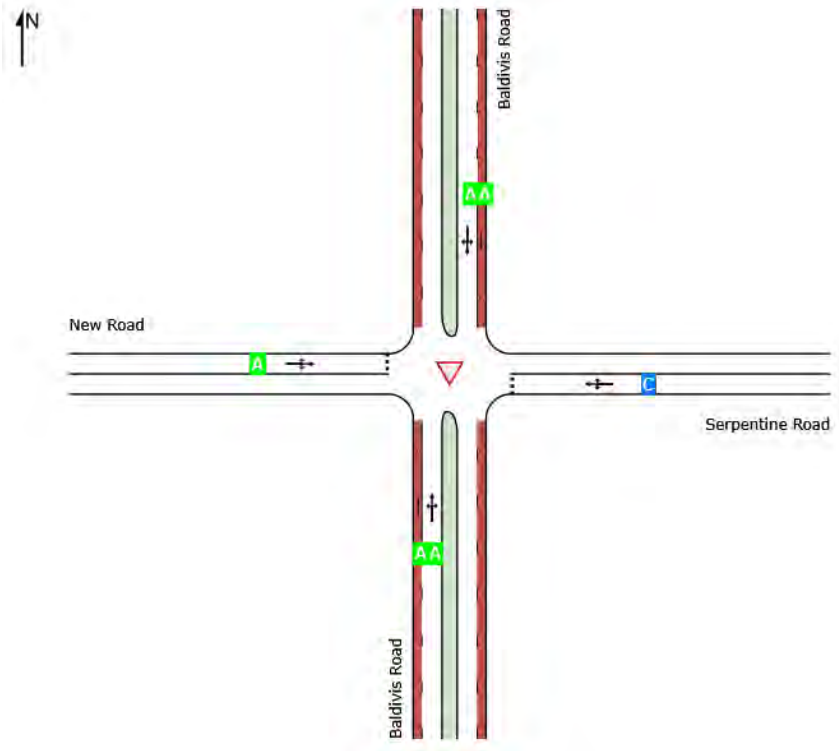

Figure 4 – LOS (Model 1.1a+ Serpentine Road / Baldivis Road / New Road (Paramount Estate)– 2031 AM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 (C)	1	0.0	6196	0.000	100	0.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	739	7.5	1814	0.408	100	0.8	LOS A	0.6	4.6	Full	130	0.0	0.0
Approach	740	7.5		0.408		0.8	NA	0.6	4.6				
East: Serpentine Road													
Lane 1	147	0.4	348	0.423	100	17.9	LOS C	1.8	12.8	Full	60	0.0	0.0
Approach	147	0.4		0.423		17.9	LOS C	1.8	12.8				
North: Baldivis Road													
Lane 1 (C)	1	0.0	6196	0.000	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Lane 2	572	7.5	1824	0.314	100	0.8	LOS A	0.3	2.4	Full	150	0.0	0.0
Approach	573	7.5		0.314		0.8	NA	0.3	2.4				
West: New Road													
Lane 1	69	1.0	666	0.104	100	7.2	LOS A	0.3	2.4	Full	150	0.0	0.0
Approach	69	1.0		0.104		7.2	LOS A	0.3	2.4				
Intersection	1530	6.5		0.423		2.7	NA	1.8	12.8				

Figure 5 – Lane Summary (Model 1.1a+ Serpentine Road / Baldivis Road / New Road (Paramount Estate)– 2031 AM)

5.1.2 1.1p+ Serpentine Road / Baldivis Road / New Road (Paramount Estate) – 2031 PM

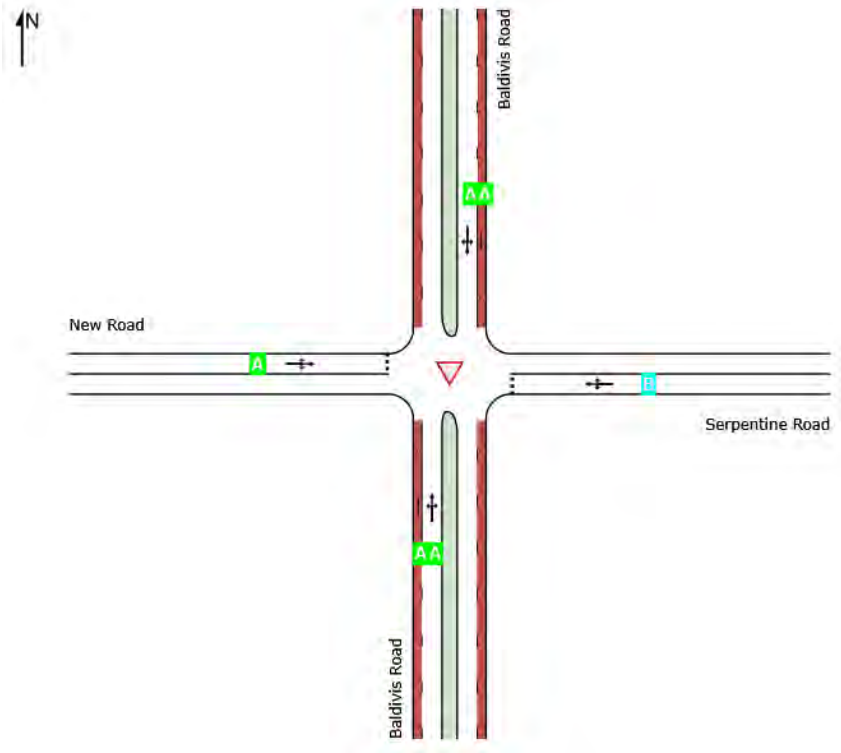

Figure 6 – LOS (Model 1.1p+ Serpentine Road / Baldivis Road / New Road (Paramount Estate)– 2031 PM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 (C)	1	0.0	6196	0.000	100	0.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	726	7.0	1685	0.431	100	2.4	LOS A	1.7	13.0	Full	130	0.0	0.0
Approach	728	7.0		0.431		2.4	NA	1.7	13.0				
East: Serpentine Road													
Lane 1	66	0.4	315	0.208	100	15.0	LOS B	0.7	4.6	Full	60	0.0	0.0
Approach	66	0.4		0.208		15.0	LOS B	0.7	4.6				
North: Baldivis Road													
Lane 1 (C)	1	0.0	6196	0.000	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Lane 2	701	6.8	1714	0.409	100	2.7	LOS A	1.6	11.6	Full	150	0.0	0.0
Approach	702	6.8		0.409		2.7	NA	1.6	11.6				
West: New Road													
Lane 1	59	1.0	1023	0.058	100	5.1	LOS A	0.2	1.4	Full	150	0.0	0.0
Approach	59	1.0		0.058		5.1	LOS A	0.2	1.4				
Intersection	1554	6.4		0.431		3.2	NA	1.7	13.0				

Figure 7 – Lane Summary (Model 1.1p+ Serpentine Road / Baldivis Road / New Road (Paramount Estate)– 2031 PM)

5.1.3 1.1a+ Serpentine Road / Baldivis Road / New Road (Paramount Estate) – 2041 AM

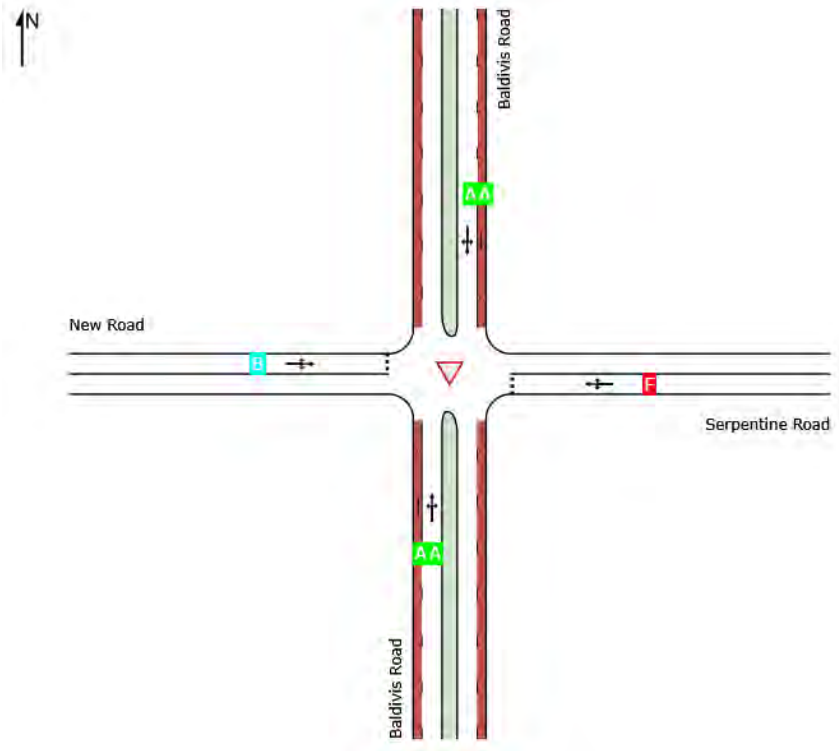

Figure 8 – LOS (Model 1.1a+ Serpentine Road / Baldivis Road / New Road (Paramount Estate)– 2041 AM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 (C)	1	0.0	6196	0.000	100	0.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	914	7.8	1799	0.508	100	1.1	LOS A	1.0	7.2	Full	130	0.0	0.0
Approach	915	7.8		0.508		1.1	NA	1.0	7.2				
East: Serpentine Road													
Lane 1	147	0.4	187	0.787	100	58.1	LOS F [11]	4.7	32.9	Full	60	0.0	0.0
Approach	147	0.4		0.787		58.1	LOS F [11]	4.7	32.9				
North: Baldivis Road													
Lane 1 (C)	1	0.0	6196	0.000	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Lane 2	715	7.7	1808	0.395	100	1.1	LOS A	0.6	4.3	Full	150	0.0	0.0
Approach	717	7.7		0.395		1.1	NA	0.6	4.3				
West: New Road													
Lane 1	69	1.0	398	0.175	100	10.9	LOS B	0.5	3.7	Full	150	0.0	0.0
Approach	69	1.0		0.175		10.9	LOS B	0.5	3.7				
Intersection	1848	6.9		0.787		6.0	NA	4.7	32.9				

Figure 9 – Lane Summary (Model 1.1a+ Serpentine Road / Baldivis Road / New Road (Paramount Estate)– 2041 AM)

5.1.4 1.1p+ Serpentine Road / Baldivis Road / New Road (Paramount Estate) – 2041 PM

