Ref: 21/223

10th September 2021

Winarch Capital
C/- ADW Johnson
7/335 Hillsborough Road
WARNERS BAY NSW 2282

Attention: - Stephanie Van Dissel

Dear Stephanie,

RE: Traffic Impact Assessment Report Addendum 1 – Staging Modification – Warner Industrial Estate – Sparks Road, Hue Hue Road, Kiah Ridge Road and M1 Motorway, Jilliby.

Reference is made to your commission to prepare a Traffic Impact Assessment Report Addendum to support a modification to an existing Development Consent, former Part 3A Approval MP07_0162, for a 90 lot industrial estate relating to land located adjacent to Sparks Road, Hue Hue Road, Kiar Ridge Road and the M1 Motorway, Jilliby (the site) previously owned by Central Coast Council and now purchased by Winarch Capital.

TAR technologies undertook a traffic impact assessment of the proposed industrial subdivision in June 2008 (TAR 2008) for the currently approved development of the site (MP07_0162) for a 90 lot torrens title industrial subdivision to be constructed in 2 stages. The proposed modified development seeks to divide Stage 1 of the development into 4 stages being Stages 1A, 1B, 1C & 1D which relates to 69 lots of the 90 lots within the approved development. Stage 2 is not impact by this modification and Stage 2 will be developed by another developer sometime in the future. There is no change to the development area or the lot yield of the overall development resulting from this modification. The following Traffic Impact Assessment Report Addendum is provided below and it should be read in conjunction with the original Traffic Impact Assessment for the site (TAR 2008).

Traffic Addendum 1 – Modification to Staging – Industrial Subdivision – Sparks Road, Hue Hue Road, Kiah Ridge Road and M1 Motorway, Jilliby

Development

The proposal seeks to modify the approved development on the site (MP07_0162) by introducing an additional four stages within Stage 1 of the approved development. No additional lots or land is proposed with the modification therefore traffic generation from the site will not change from the original approved development. The new additional staging within approved Stage 1 will however cause some changes to the

traffic distribution on the adjoining local and state road network until the full development of approved Stage 1 is completed.

Stage 1 will now be constructed in a further 4 stages with the proposed staging shown within ***Attachment 1*** and described as follows including net development areas (NDA);

- Stage 1A – 25 lots (NDA – 21.44ha)
- Stage 1B – 12 lots (NDA – 7.03ha)
- Stage 1C – 13 lots (NDA – 14.77ha)
- Stage 1D – 19 lots (NDA – 18.36ha)

The impact of this amended staging from a traffic impact perspective is that the development will rely on one subdivision access off Hue Hue Road for Stages 1A and 1B until the Sparks Road roundabout access is constructed in Stage 1C. Once Stage 1C and the Sparks Road roundabout is constructed the amended staging of the development will not change the traffic impacts of the approved development.

Therefore, this traffic addendum looks at the traffic impacts on the local and state road network of Stages 1A and 1B being constructed without the Sparks Road roundabout being constructed. The relevant traffic impacts of this amended staging to be analysed in this Addendum will be the two-way mid-block capacity of Hue Hue Road between the site access and Sparks Road, the operation of the site access to Hue Hue Road and the operation of the Sparks Road / Hue Hue Road give way priority controlled T-intersection.

No changes are proposed to the overall access arrangements for the development and there will be no traffic impacts on the operation of Sparks Road, Hue Hue Road north of the site, the M1 Pacific Motorway and the M1 Pacific Motorway Sparks Road interchange resulting from this modification to the original approved development therefore no further analysis of these parts of the local and state road network has been undertaken in this Addendum.

Traffic Impact – Existing Road Network

The Warnervale Developer Contributions Plan was developed using the following traffic generation data;

- 2.3 Trips/Employees/Day;
- 28 Employees/Ha; and
- Peak hour traffic volumes being 15 % of daily volumes.

This method was used to estimate traffic volumes for the approved development within (TAR 2008) and therefore has been used in this assessment. Therefore the relevant traffic generation from Stages 1a and 1b (net development area – 28.47 ha) can be calculated as follows;

- Daily Traffic = 1,834 vtpd;
- AM and PM peak hour traffic = 276 vtph.

This traffic generation estimate for combined proposed stages 1a and 1b has been adopted in this assessment.

The original traffic report for this development relied on the traffic assessments undertaken by Central Coast Council during the strategic planning of the Wyong Employment Zone, of which the development is part of, therefore no data on traffic distribution was found in the original traffic impact assessment (TAR 2008). To enable this assessment the following worst case trip generation scenario has been used;

- In the AM peak 70% of traffic is inbound and this is mirrored in the PM peak (i.e. 70 % of traffic outbound)
- At the Hue Hue Road site access 10% of development traffic will have an origin / destination north.
- At the Sparks Road / Hue Hue Road intersection another 10 % of development traffic will have an origin / destination south with the remaining 80 % of development traffic having an origin / destination east.

The resulting trip distribution for development traffic from Stages 1a and 1b is therefore shown diagrammatically in ***Figure 1*** below.