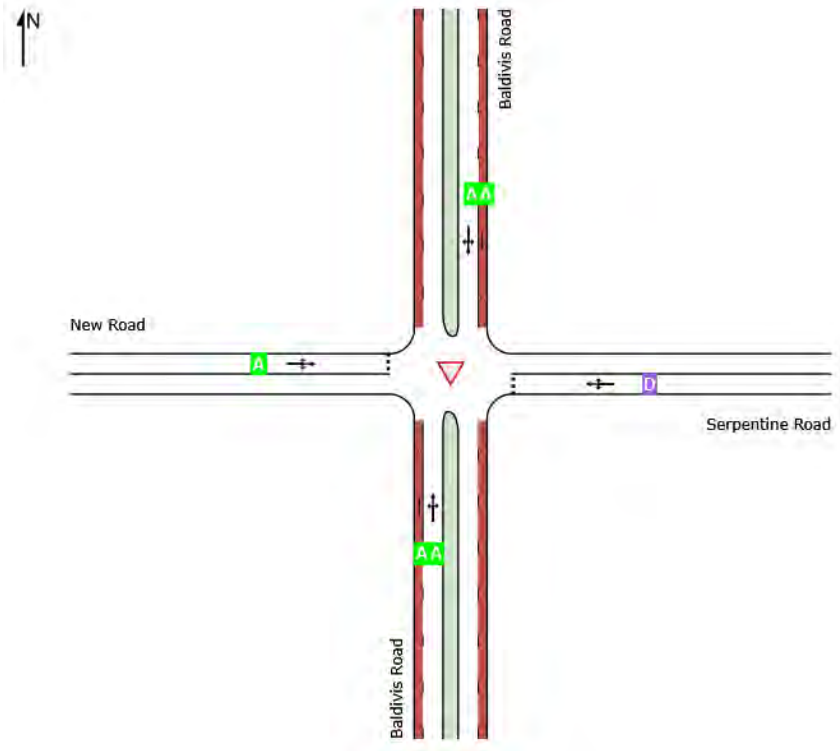

Figure 10 – LOS (Model 1.1p+ Serpentine Road / Baldivis Road / New Road (Paramount Estate)– 2041 PM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 (C)	1	0.0	6196	0.000	100	0.0	LOS A	0.0	0.0	Full	130	0.0	0.0
Lane 2	896	7.3	1649	0.543	100	3.2	LOS A	2.8	20.9	Full	130	0.0	0.0
Approach	897	7.3		0.543		3.2	NA	2.8	20.9				
East: Serpentine Road													
Lane 1	66	0.4	169	0.388	100	32.0	LOS D	1.3	9.4	Full	60	0.0	0.0
Approach	66	0.4		0.388		32.0	LOS D	1.3	9.4				
North: Baldivis Road													
Lane 1 (C)	1	0.0	6196	0.000	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Lane 2	845	7.2	1665	0.507	100	3.6	LOS A	2.6	19.3	Full	150	0.0	0.0
Approach	846	7.1		0.507		3.6	NA	2.6	19.3				
West: New Road													
Lane 1	59	1.0	698	0.084	100	6.7	LOS A	0.3	1.9	Full	150	0.0	0.0
Approach	59	1.0		0.084		6.7	LOS A	0.3	1.9				
Intersection	1868	6.8		0.543		4.5	NA	2.8	20.9				

Figure 11 – Lane Summary (Model 1.1p+ Serpentine Road / Baldivis Road / New Road (Paramount Estate)– 2041 PM)

5.2 M02 Solis Boulevard / Road 01 / Baldivis Road

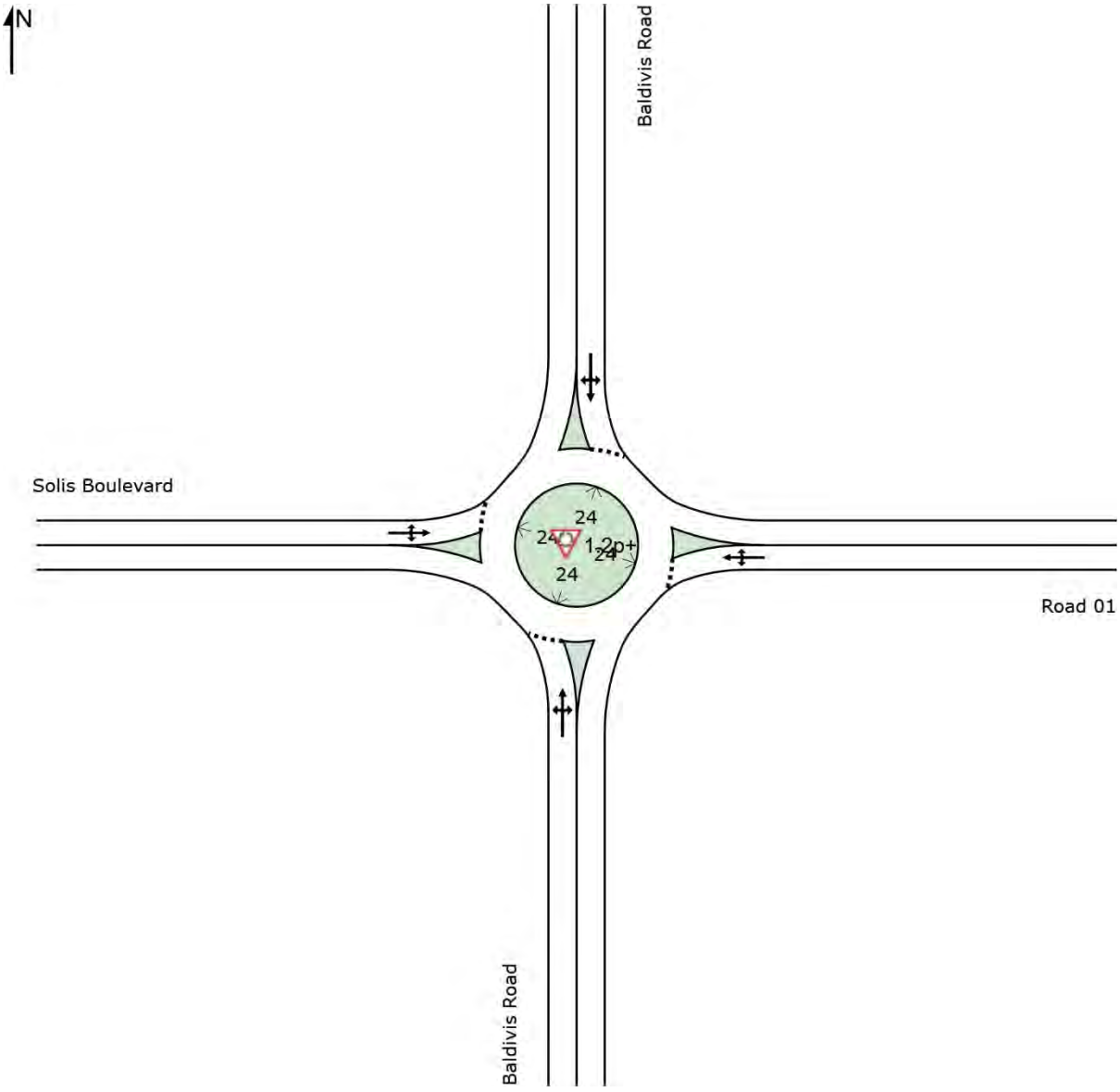

Figure 12 – M02 Solis Boulevard / Road 01 / Baldivis Road – SIDRA Schematic Geometry

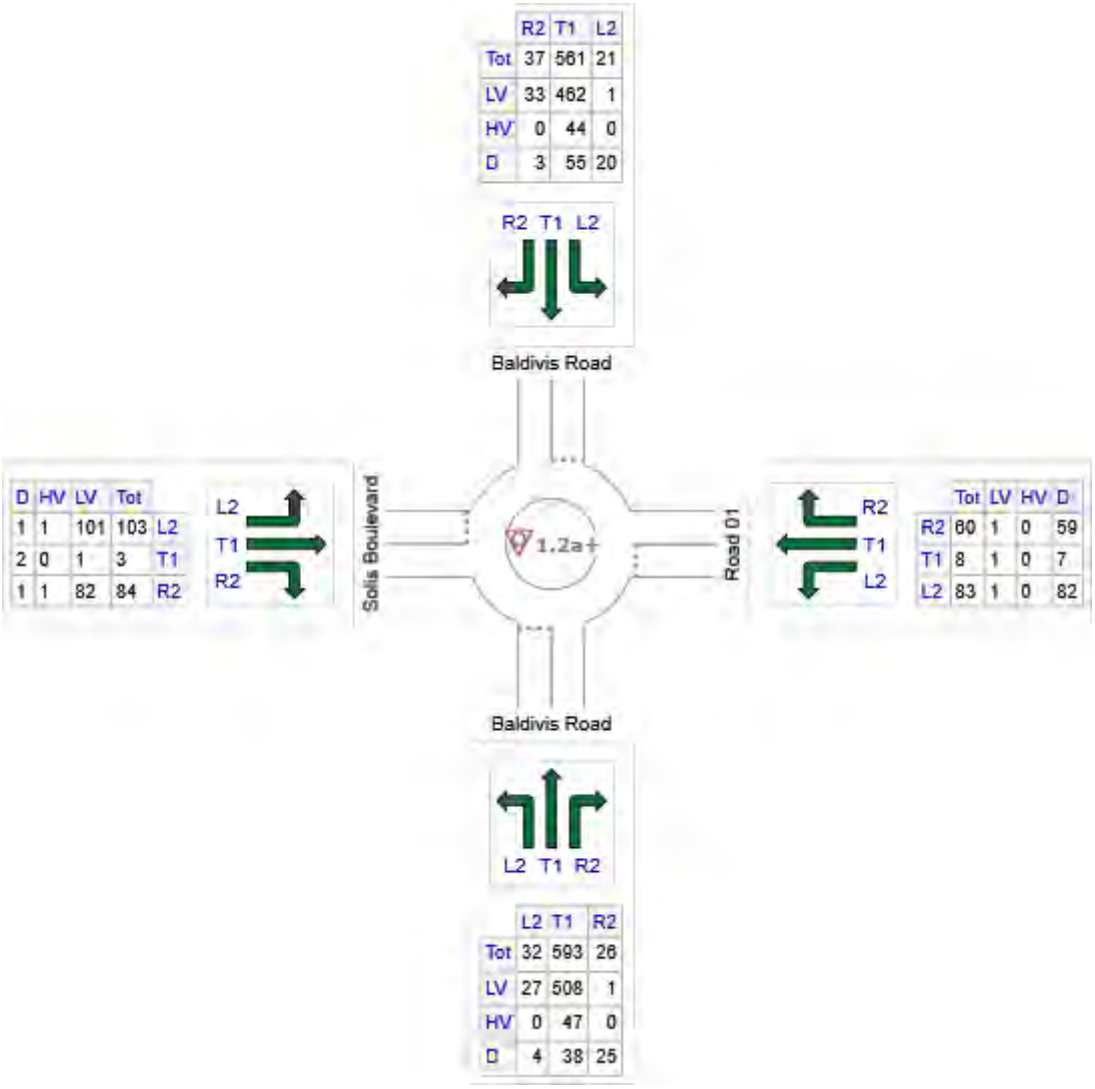

Figure 13 - M02 Solis Boulevard / Road 01 / Baldivis Road – Demand flows AM peak 2031

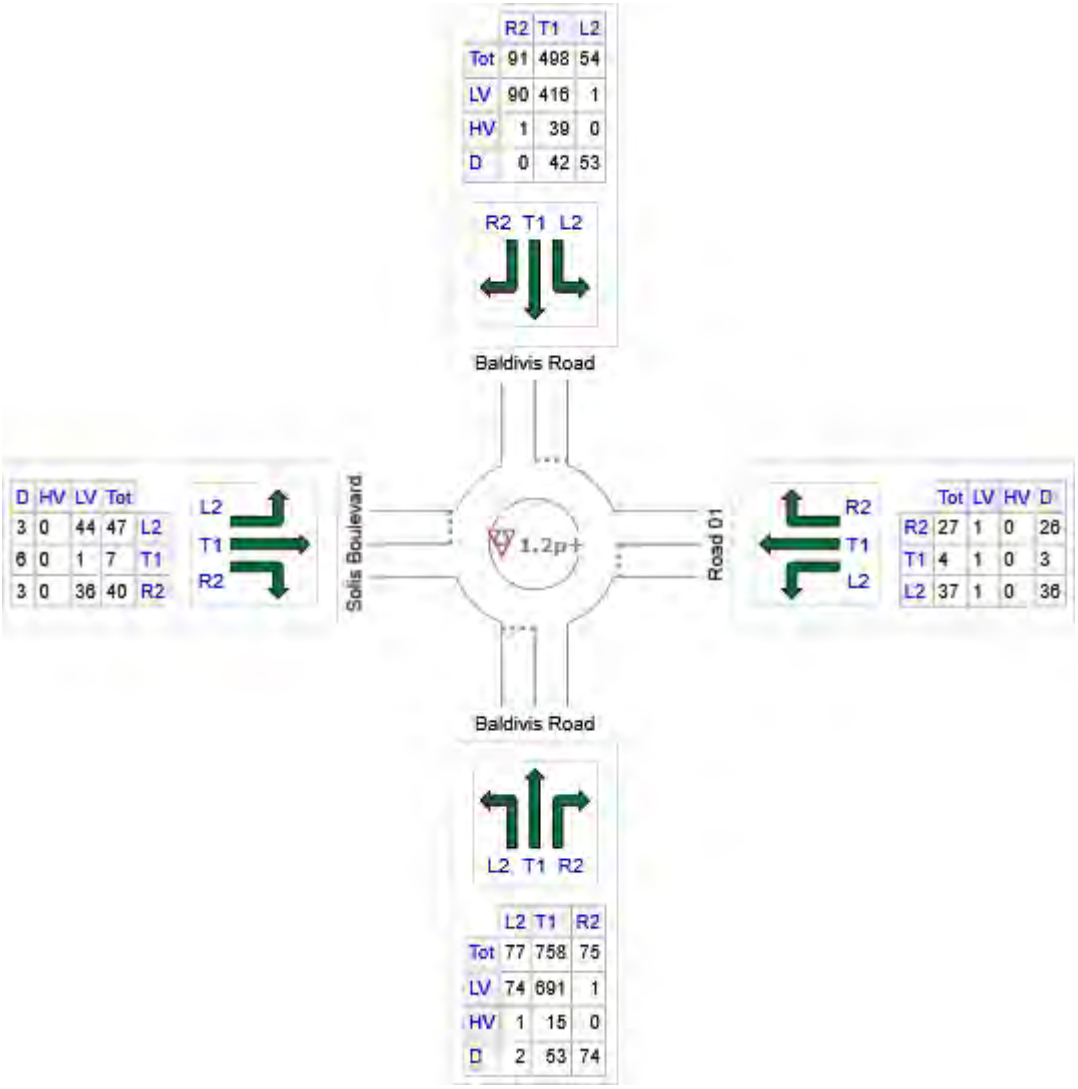

Figure 14 - M02 Solis Boulevard / Road 01 / Baldivis Road – Demand flows PM peak 2031

5.2.1 1.2a+ Solis Boulevard / Road 01 / Baldivis Road – 2031 AM

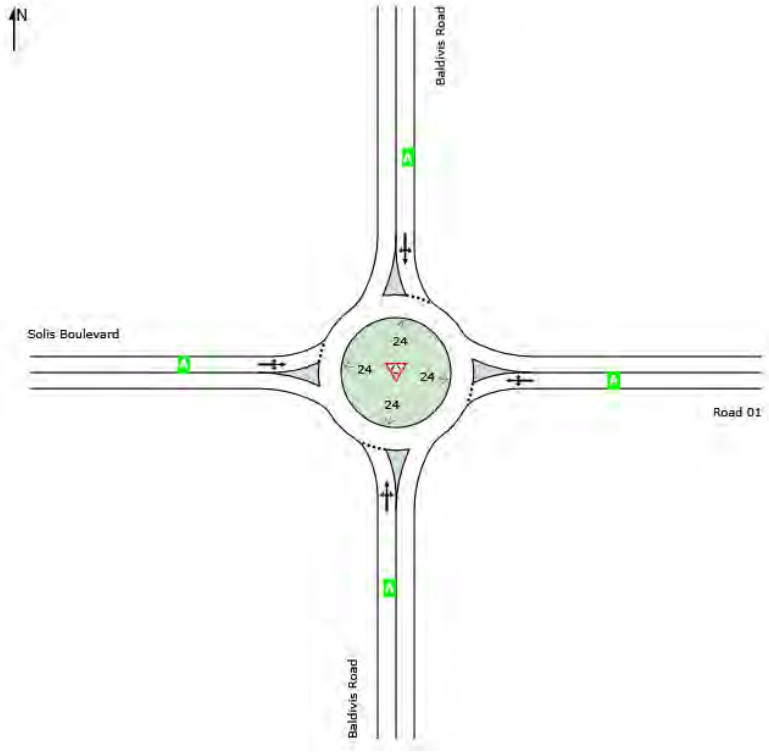

Figure 15 – LOS (Model 1.2a+ Solis Boulevard / Road 01 / Baldivis Road – 2031 AM)

Lane Use and Performance													
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 d	651	7.2	1355	0.480	100	7.1	LOS A	4.0	29.8	Full	250	0.0	0.0
Approach	651	7.2		0.480		7.1	LOS A	4.0	29.8				
East: Road 01													
Lane 1 d	152	0.0	758	0.200	100	7.7	LOS A	1.3	9.3	Full	60	0.0	0.0
Approach	152	0.0		0.200		7.7	LOS A	1.3	9.3				
North: Baldivis Road													
Lane 1 d	619	7.2	1331	0.465	100	7.2	LOS A	3.9	28.7	Full	240	0.0	0.0
Approach	619	7.2		0.465		7.2	LOS A	3.9	28.7				
West: Solis Boulevard													
Lane 1 d	191	1.0	755	0.252	100	9.6	LOS A	1.7	12.1	Full	70	0.0	0.0
Approach	191	1.0		0.252		9.6	LOS A	1.7	12.1				
Intersection	1612	5.8		0.480		7.5	LOS A	4.0	29.8				

Figure 16 – Lane Summary (Model 1.2a+ Solis Boulevard / Road 01 / Baldivis Road – 2031 AM)

5.2.2 1.2p+ Solis Boulevard / Road 01 / Baldivis Road – 2031 PM

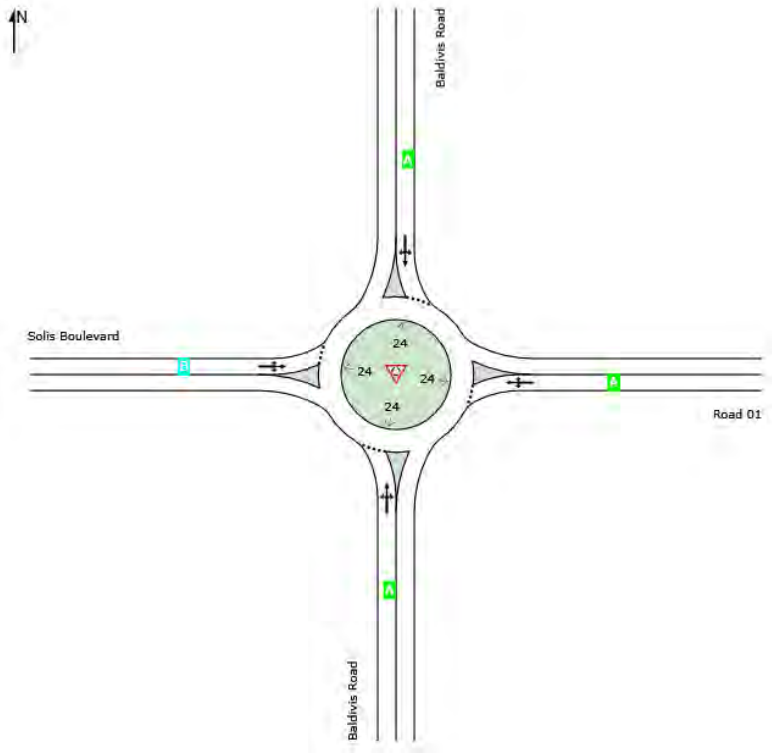

Figure 17 – LOS (Model 1.2p+ Solis Boulevard / Road 01 / Baldivis Road – 2031 PM)

Lane Use and Performance													
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 d	909	1.7	1394	0.652	100	7.5	LOS A	6.7	47.5	Full	250	0.0	0.0
Approach	909	1.7		0.652		7.5	LOS A	6.7	47.5				
East: Road 01													
Lane 1 d	68	0.0	794	0.086	100	6.8	LOS A	0.5	3.8	Full	60	0.0	0.0
Approach	68	0.0		0.086		6.8	LOS A	0.5	3.8				
North: Baldivis Road													
Lane 1 d	642	6.3	1337	0.480	100	7.6	LOS A	3.8	28.0	Full	240	0.0	0.0
Approach	642	6.3		0.480		7.6	LOS A	3.8	28.0				
West: Solis Boulevard													
Lane 1 d	95	0.9	606	0.156	100	11.0	LOS B	1.1	7.7	Full	70	0.0	0.0
Approach	95	0.9		0.156		11.0	LOS B	1.1	7.7				
Intersection	1714	3.3		0.652		7.7	LOS A	6.7	47.5				

Figure 18 – Lane Summary (Model 1.2p+ Solis Boulevard / Road 01 / Baldivis Road – 2031 PM)