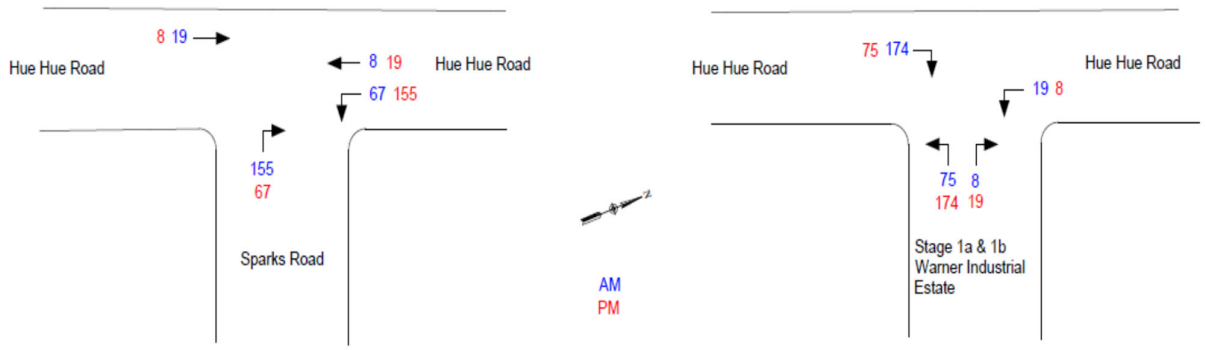

Figure 1 – Development Traffic Trip Distribution

In terms of existing traffic volumes Northern Transport Planning and Engineering undertook AM and PM peak period traffic counts at the Sparks Road / Hue Hue intersection on Thursday 2nd December 2021 at a time when the Central Coast had been out of the Covid lockdown for nearly 1 month and traffic volumes on the road network had returned to the new post Covid normal volumes. The count sheets for these counts are provided in ***Attachment 2***.

Peak traffic periods were found to be 7.45 am to 8.45 am and 3 pm – 4 pm which is typical of an Industrial area. The existing two way mid-block traffic volumes extracted from these counts for the road network impacted by the proposed modification are shown in Table 1 below. Also shown in ***Table 1*** is the likely traffic volumes on the

local road network in 2027 with just background traffic of 1.5 % per annum. 2027 was chosen as the horizon year as this is when stage 1c of the development including the Sparks Road roundabout access to the site will be constructed and traffic distribution reverts to that assessed in the original traffic report for the development. A background traffic growth of 1.5 % per annum was also adopted because this is the average background traffic growth rate used by TfNSW in its strategic modelling of the classified road network in the Central Coast.

Table 1 – 2021 and 2027 traffic volumes – No development

Road	Section	2021		2027 @ 1.5% p.a.	
		AM (vtph)	PM (vtph)	AM (vtph)	PM (vtph)
Hue Hue Road	north of Sparks Road	337	422	368	462
Hue Hue Road	south of Sparks Road	596	591	652	646
Sparks Road	east of Hue Hue Road	741	769	810	841

The road network around the site is partly urban and partly rural construction and based on the *Figures 4.4 and 4.6 of the RTA's Guide to Traffic Generating Developments* shown below, noting the road network around the site as two lane two way undivided roads it would be considered a two way mid-block capacity for a level of service C (LoS C) on the road network would be in the order of 1,400 vtph to 1,800 vtph. For this assessment it is assumed the two-way mid-block road capacity of the network is 1,800 vtph as with development of the area for industrial land-uses it is likely the road network will become more of an urban road than a rural road with speed zonings well less than 100 km/h.

As existing traffic volumes and 2027 traffic volumes shown in ***Table 1*** are well less than the two-way mid-block road capacity it can be concluded that there is spare mid-block capacity within the road network to cater for additional development traffic. From the trip distribution diagram shown in ***Figure 1*** above, it can be seen that the additional road network traffic resulting from the construction of Stages 1a and 1b of this development are 249 vtph on Hue Hue Road north of Sparks Road, 27 vtph on Hue Hue Road south of Sparks Road and 222 vtph on Sparks Road, east of Hue Hue Road. This traffic can be accommodated within the road network without two way mid-block road capacities being reached as shown in ***Table 2*** below.

Table 4.3
Typical mid-block capacities for urban roads with interrupted flow

Type of Road	One-Way Mid-block Lane Capacity (pcu/hr)	
Median or inner lane:	Divided Road	1,000
	Undivided Road	900
Outer or kerb lane:	With Adjacent Parking Lane	900
	Clearway Conditions	900
	Occasional Parked Cars	600
4 lane undivided:	Occasional Parked Cars	1,500
	Clearway Conditions	1,800
4 lane divided:	Clearway Conditions	1,900

Source: - RTA's Guide to Traffic Generating Developments (2002)

Table 4.5
peak hour flow on two-lane rural roads (veh/hr)
(Design speed of 100km/hr)

Terrain	Level of Service	Percent of Heavy Vehicles			
		0	5	10	15
Level	B	630	590	560	530
	C	1030	970	920	870
	D	1630	1550	1480	1410
	E	2630	2500	2390	2290
Rolling	B	500	420	360	310
	C	920	760	650	570
	D	1370	1140	970	700
	E	2420	2000	1720	1510
Mountainous	B	340	230	180	150
	C	600	410	320	260
	D	1050	680	500	400
	E	2160	1400	1040	820

The data for Table 4.5 assumes the following criteria:

- *terrain level* with 20% no overtaking.
- *rolling* with 40% no overtaking.
- *mountainous* with 60% no overtaking.
- 3.7 m traffic lane width with side clearances of at least 2m.
- 60/40 directional split of traffic.

Source: - RTA's Guide to Traffic Generating Developments (2002)

Table 1 – Two-way Mid-block Road Capacity Assessment

Road	Section	Capacity vtph	2021		2027 @ 1.5% p.a.		Development traffic	
			AM (vtph)	PM (vtph)	AM (vtph)	PM (vtph)	AM	PM
Hue Hue Road	north of Sparks Road	1800	586	671	617	711	249	249
Hue Hue Road	south of Sparks Road	1800	623	618	679	673	27	27
Sparks Road	east of Hue Hue Road	1800	963	991	1032	1063	222	222

Therefore it can be concluded that both Hue Hue Road and Sparks Road have sufficient spare two-way mid-block capacity to cater for the proposed staging of the Warner Industrial Estate.