5.2.3 1.2a+ Solis Boulevard / Road 01 / Baldivis Road – 2041 AM

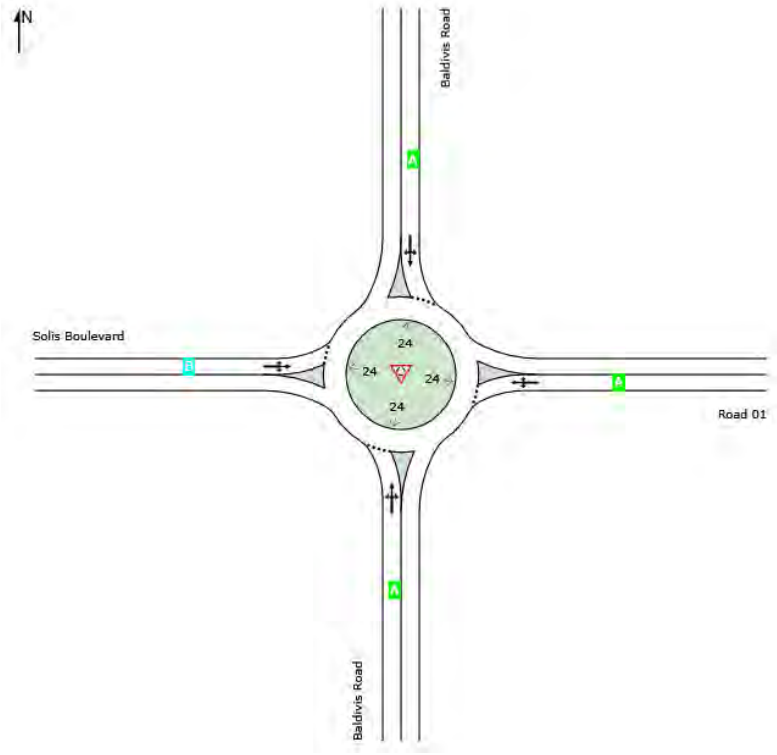

Figure 19 – LOS (Model 1.2a+ Solis Boulevard / Road 01 / Baldivis Road – 2041 AM)

Lane Use and Performance													
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 d	807	7.5	1365	0.591	100	7.2	LOS A	5.9	43.8	Full	250	0.0	0.0
Approach	807	7.5		0.591		7.2	LOS A	5.9	43.8				
East: Road 01													
Lane 1 d	152	0.0	634	0.239	100	9.4	LOS A	1.7	11.8	Full	60	0.0	0.0
Approach	152	0.0		0.239		9.4	LOS A	1.7	11.8				
North: Baldivis Road													
Lane 1 d	761	7.5	1339	0.568	100	7.3	LOS A	5.6	41.4	Full	240	0.0	0.0
Approach	761	7.5		0.568		7.3	LOS A	5.6	41.4				
West: Solis Boulevard													
Lane 1 d	191	1.0	621	0.307	100	11.7	LOS B	2.2	15.7	Full	70	0.0	0.0
Approach	191	1.0		0.307		11.7	LOS B	2.2	15.7				
Intersection	1909	6.2		0.591		7.8	LOS A	5.9	43.8				

Figure 20 – Lane Summary (Model 1.2a+ Solis Boulevard / Road 01 / Baldivis Road – 2041 AM)

5.2.4 1.2p+ Solis Boulevard / Road 01 / Baldivis Road – 2041 PM

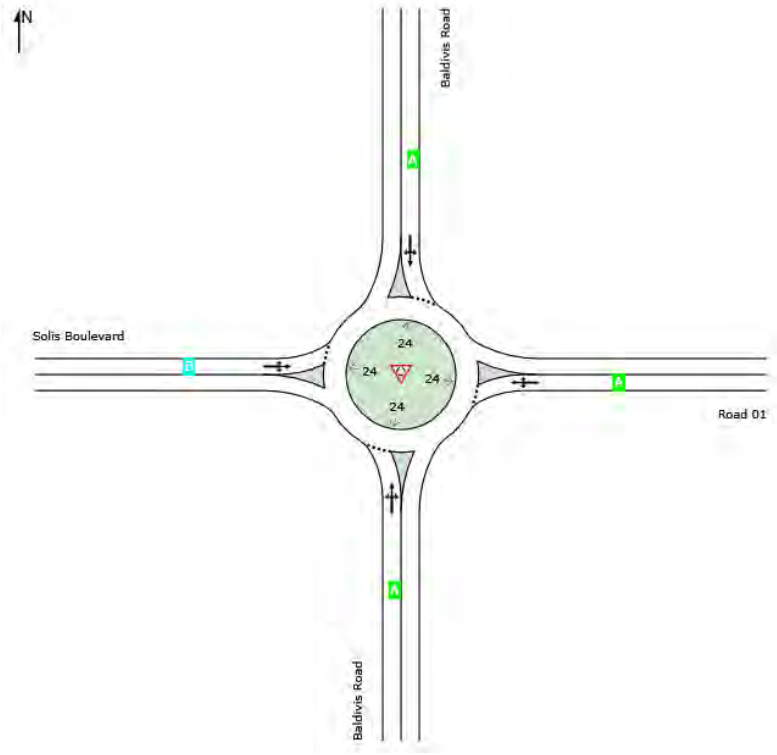

Figure 21 – LOS (Model 1.2p+ Solis Boulevard / Road 01 / Baldivis Road – 2041 PM)

Lane Use and Performance													
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 d	1107	1.7	1404	0.788	100	7.9	LOS A	10.9	77.1	Full	250	0.0	0.0
Approach	1107	1.7		0.788		7.9	LOS A	10.9	77.1				
East: Road 01													
Lane 1 d	68	0.0	681	0.100	100	8.1	LOS A	0.7	4.6	Full	60	0.0	0.0
Approach	68	0.0		0.100		8.1	LOS A	0.7	4.6				
North: Baldivis Road													
Lane 1 d	769	6.7	1342	0.573	100	7.7	LOS A	5.3	39.1	Full	240	0.0	0.0
Approach	769	6.7		0.573		7.7	LOS A	5.3	39.1				
West: Solis Boulevard													
Lane 1 d	95	0.9	428	0.221	100	14.5	LOS B	1.7	11.9	Full	70	0.0	0.0
Approach	95	0.9		0.221		14.5	LOS B	1.7	11.9				
Intersection	2039	3.5		0.788		8.1	LOS A	10.9	77.1				

Figure 22 – Lane Summary (Model 1.2p+ Solis Boulevard / Road 01 / Baldivis Road – 2041 PM)