Road network capacity is however generally governed by the satisfactory operation of intersections on the network. The main intersection impacted by the proposed modification to staging of the development is the Sparks Road / Hue Hue Road priority controlled give way intersection. It would be reasonable to conclude that should the development not adversely impact on this intersection it would not adversely impact on intersections on the wider local and state road network.

The impact of the development on this intersection has been assessed using the Sidra Intersection modelling program. This software package predicts likely delays, queue lengths and levels of service that will occur at intersections and is a widely accepted intersection analysis in Australia and overseas. Assessment is then based on the LoS requirements of TfNSW shown below:

Table 4.2
Level of service criteria for intersections

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode

Source: - RTA's Guide to Traffic Generating Developments (2002)

The following assumptions have been made in undertaking this modelling;

- Future traffic growth is calculated at a 1.5% per annum background traffic growth rate;
- Trip generation and trip distribution is as per ***Figure 1***.
- Development traffic was assumed to include 10 % heavy vehicles.
- As a priority controlled intersection the worst average delay, LoS and back of queue length is reported.
- It was assumed Stage 1c and the Sparks Road roundabout access to the site would be constructed by 2027.
- Calibration of the model to observed performance resulted in the adopted gap acceptance value for the right turn movement out of Sparks Road being 6 seconds with a 3 metre follow up headway which is still above the minimum recommended values of 5 seconds and 3 seconds respectively provided within *Austroads Guide to Road Design – Part4A – Unsignalised and signalised intersections*.

The results of the modelling for this intersection are summarised in ***Table 1*** below. The Sidra Movement Summary Tables are provided in ***Attachment 3***.

Table 1 – Sidra Results (all vehicles) for Sparks Road / Hue Hue Road intersection

Modelled Peak	Degree of Saturation (v/c)	Worst Average Delay (s)	Worst Level of Service	95% back of queue length (cars)
2021 AM	0.251	8.5	A	1.1
2021 PM	0.241	9.0	A	1.1
2021 AM + development	0.302	9.5	A	1.6
2021 PM + development	0.350	12.7	A	2.6
2031 AM + development	0.351	10.5	A	2.1
2031 PM + development	0.414	12.7	A	2.6

The modelling shows that the intersection is currently operating satisfactorily with little delay and queuing occurring at the intersection and at approximately 25% capacity. The impact on the intersection from constructing and releasing Stages 1a and 1b of the approved development is minor with average delay increases and increased queue lengths being less than 4 seconds and 1.5 vehicles respectively in the critical PM peak hour period. With background traffic growth until the Sparks Road roundabout site access is constructed in 2027 the intersection will still be operating satisfactorily without any loss of LoS being experienced by motorists and with the intersection still operating at only approximately 40% capacity.

Therefore it is reasonable to conclude that the development does not adversely impact on the operation of this intersection therefore will not adversely impact on the local and wider state road network.

Traffic Impact – Hue Hue Road access.

The proposed site access off Hue Hue Road is to be constructed as rural give way controlled T-intersection with protected right and left turn lanes off Hue Hue Road (CHR / AUL). No changes to the proposed location or intersection layout is proposed as part of this modification application therefore there is no need to assess the location and intersection layout within this addendum report as the full development of the site will result in more traffic using the intersection than will occur in Stages 1a and 1b of the modified development before the site access off Sparks Road is constructed.

However the access has been modelled using the Sidra Intersection modelling program to demonstrate satisfactory operation of the intersection on construction and development of Stages 1a and 1b until the roundabout access to Sparks Road is constructed (2027).

The following assumptions have been made in undertaking this modelling;

- Future traffic growth is calculated at a 1.5% per annum background traffic growth rate;
- Trip generation and trip distribution is as per ***Figure 1***.
- Development traffic was assumed to include 10 % heavy vehicles.
- As a priority controlled intersection the worst average delay, LoS and back of queue length is reported.
- It was assumed Stage 1c and the Sparks Road roundabout access to the site would be constructed by 2027.

The results of the modelling for this intersection are summarised in ***Table 2*** below. The Sidra Movement Summary Tables are provided in ***Attachment 3***.

The modelling shows that the Hue Hue Road site access intersection operates satisfactorily (20% capacity) with development of Stages 1a and 1b of the development until construction of the Sparks Road roundabout access to the site in Stage 1c. Average delays and queue lengths are well within the thresholds determined by TfNSW for satisfactory intersection operation.

Table 2 – Sidra Results (all vehicles) for Hue Hue Road site access intersection

Modelled Peak	Degree of Saturation (v/c)	Worst Average Delay (s)	Worst Level of Service	95% back of queue length (cars)
2021 AM + development	0.178	9.6	A	0.8
2021 PM + development	0.202	9.6	A	0.8
2031 AM + development	0.183	10.0	A	0.8
2031 PM + development	0.207	10.0	A	0.9

Conclusion

This traffic impact assessment report addendum for the proposed staging within Stage 1 of the approved Warner Industrial Estate (MP07_0162) at Hue Hue Road and Sparks road Jilliby has concluded;

- The proposal to construct two stages of Stage 1 (Stage 1a and 1b) before constructing the roundabout access to the site off Sparks Road will result in some additional initial traffic volume increases on Hue Hue Road and through the Hue Hue Road access to the site being constructed as Stage 1a works.
- The construction of Stages 1a and 1b of the Estate is expected to generate up to 1,834 vtpd or 276 vtph during peak traffic periods.
- As existing traffic volumes and 2027 traffic volumes on Hue Hue Road post development are well less than the two-way mid-block road capacity of Hue Hue Road, it can be concluded that there is spare mid-block capacity within the road network to cater for additional development traffic.
- Sidra Intersection modelling of the Sparks Road / Hue Hue Road priority controlled intersection shows that the intersection is currently operating satisfactorily with little delay and queuing occurring at the intersection and at approximately 25% capacity. The impact on the intersection from constructing and releasing Stages 1a and 1b of the approved development is minor with average delay increases and increased queue lengths being less than 4 seconds and 1.5 vehicles respectively in the critical PM peak hour period. With background traffic growth until the Sparks Road roundabout site access is constructed in 2027 the intersection will still be operating satisfactorily without any loss of LoS being experienced by motorists and with the intersection still operating at only approximately 40% capacity.
- Sidra Intersection modelling of the Hue Hue Road site access to be constructed in Stage 1a shows that the intersection operates satisfactorily (20% capacity) with development of Stages 1a and 1b of the development until construction of the Sparks Road roundabout access to the site in Stage 1c. Average delays and queue lengths are well within the thresholds determined by TfNSW for satisfactory intersection operation.
- Overall it is concluded that the proposed modification to the staging of the Warner Industrial Estate will not adversely impact on the local and wider state road network.

Recommendation

Having undertaken this traffic addendum report for the proposed modification to the staging of the approved Warner Industrial Estate (MP07_0162) it is recommended that the modification can be supported by the Department of Planning, Industry and Environment. The proposed modification to the staging of the development does not adversely impact on the local and state road network meeting all the traffic impact requirements of Central Coast Council and TfNSW.

For further information or clarification please do not hesitate to contact me on 0423 324 188.

Yours sincerely

Jeff Garry

Director
Intersect Traffic

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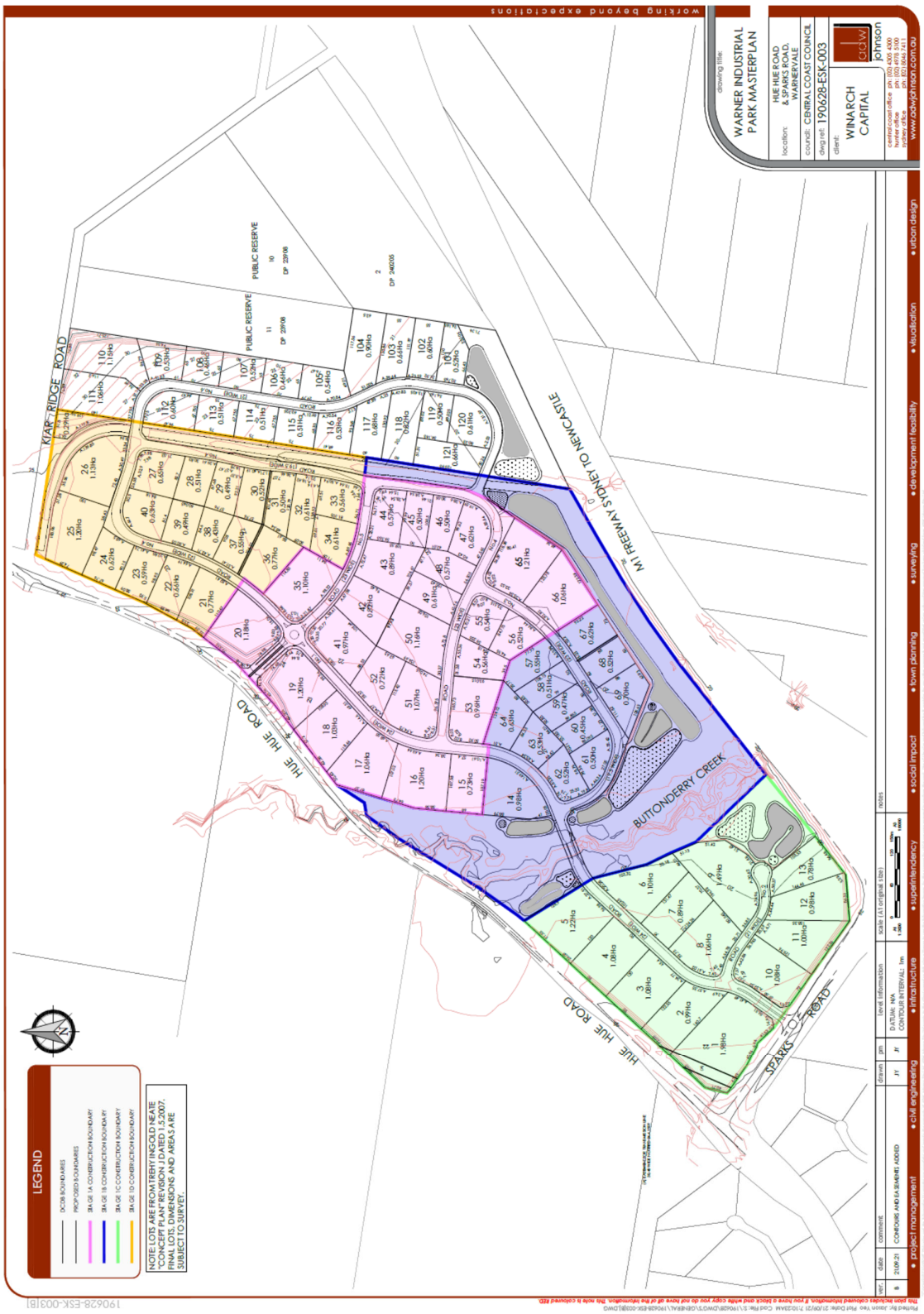
PO BOX 268 EAST MAITLAND NSW 2323