5.3 M03 Sixty Eight Road / Baldivis Road

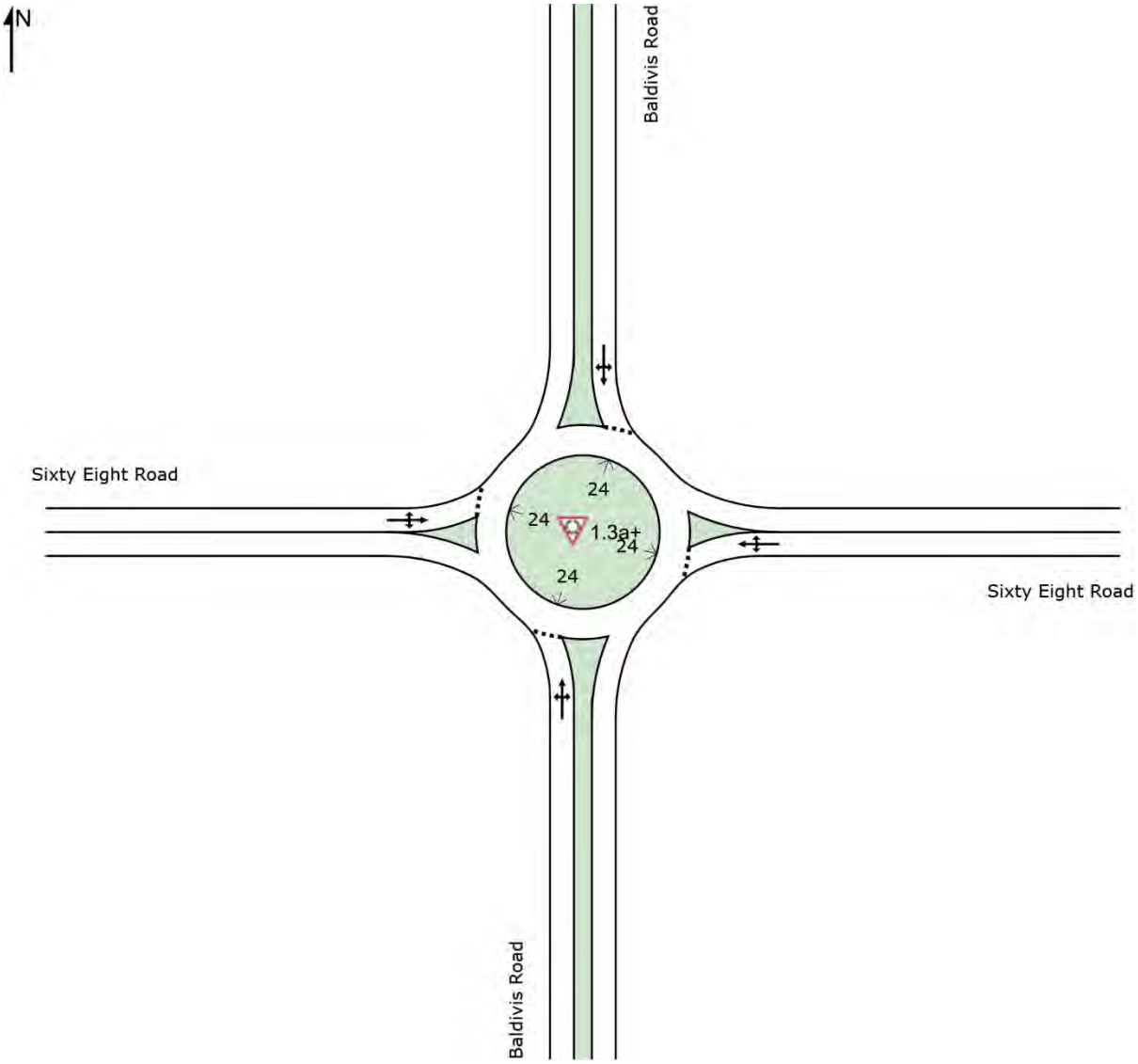

Figure 23 – M03 Sixty Eight Road / Baldivis Road – SIDRA Schematic Geometry

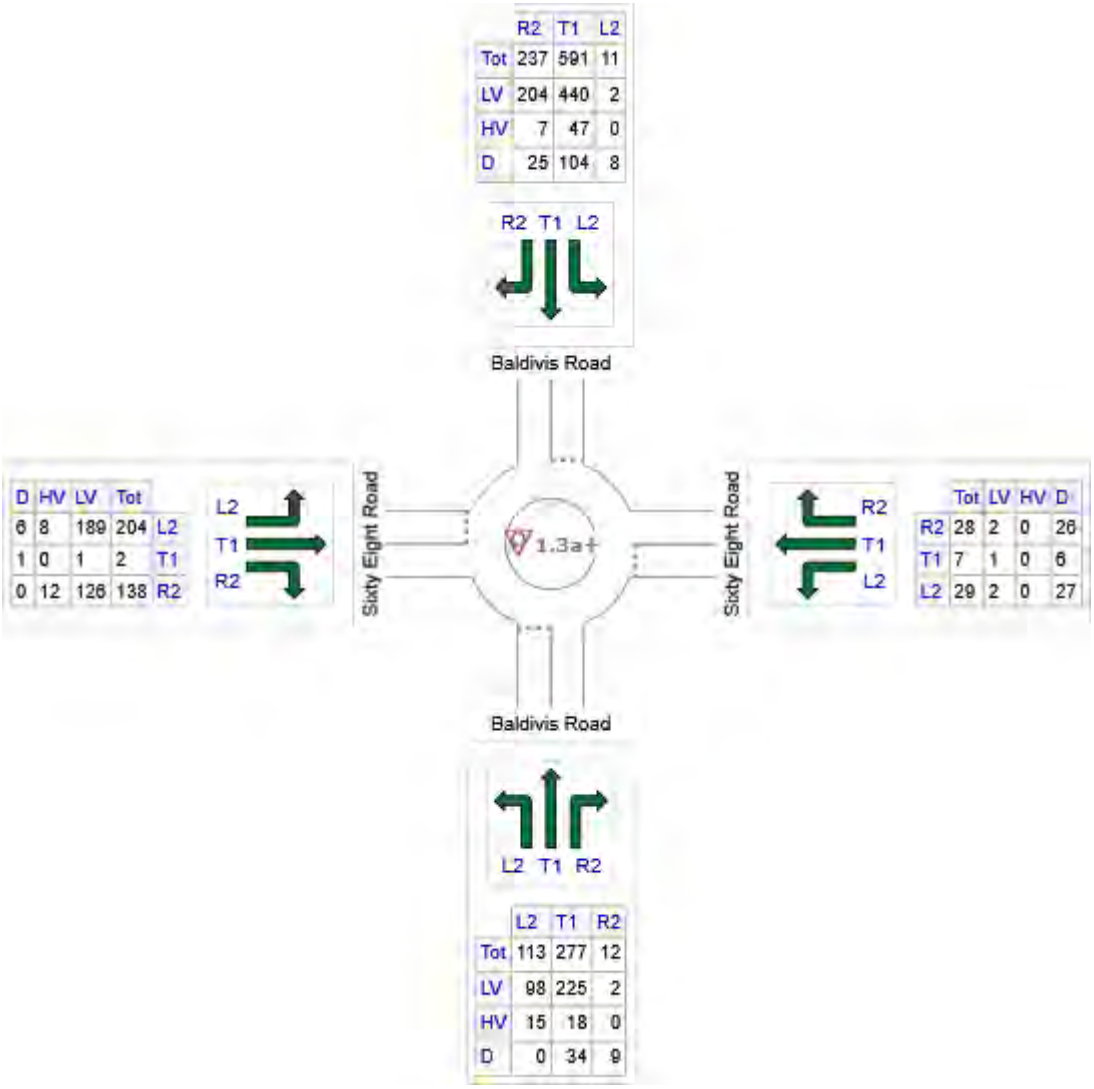

Figure 24 - M03 Sixty Eight Road / Baldivis Road – Demand flows AM peak 2031

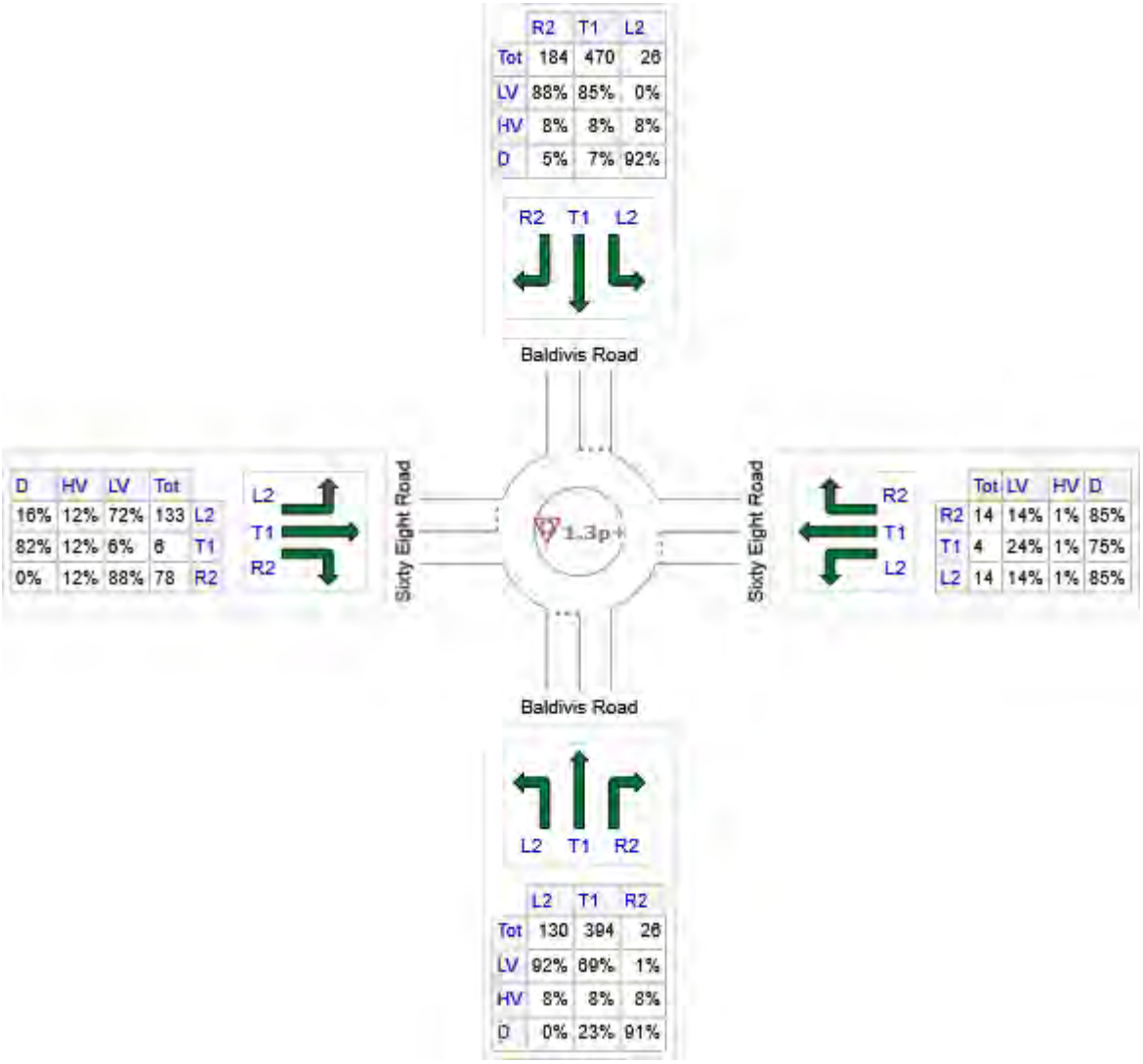

Figure 25 - M03 Sixty Eight Road / Baldivis Road – Demand flows PM peak 2031

5.3.1 1.3a+ Sixty Eight Road / Baldivis Road – 2031 AM

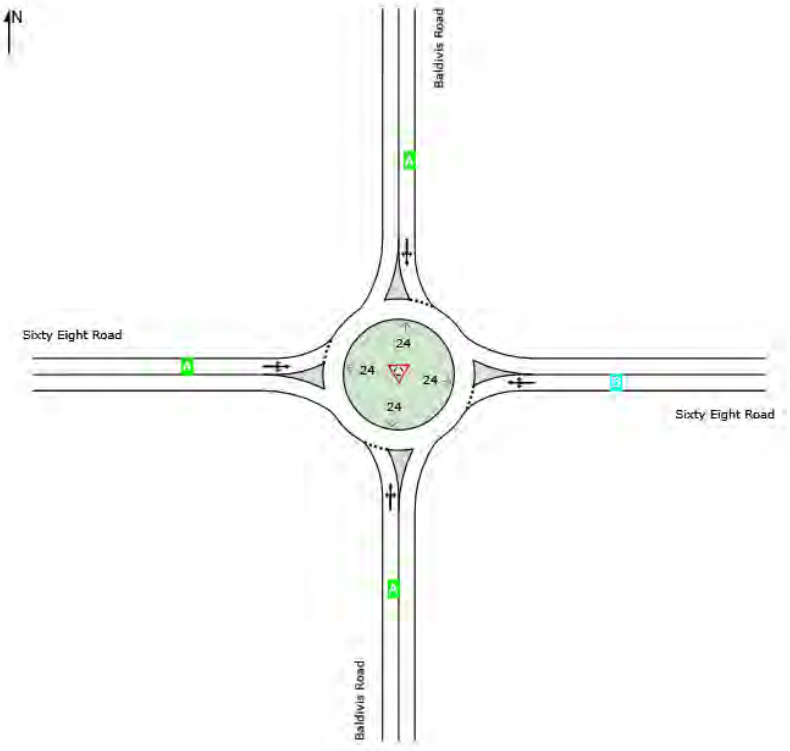

Figure 26 – LOS (Model 1.3a+ Sixty Eight Road / Baldivis Road – 2031 AM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 d	401	8.1	1043	0.384	100	8.2	LOS A	2.9	21.5	Full	1400	0.0	0.0
Approach	401	8.1		0.384		8.2	LOS A	2.9	21.5				
East: Sixty Eight Road													
Lane 1 d	65	0.0	498	0.131	100	13.4	LOS B	0.9	6.6	Full	70	0.0	0.0
Approach	65	0.0		0.131		13.4	LOS B	0.9	6.6				
North: Baldivis Road													
Lane 1 d	839	6.4	1261	0.665	100	9.3	LOS A	7.5	55.7	Full	250	0.0	0.0
Approach	839	6.4		0.665		9.3	LOS A	7.5	55.7				
West: Sixty Eight Road													
Lane 1 d	344	5.8	1001	0.344	100	6.8	LOS A	2.4	18.0	Full	320	0.0	0.0
Approach	344	5.8		0.344		6.8	LOS A	2.4	18.0				
Intersection	1649	6.5		0.665		8.7	LOS A	7.5	55.7				

Figure 27 – Lane Summary (Model 1.3a+ Sixty Eight Road / Baldivis Road – 2031 AM)

5.3.2 1.3p+ Sixty Eight Road / Baldivis Road – 2031 PM

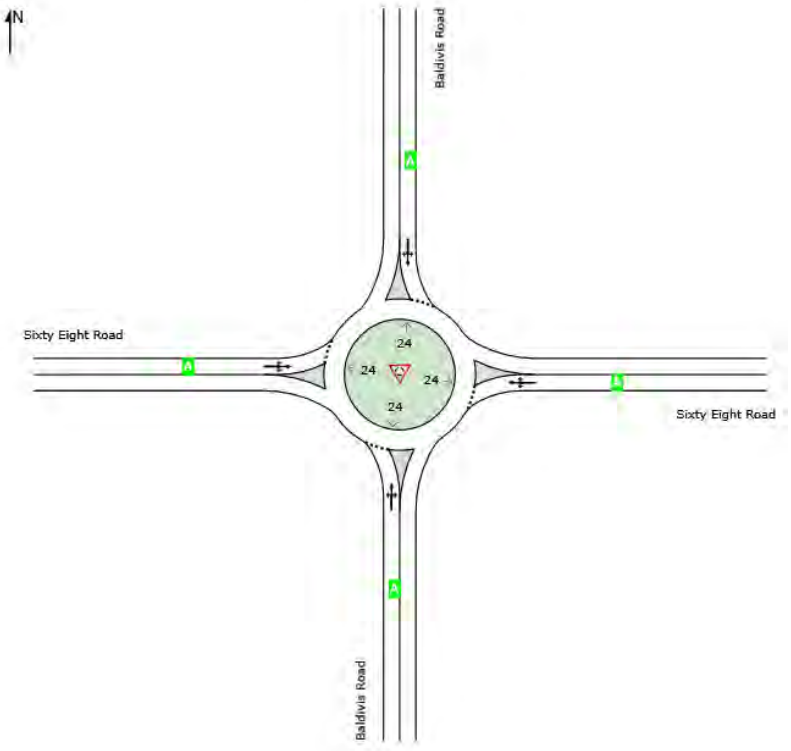

Figure 28 – LOS (Model 1.3p+ Sixty Eight Road / Baldivis Road – 2031 PM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 d	551	7.9	1159	0.475	100	8.0	LOS A	3.9	29.3	Full	1400	0.0	0.0
Approach	551	7.9		0.475		8.0	LOS A	3.9	29.3				
East: Sixty Eight Road													
Lane 1 d	32	1.0	700	0.045	100	10.0	LOS A	0.3	2.0	Full	70	0.0	0.0
Approach	32	1.0		0.045		10.0	LOS A	0.3	2.0				
North: Baldivis Road													
Lane 1 d	680	7.9	1315	0.517	100	8.5	LOS A	4.9	36.5	Full	250	0.0	0.0
Approach	680	7.9		0.517		8.5	LOS A	4.9	36.5				
West: Sixty Eight Road													
Lane 1 d	218	11.9	860	0.253	100	7.5	LOS A	1.7	12.9	Full	320	0.0	0.0
Approach	218	11.9		0.253		7.5	LOS A	1.7	12.9				
Intersection	1481	8.3		0.517		8.2	LOS A	4.9	36.5				

Figure 29 – Lane Summary (Model 1.3p+ Sixty Eight Road / Baldivis Road – 2031 PM)

5.3.3 1.3a+ Sixty Eight Road / Baldivis Road – 2041 AM

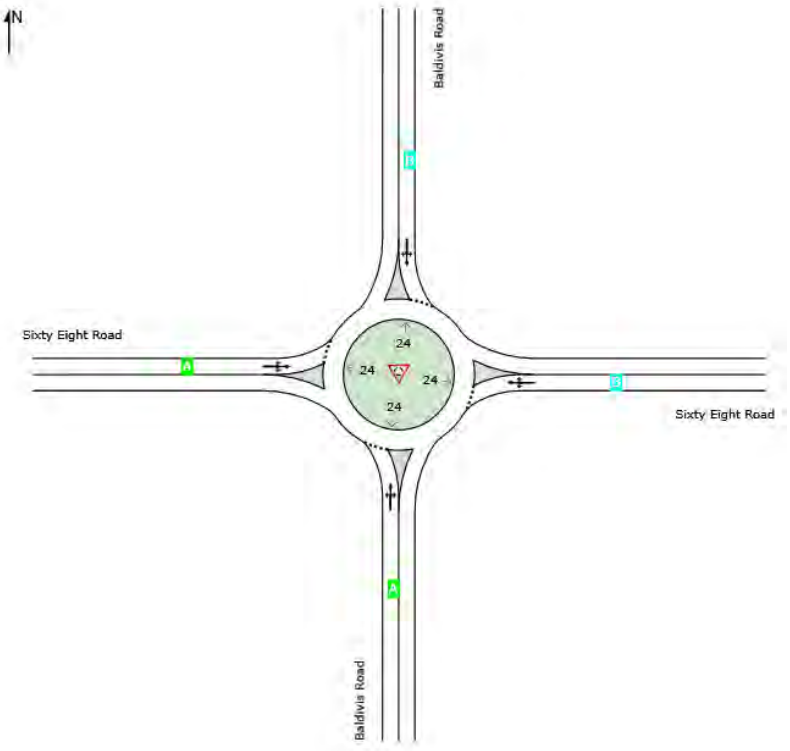

Figure 30 – LOS (Model 1.3a+ Sixty Eight Road / Baldivis Road – 2041 AM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 d	548	8.4	963	0.569	100	9.6	LOS A	5.5	41.0	Full	1400	0.0	0.0
Approach	548	8.4		0.569		9.6	LOS A	5.5	41.0				
East: Sixty Eight Road													
Lane 1 d	66	0.1	287	0.232	100	19.6	LOS B	1.9	13.0	Full	70	0.0	0.0
Approach	66	0.1		0.232		19.6	LOS B	1.9	13.0				
North: Baldivis Road													
Lane 1 d	1035	6.7	1211	0.855	100	13.3	LOS B	17.5	129.8	Full	250	0.0	0.0
Approach	1035	6.7		0.855		13.3	LOS B	17.5	129.8				
West: Sixty Eight Road													
Lane 1 d	418	5.8	888	0.471	100	8.0	LOS A	3.7	27.5	Full	320	0.0	0.0
Approach	418	5.8		0.471		8.0	LOS A	3.7	27.5				
Intersection	2067	6.8		0.855		11.4	LOS B	17.5	129.8				

Figure 31 – Lane Summary (Model 1.3a+ Sixty Eight Road / Baldivis Road – 2041 AM)

5.3.4 1.3p+ Sixty Eight Road / Baldivis Road – 2041 PM

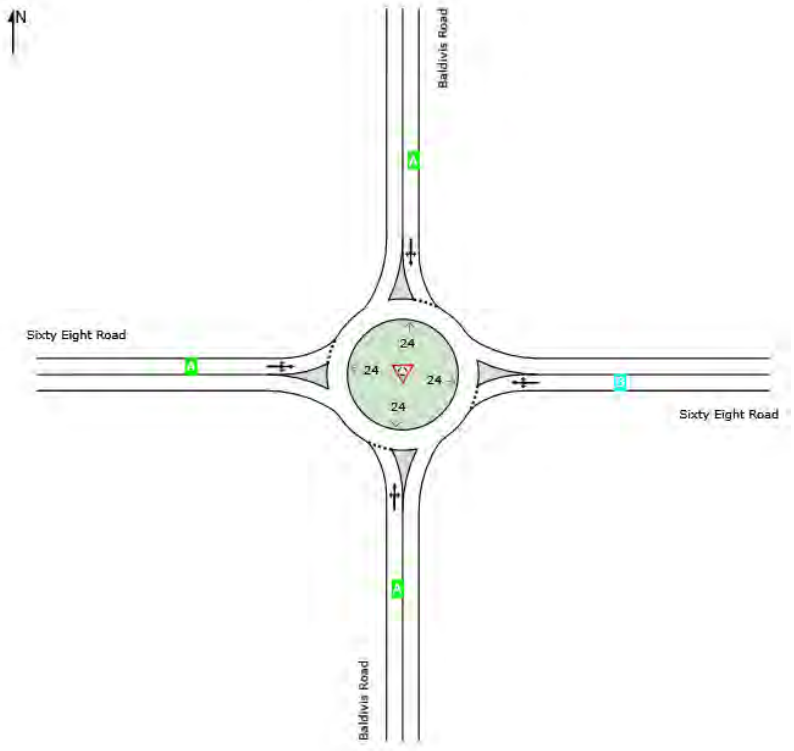

Figure 32 – LOS (Model 1.3p+ Sixty Eight Road / Baldivis Road – 2041 PM)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Baldivis Road													
Lane 1 d	730	8.4	1092	0.668	100	9.7	LOS A	7.7	57.6	Full	1400	0.0	0.0
Approach	730	8.4		0.668		9.7	LOS A	7.7	57.6				
East: Sixty Eight Road													
Lane 1 d	33	1.2	522	0.063	100	12.5	LOS B	0.4	3.1	Full	70	0.0	0.0
Approach	33	1.2		0.063		12.5	LOS B	0.4	3.1				
North: Baldivis Road													
Lane 1 d	853	8.1	1285	0.664	100	9.0	LOS A	7.8	58.5	Full	250	0.0	0.0
Approach	853	8.1		0.664		9.0	LOS A	7.8	58.5				
West: Sixty Eight Road													
Lane 1 d	260	12.2	723	0.359	100	8.9	LOS A	2.6	20.3	Full	320	0.0	0.0
Approach	260	12.2		0.359		8.9	LOS A	2.6	20.3				
Intersection	1875	8.7		0.668		9.3	LOS A	7.8	58.5				

Figure 33 – Lane Summary (Model 1.3p+ Sixty Eight Road / Baldivis Road – 2041 PM)

5.4 M04 Serpentine Road / Road 02 / New Road (Heritage Park)

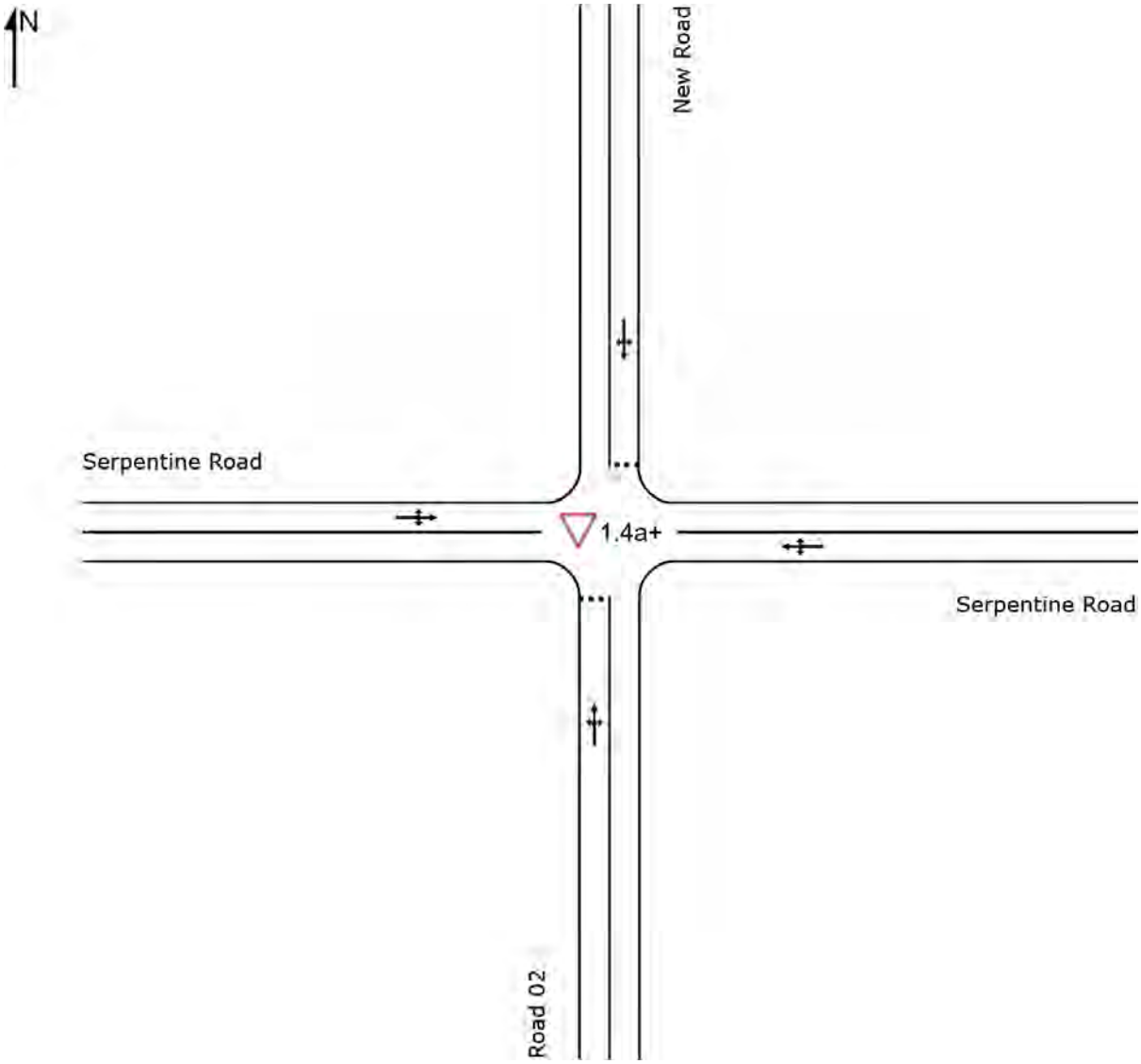

Figure 34 – M04 Serpentine Road / Road 02 / New Road (Heritage Park)– SIDRA Schematic Geometry