Attachment :- Site Staging Plan



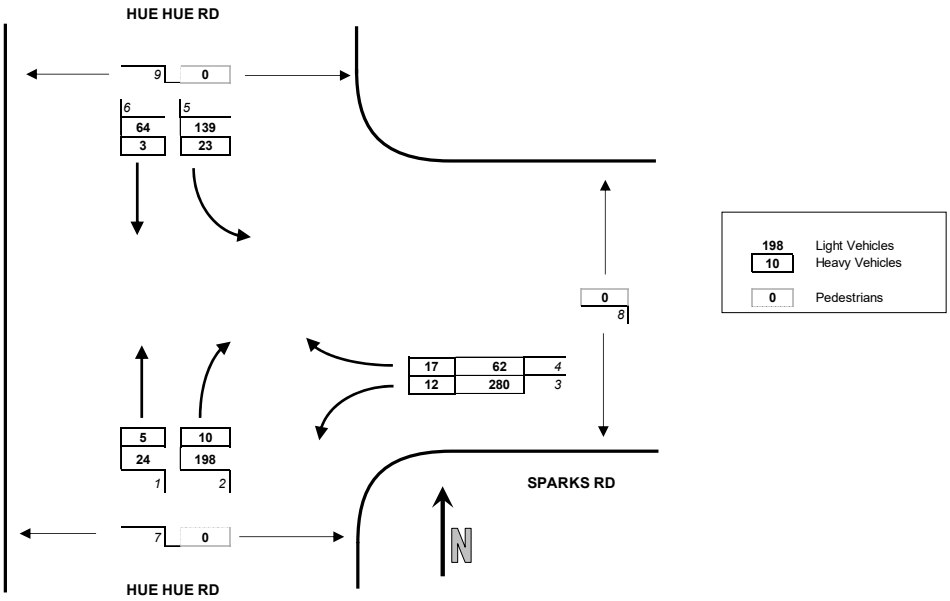
Attachment 2 – Traffic Count Data

2/12/2021 - HUE HUE RD / SPARKS RD, JILLIBY

8:45 <<< HOUR ENDING **Thursday**

Summary:	HUE HUE RD / SPARKS RD
767	Total Light Vehicles
70	Total Heavy Vehicles
0	Total Pedestrians

Quality Surveys
223404



2/12/2021 - HUE HUE RD / SPARKS RD, JILLIBY

Light Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN	HOUR
06:15	4	23	17	5	26	6	81	
06:30	5	27	28	17	19	5	101	
06:45	3	34	40	20	16	9	122	
07:00	7	40	54	22	25	8	156	460
07:15	3	29	30	13	16	15	106	485
07:30	6	47	26	23 <	22	16	140	524
07:45	6	39	43	11	28	13	140	542
08:00	5	46	55	15	36	19	176	562
08:15	7	45	76	20	39	9	196	652
08:30	2	52	64	13	32	19	182	694
08:45	10	55 <	85 <	14	32 <	17 <	213	767 <
09:00	13 <	38	50	27	17	10	155	746

Pedestrians

	7	8	9
06:15	0	0	0
06:30	0	0	0
06:45	0	0	0
07:00	0	0	0
07:15	0	0	0
07:30	0	0	0
07:45	0	0	0
08:00	0	0	0
08:15	0	0	0
08:30	0	0	0
08:45	0	0	0
09:00	0	0	0

Heavy Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN	HOUR
06:15	0	3	3	0	2	1	9	
06:30	0	3	0	2	1	1	7	
06:45	0	4	4	1	0	1	10	
07:00	3	4	4	5	2	1	19	45
07:15	1	4	0	6	3	1	15	51
07:30	2	6 <	3	5	4	2 <	22	66
07:45	2 <	1	2	3	3	0	11	67
08:00	0	3	2	3	6	1	15	63
08:15	1	3	4	2	5	1	16	64
08:30	2	2	3	7	6	1	21	63
08:45	2	2	3 <	5	6 <	0	18	70
09:00	3 <	2	2 <	9 <	5	0	21	76 <

All Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN	HOUR
06:15	4	26	20	5	28	7	90	
06:30	5	30	28	19	20	6	108	
06:45	3	38	44	21	16	10	132	
07:00	10	44	58	27	27	9	175	505
07:15	4	33	30	19	19	16	121	536
07:30	8	53	29	28	26	18	162	590
07:45	8	40	45	14	31	13	151	609
08:00	5	49	57	18	42	20 <	191	625
08:15	8	48	80	22	44	10	212	716
08:30	4	54	67	20	38	20	203	757
08:45	12	57 <	88 <	19	38 <	17 <	231	837 <
09:00	16 <	40	52	36 <	22	10	176	822