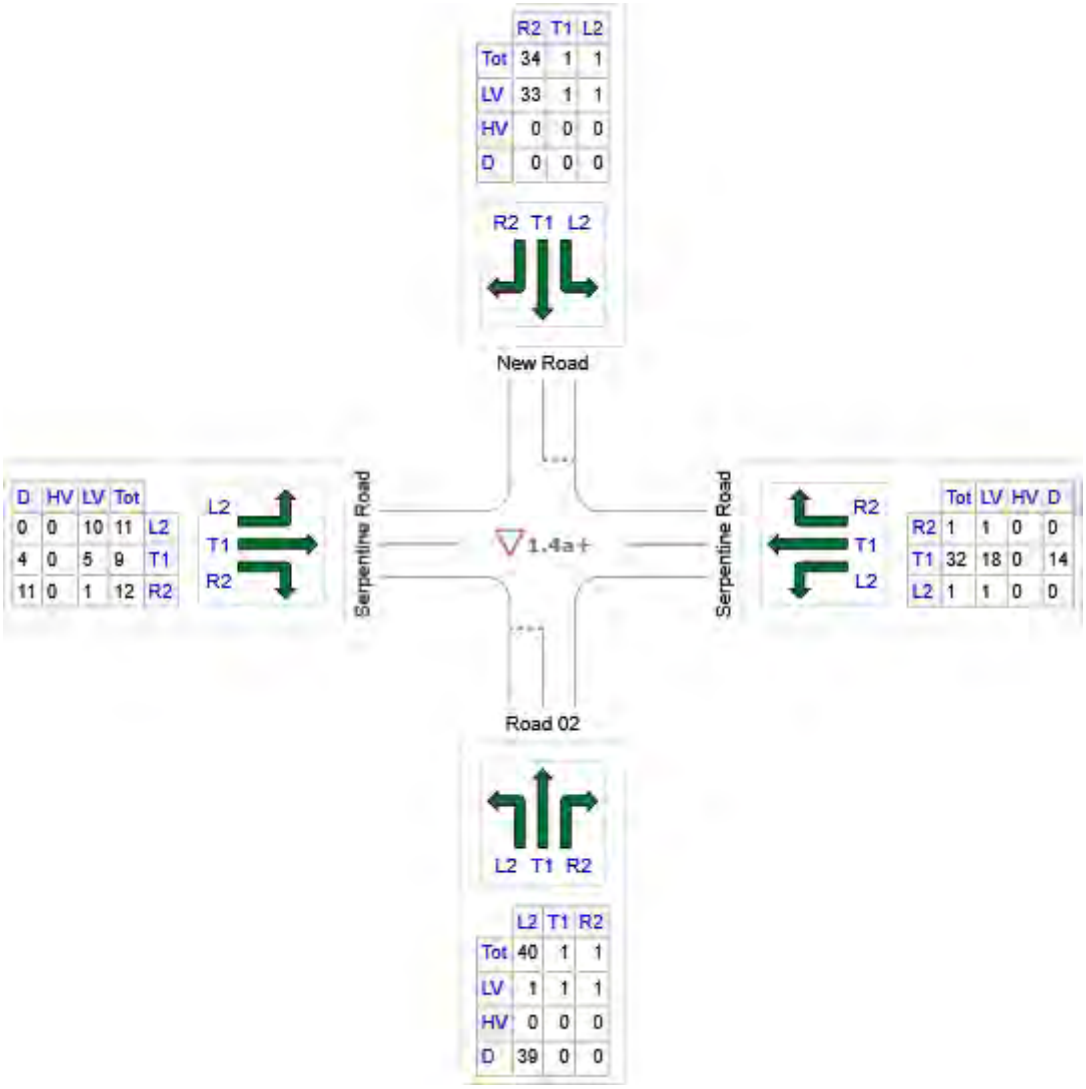

Figure 35 - M04 Serpentine Road / Road 02 / New Road (Heritage Park) – Demand flows AM peak 2031

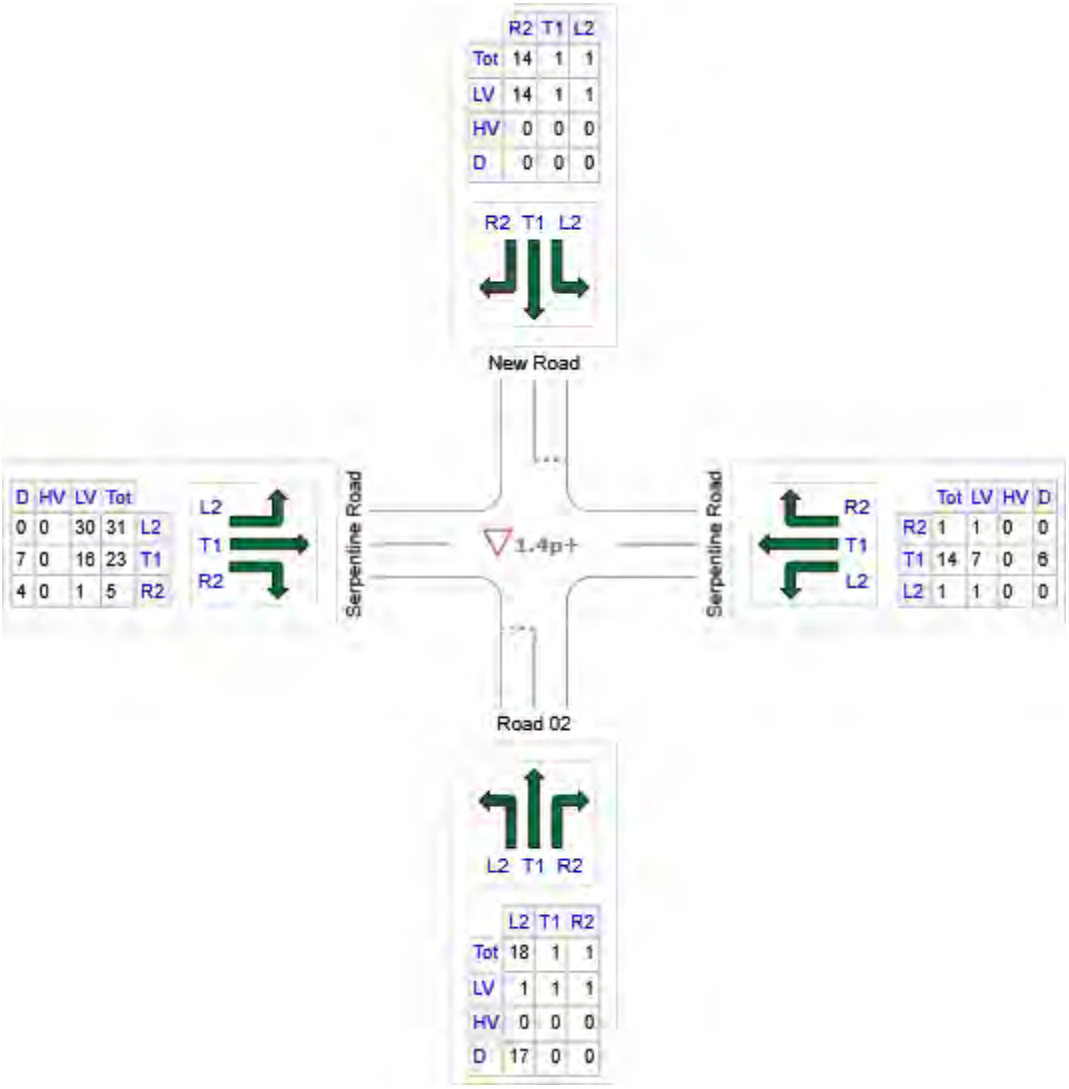

Figure 36 - M04 Serpentine Road / Road 02 / New Road (Heritage Park) – Demand flows PM peak 2031

5.4.1 1.4a+ Serpentine Road / Road 02 / New Road (Heritage Park) – 2031 AM

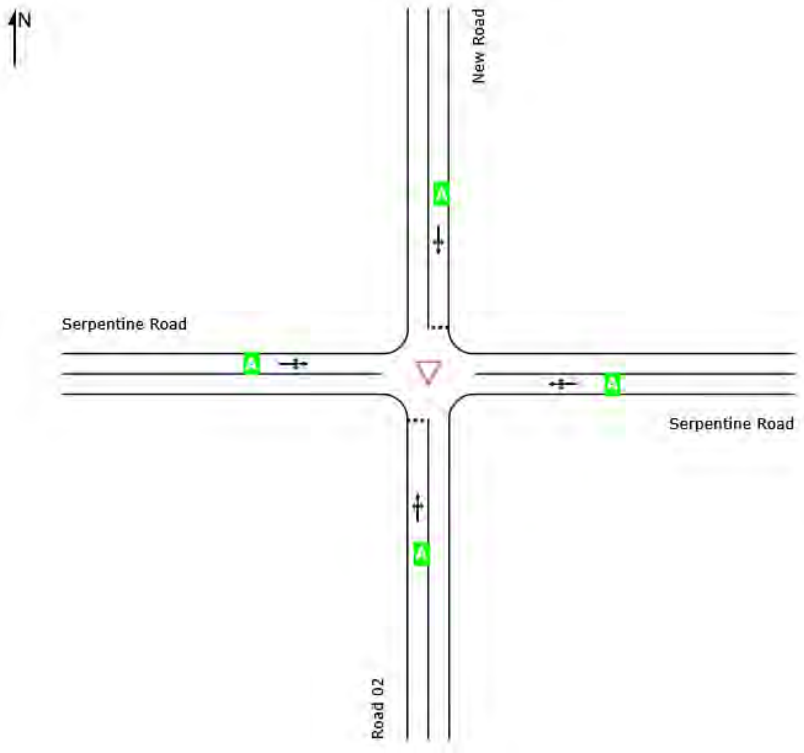

Figure 37 – LOS (Model 1.4a+ Serpentine Road / Road 02 / New Road (Heritage Park)– 2031 AM)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Road 02													
Lane 1	42	0.1	2451	0.017	100	3.4	LOS A	0.1	0.6	Full	60	0.0	0.0
Approach	42	0.1		0.017		3.4	LOS A	0.1	0.6				
East: Serpentine Road													
Lane 1	34	0.6	1967	0.017	100	0.3	LOS A	0.0	0.0	Full	70	0.0	0.0
Approach	34	0.6		0.017		0.3	NA	0.0	0.0				
North: New Road													
Lane 1	36	1.0	1446	0.025	100	4.7	LOS A	0.1	0.4	Full	65	0.0	0.0
Approach	36	1.0		0.025		4.7	LOS A	0.1	0.4				
West: Serpentine Road													
Lane 1	32	0.5	2038	0.015	100	3.2	LOS A	0.1	0.4	Full	140	0.0	0.0
Approach	32	0.5		0.015		3.2	NA	0.1	0.4				
Intersection	143	0.5		0.025		3.0	NA	0.1	0.6				

Figure 38 – Lane Summary (Model 1.4a+ Serpentine Road / Road 02 / New Road (Heritage Park)– 2031 AM)

5.4.2 1.4p+ Serpentine Road / Road 02 / New Road (Heritage Park)– 2031 PM

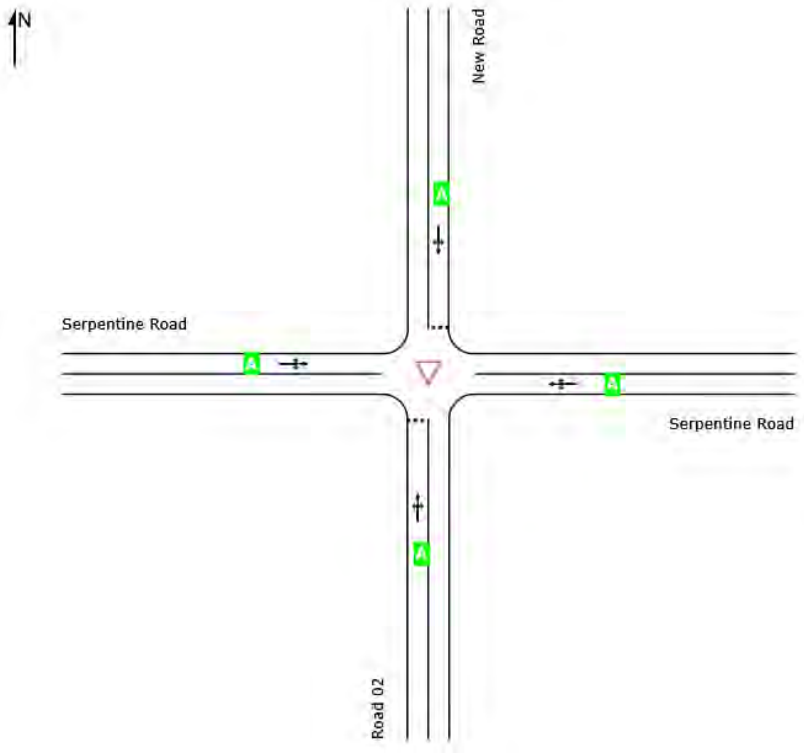

Figure 39 – LOS (Model 1.4p+ Serpentine Road / Road 02 / New Road (Heritage Park)– 2031 PM)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Road 02													
Lane 1	20	0.2	2403	0.008	100	3.4	LOS A	0.0	0.3	Full	60	0.0	0.0
Approach	20	0.2		0.008		3.4	LOS A	0.0	0.3				
East: Serpentine Road													
Lane 1	16	0.6	1969	0.008	100	0.6	LOS A	0.0	0.0	Full	70	0.0	0.0
Approach	16	0.6		0.008		0.6	NA	0.0	0.0				
North: New Road													
Lane 1	16	1.0	1499	0.011	100	4.6	LOS A	0.0	0.2	Full	65	0.0	0.0
Approach	16	1.0		0.011		4.6	LOS A	0.0	0.2				
West: Serpentine Road													
Lane 1	59	0.8	1936	0.030	100	2.8	LOS A	0.0	0.2	Full	140	0.0	0.0
Approach	59	0.8		0.030		2.8	NA	0.0	0.2				
Intersection	111	0.7		0.030		2.8	NA	0.0	0.3				

Figure 40 – Lane Summary (Model 1.4p+ Serpentine Road / Road 02 / New Road (Heritage Park)– 2031 PM)

5.4.3 1.4a+ Serpentine Road / Road 02 / New Road (Heritage Park)– 2041 AM

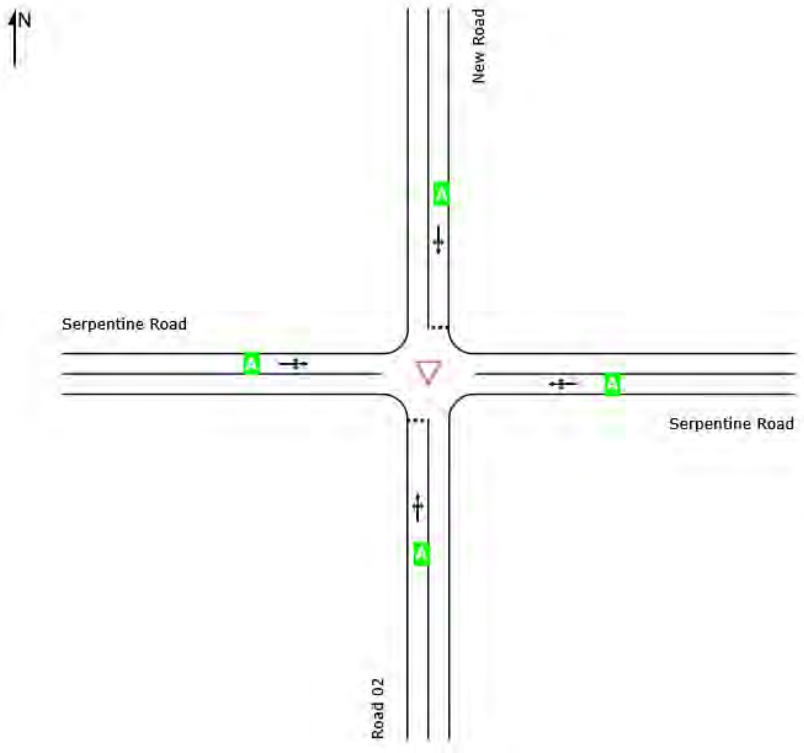

Figure 41 – LOS (Model 1.4a+ Serpentine Road / Road 02 / New Road (Heritage Park) – 2041 AM)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Road 02													
Lane 1	42	0.1	2451	0.017	100	3.4	LOS A	0.1	0.6	Full	60	0.0	0.0
Approach	42	0.1		0.017		3.4	LOS A	0.1	0.6				
East: Serpentine Road													
Lane 1	34	0.6	1967	0.017	100	0.3	LOS A	0.0	0.0	Full	70	0.0	0.0
Approach	34	0.6		0.017		0.3	NA	0.0	0.0				
North: New Road													
Lane 1	36	1.0	1446	0.025	100	4.7	LOS A	0.1	0.4	Full	65	0.0	0.0
Approach	36	1.0		0.025		4.7	LOS A	0.1	0.4				
West: Serpentine Road													
Lane 1	32	0.5	2038	0.015	100	3.2	LOS A	0.1	0.4	Full	140	0.0	0.0
Approach	32	0.5		0.015		3.2	NA	0.1	0.4				
Intersection	143	0.5		0.025		3.0	NA	0.1	0.6				

Figure 42 – Lane Summary (Model 1.4a+ Serpentine Road / Road 02 / New Road (Heritage Park)– 2041 AM)

5.4.4 1.4p+ Serpentine Road / Road 02 / New Road (Heritage Park) – 2041 PM

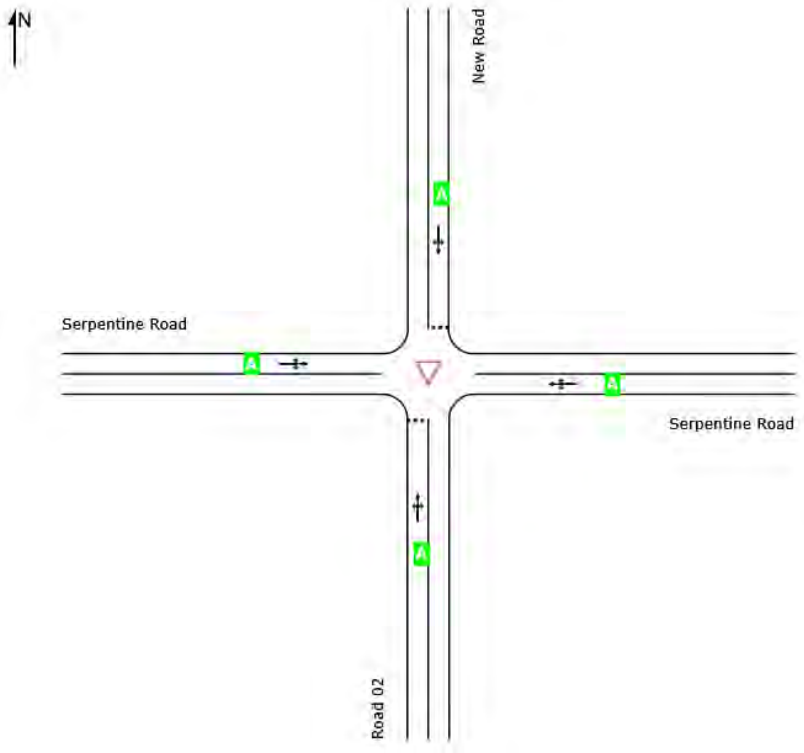

Figure 43 – LOS (Model 1.4p+ Serpentine Road / Road 02 / New Road (Heritage Park) – 2041 PM)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Road 02													
Lane 1	20	0.2	2403	0.008	100	3.4	LOS A	0.0	0.3	Full	60	0.0	0.0
Approach	20	0.2		0.008		3.4	LOS A	0.0	0.3				
East: Serpentine Road													
Lane 1	16	0.6	1969	0.008	100	0.6	LOS A	0.0	0.0	Full	70	0.0	0.0
Approach	16	0.6		0.008		0.6	NA	0.0	0.0				
North: New Road													
Lane 1	16	1.0	1499	0.011	100	4.6	LOS A	0.0	0.2	Full	65	0.0	0.0
Approach	16	1.0		0.011		4.6	LOS A	0.0	0.2				
West: Serpentine Road													
Lane 1	59	0.8	1936	0.030	100	2.8	LOS A	0.0	0.2	Full	140	0.0	0.0
Approach	59	0.8		0.030		2.8	NA	0.0	0.2				
Intersection	111	0.7		0.030		2.8	NA	0.0	0.3				

Figure 44 – Lane Summary (Model 1.4p+ Serpentine Road / Road 02 / New Road (Heritage Park)– 2041 PM)