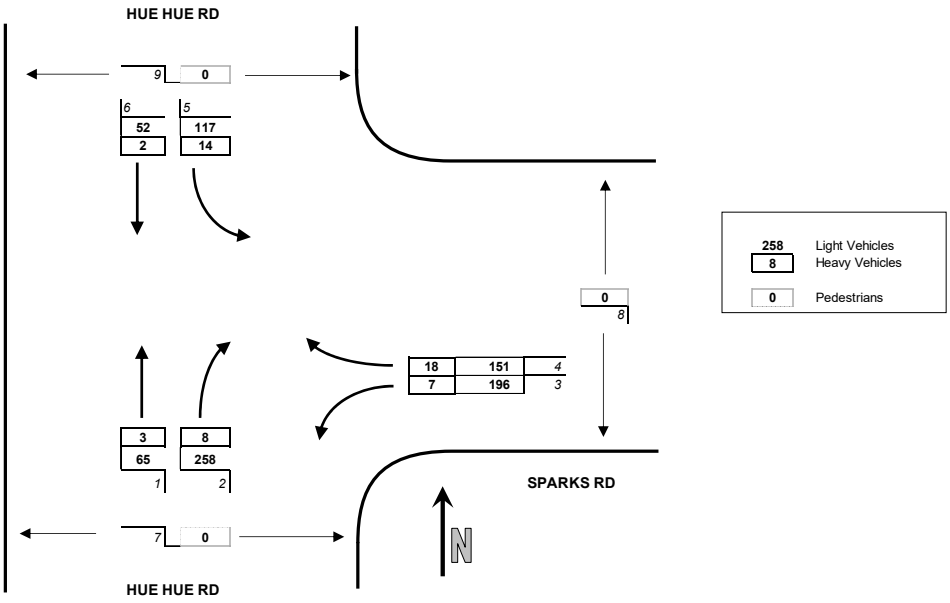
Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

2/12/2021 - HUE HUE RD / SPARKS RD, JILLIBY

16:00 <<< HOUR ENDING **Thursday**

Summary: HUE HUE RD / SPARKS RD	
839	Total Light Vehicles
52	Total Heavy Vehicles
0	Total Pedestrians

Quality Surveys
223404



2/12/2021 - HUE HUE RD / SPARKS RD, JILLIBY

Light Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR		Pedestrians 7	8	9
15:15	12	76	55	42	35	11	231		0	0	0
15:30	20	53	49	40	24	10	196		0	0	0
15:45	17	70	45	37	28	17	214		0	0	0
16:00	16	59 <	47 <	32 <	30 <	14	198	839 <	0	0	0
16:15	21	60	47	27	32	14	201	809	0	0	0
16:30	22 <	66	48	36	25	16 <	213	826	0	0	0
16:45	13	60	47	22	24	9	175	787	0	0	0
17:00	20 <	67	49	30	21	13	200	789	0	0	0
17:15	13	56	44	29	14	6	162	750	0	0	0
17:30	21	58	44	32	15	9	179	716	0	0	0
17:45	12	52	44	21	16	8	153	694	0	0	0
18:00	15	39	37	23	23	10	147	641	0	0	0

Heavy Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR	
15:15	2	2	0	5	4	0	13	
15:30	0	2	5	9	3	1	20	
15:45	0	2	1	1	2	0	6	
16:00	1	2	1 <	3 <	5 <	1	13	52 <
16:15	1	0	0 <	4	3	1 <	9	48
16:30	2 <	2	3	1	0	0	8	36
16:45	0 <	1	1	2	1	0	5	35
17:00	0	6	1	1	0	0	8	30
17:15	0	2	0	1	1	1	5	26
17:30	0	0	1	2	0	1	4	22
17:45	0	4 <	2	1	2	0	9	26
18:00	1	1	1	0	0	0	3	21

All Vehicles

	1	2	3	4	5	6	Total Vehicles 15 MIN HOUR	
15:15	14	78	55	47	39	11	244	
15:30	20	55	54	49	27	11	216	
15:45	17	72	46	38	30	17	220	
16:00	17	61 <	48 <	35 <	35 <	15	211	891 <
16:15	22	60	47	31	35	15	210	857
16:30	24 <	68	51	37	25	16 <	221	862
16:45	13	61	48	24	25	9	180	822
17:00	20	73	50	31	21	13	208	819
17:15	13	58	44	30	15	7	167	776
17:30	21	58	45	34	15	10	183	738
17:45	12	56	46	22	18	8	162	720
18:00	16	40	38	23	23	10	150	662

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

Attachment 3 – Sidra Movement Summary Tables

MOVEMENT SUMMARY

Site: 101 [2021AM (Site Folder: General)]

Sparks Road / Hue Hue Road intersection
December 2021 counts
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	29	5	31	17.2	0.018	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	208	10	219	4.8	0.201	6.8	LOS A	0.9	6.4	0.39	0.63	0.39	51.9
Approach		237	15	249	6.3	0.201	6.0	NA	0.9	6.4	0.34	0.55	0.34	52.8
East: Sparks Road														
4	L2	292	12	307	4.1	0.251	5.9	LOS A	1.1	8.0	0.19	0.55	0.19	52.7
6	R2	79	17	83	21.5	0.099	8.5	LOS A	0.5	3.8	0.54	0.69	0.54	50.3
Approach		371	29	391	7.8	0.251	6.5	LOS A	1.1	8.0	0.27	0.58	0.27	52.2
North: Hue Hue Road														
7	L2	162	23	171	14.2	0.101	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	67	3	71	4.5	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		229	26	241	11.4	0.101	4.1	NA	0.0	0.0	0.00	0.41	0.00	54.8
All Vehicles		837	70	881	8.4	0.251	5.7	NA	1.1	8.0	0.21	0.53	0.21	53.0

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

MOVEMENT SUMMARY

Site: 101 [2021PM (Site Folder: General)]

Sparks Road / Hue Hue Road intersection
December 2021 counts
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	68	3	72	4.4	0.038	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	266	8	280	3.0	0.241	6.6	LOS A	1.1	8.0	0.36	0.61	0.36	52.1
Approach		334	11	352	3.3	0.241	5.2	NA	1.1	8.0	0.28	0.49	0.28	53.5
East: Sparks Road														
4	L2	203	7	214	3.4	0.172	5.8	LOS A	0.7	5.0	0.16	0.55	0.16	52.9
6	R2	169	18	178	10.7	0.215	9.0	LOS A	1.0	7.9	0.59	0.76	0.59	50.3
Approach		372	25	392	6.7	0.215	7.3	LOS A	1.0	7.9	0.36	0.65	0.36	51.7
North: Hue Hue Road														
7	L2	131	14	138	10.7	0.080	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.0
8	T1	54	2	57	3.7	0.030	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		185	16	195	8.6	0.080	4.0	NA	0.0	0.0	0.00	0.41	0.00	54.9
All Vehicles		891	52	938	5.8	0.241	5.8	NA	1.1	8.0	0.25	0.54	0.25	53.0

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

MOVEMENT SUMMARY

▽ Site: 101 [2021AM + development (Site Folder: General)]

Sparks Road / Hue Hue Road intersection
December 2021 counts
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	48	7	51	14.6	0.029	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	208	10	219	4.8	0.220	7.4	LOS A	1.0	7.0	0.46	0.68	0.46	51.7
Approach		256	17	269	6.6	0.220	6.0	NA	1.0	7.0	0.37	0.55	0.37	53.1
East: Sparks Road														
4	L2	292	12	307	4.1	0.254	6.0	LOS A	1.1	8.1	0.21	0.55	0.21	52.7
6	R2	234	32	246	13.7	0.302	9.5	LOS A	1.6	12.9	0.62	0.81	0.67	49.8
Approach		526	44	554	8.4	0.302	7.6	LOS A	1.6	12.9	0.39	0.67	0.41	51.4
North: Hue Hue Road														
7	L2	229	30	241	13.1	0.142	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	75	4	79	5.3	0.042	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		304	34	320	11.2	0.142	4.3	NA	0.0	0.0	0.00	0.43	0.00	54.5
All Vehicles		1086	95	1143	8.7	0.302	6.3	NA	1.6	12.9	0.28	0.57	0.29	52.6

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

MOVEMENT SUMMARY

▽ Site: 101 [2021PM + development (Site Folder: General)]

Sparks Road / Hue Hue Road intersection
December 2021 counts
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	76	4	80	5.3	0.043	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	266	8	280	3.0	0.299	7.9	LOS A	1.4	9.9	0.52	0.74	0.53	51.3
Approach		342	12	360	3.5	0.299	6.2	NA	1.4	9.9	0.40	0.57	0.41	53.1
East: Sparks Road														
4	L2	203	7	214	3.4	0.176	5.9	LOS A	0.7	5.1	0.19	0.55	0.19	52.8
6	R2	236	25	248	10.6	0.350	11.2	LOS A	2.0	15.6	0.68	0.92	0.83	48.8
Approach		439	32	462	7.3	0.350	8.8	LOS A	2.0	15.6	0.45	0.75	0.53	50.5
North: Hue Hue Road														
7	L2	286	29	301	10.1	0.174	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.0
8	T1	74	5	78	6.8	0.042	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		360	34	379	9.4	0.174	4.5	NA	0.0	0.0	0.00	0.46	0.00	54.3
All Vehicles		1141	78	1201	6.8	0.350	6.7	NA	2.0	15.6	0.29	0.60	0.33	52.4

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

MOVEMENT SUMMARY

▽ Site: 101 [2027AM + development (Site Folder: General)]

Sparks Road / Hue Hue Road intersection
December 2021 counts
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 6 years

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	48	7	55	14.6	0.031	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	208	10	239	4.8	0.250	7.6	LOS A	1.1	8.0	0.48	0.71	0.48	51.5
Approach		256	17	295	6.6	0.250	6.2	NA	1.1	8.0	0.39	0.57	0.39	52.9
East: Sparks Road														
4	L2	292	12	336	4.1	0.279	6.0	LOS A	1.3	9.1	0.22	0.56	0.22	52.6
6	R2	234	32	269	13.7	0.351	10.5	LOS A	2.1	16.5	0.66	0.88	0.79	49.2
Approach		526	44	605	8.4	0.351	8.0	LOS A	2.1	16.5	0.42	0.70	0.48	51.0
North: Hue Hue Road														
7	L2	229	30	264	13.1	0.155	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	75	4	86	5.3	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		304	34	350	11.2	0.155	4.3	NA	0.0	0.0	0.00	0.43	0.00	54.5
All Vehicles		1086	95	1250	8.7	0.351	6.6	NA	2.1	16.5	0.30	0.60	0.32	52.4

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

MOVEMENT SUMMARY

Site: 101 [2027PM + development (Site Folder: General)]

Sparks Road / Hue Hue Road intersection
December 2021 counts
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 6 years

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	76	4	87	5.3	0.047	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	266	8	306	3.0	0.341	8.5	LOS A	1.8	12.7	0.55	0.79	0.63	50.9
Approach		342	12	394	3.5	0.341	6.6	NA	1.8	12.7	0.43	0.62	0.49	52.7
East: Sparks Road														
4	L2	203	7	234	3.4	0.193	6.0	LOS A	0.8	5.7	0.20	0.55	0.20	52.7
6	R2	236	25	272	10.6	0.414	12.7	LOS A	2.6	20.0	0.72	0.97	0.98	47.8
Approach		439	32	505	7.3	0.414	9.6	LOS A	2.6	20.0	0.48	0.78	0.62	50.0
North: Hue Hue Road														
7	L2	286	29	329	10.1	0.190	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.0
8	T1	74	5	85	6.8	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		360	34	414	9.4	0.190	4.5	NA	0.0	0.0	0.00	0.46	0.00	54.3
All Vehicles		1141	78	1313	6.8	0.414	7.1	NA	2.6	20.0	0.31	0.63	0.38	52.1

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

MOVEMENT SUMMARY

▽ Site: 101 [2021 AM + development (Site Folder: General)]

Hue Hue Road access to Warner Industrial Estate
Stage 1a & 1b only
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	108	22	114	20.4	0.066	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	174	17	183	9.8	0.178	7.0	LOS A	0.8	5.8	0.41	0.65	0.41	51.6
Approach		282	39	297	13.8	0.178	4.3	NA	0.8	5.8	0.25	0.40	0.25	54.5
East: Site Access Road														
4	L2	75	7	79	9.3	0.092	6.9	LOS A	0.3	2.6	0.37	0.62	0.37	52.1
6	R2	8	1	8	12.5	0.092	9.6	LOS A	0.3	2.6	0.37	0.62	0.37	51.7
Approach		83	8	87	9.6	0.092	7.1	LOS A	0.3	2.6	0.37	0.62	0.37	52.1
North: Hue Hue Road														
7	L2	19	2	20	10.5	0.012	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	229	26	241	11.4	0.133	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		248	28	261	11.3	0.133	0.5	NA	0.0	0.0	0.00	0.04	0.00	59.4
All Vehicles		613	75	645	12.2	0.178	3.1	NA	0.8	5.8	0.16	0.29	0.16	56.0

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

MOVEMENT SUMMARY

Site: 101 [2021 PM + development (Site Folder: General)]

Hue Hue Road access to Warner Industrial Estate
Stage 1a & 1b only
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	227	11	239	4.8	0.128	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	75	7	79	9.3	0.071	6.5	LOS A	0.3	2.1	0.33	0.60	0.33	51.8
Approach		302	18	318	6.0	0.128	1.6	NA	0.3	2.1	0.08	0.15	0.08	57.7
East: Site Access Road														
4	L2	174	17	183	9.8	0.202	6.7	LOS A	0.8	6.3	0.35	0.62	0.35	52.1
6	R2	19	2	20	10.5	0.202	9.6	LOS A	0.8	6.3	0.35	0.62	0.35	51.9
Approach		193	19	203	9.8	0.202	7.0	LOS A	0.8	6.3	0.35	0.62	0.35	52.1
North: Hue Hue Road														
7	L2	8	1	8	12.5	0.005	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.1
8	T1	185	16	195	8.6	0.105	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		193	17	203	8.8	0.105	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles		688	54	724	7.8	0.202	2.8	NA	0.8	6.3	0.13	0.25	0.13	56.5

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

MOVEMENT SUMMARY

▽ Site: 101 [2027 AM + development (Site Folder: General)]

Hue Hue Road access to Warner Industrial Estate
Stage 1a & 1b only
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 6 years

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	108	22	124	20.4	0.073	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	174	17	183	9.8	0.183	7.2	LOS A	0.8	5.9	0.42	0.67	0.42	51.5
Approach		282	39	307	14.1	0.183	4.3	NA	0.8	5.9	0.25	0.40	0.25	54.6
East: Site Access Road														
4	L2	75	7	79	9.3	0.095	7.0	LOS A	0.4	2.7	0.39	0.63	0.39	52.0
6	R2	8	1	8	12.5	0.095	10.0	LOS A	0.4	2.7	0.39	0.63	0.39	51.6
Approach		83	8	87	9.6	0.095	7.3	LOS A	0.4	2.7	0.39	0.63	0.39	52.0
North: Hue Hue Road														
7	L2	19	2	20	10.5	0.012	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	229	26	264	11.4	0.145	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		248	28	284	11.3	0.145	0.4	NA	0.0	0.0	0.00	0.04	0.00	59.4
All Vehicles		613	75	678	12.3	0.183	3.1	NA	0.8	5.9	0.16	0.28	0.16	56.1

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

MOVEMENT SUMMARY

Site: 101 [2027 PM + development (Site Folder: General)]

Hue Hue Road access to Warner Industrial Estate
Stage 1a & 1b only
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 6 years

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Hue Hue Road														
2	T1	227	11	261	4.8	0.139	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	75	7	79	9.3	0.073	6.6	LOS A	0.3	2.2	0.34	0.61	0.34	51.8
Approach		302	18	340	5.9	0.139	1.6	NA	0.3	2.2	0.08	0.14	0.08	57.8
East: Site Access Road														
4	L2	174	17	183	9.8	0.207	6.8	LOS A	0.9	6.5	0.37	0.63	0.37	52.1
6	R2	19	2	20	10.5	0.207	10.0	LOS A	0.9	6.5	0.37	0.63	0.37	51.8
Approach		193	19	203	9.8	0.207	7.1	LOS A	0.9	6.5	0.37	0.63	0.37	52.0
North: Hue Hue Road														
7	L2	8	1	8	12.5	0.005	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.1
8	T1	185	16	213	8.6	0.115	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		193	17	221	8.8	0.115	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles		688	54	765	7.8	0.207	2.7	NA	0.9	6.5	0.13	0.24	0.13	56.6

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