DADDOW COURT & ABBOT DRIVE, KADINA CODE AMENDMENT

TRANSPORT INVESTIGATIONS REPORT

CIRQA™

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Client contact:	Sarah Lowe

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1. EXECUTIVE SUMMARY

CIRQA has been engaged to undertake transport investigations in relation to the potential rezoning of a parcel of land located on the north-eastern side of Kadina. Specifically, CIRQA's investigations relate to the proposed rezoning of land from Deferred Urban Zone to a Neighbourhood Zone.

This report includes assessment of the potential traffic generation associated with the proposed rezoning and redevelopment of the Affected Area, the associated impact on the adjacent existing road network and consideration of potential infrastructure provisions and upgrades. The assessment has been based on the future development of up to 250 allotments within the Affected Area.

It is anticipated that access for the Affected Area would be accommodated via connections to the existing road network immediately to the west (such as Abbott Drive, Daniel Drive, the northern end of Daddow Court and adjacent northern unmade road which could be provided as a future formalised road connection). These connections would provide for access to/from Bute Road. Additional access via residential (but undeveloped) land to the south may also be possible in the future (however this assessment has assumed the worst case of all traffic movements needing to be accommodated via Bute Road and formation of the 'eastern road' would only be required if direct property access along the eastern boundary is proposed). These access opportunities will provide connections into and through the site with associated local roads.

An assessment has been undertaken of the traffic generation associated with the future development of the Affected Area. The forecasts identify that the ultimate redevelopment of the Affected Area (if all 250 residential allotments are realised) will result in the distribution of approximately 2,000 additional daily movements (equating to 200 peak hour movements) on to the adjacent road network.

An assessment has been made of the anticipated impacts of the additional volumes (including SIDRA intersection analysis). The assessment has identified that the future traffic volumes would be easily accommodated on the surrounding road network with no change to the nature and function of any existing road or intersection (albeit, the unmade road to the north of the subject land would need to be constructed if proposed to be utilised for access).

Traffic control treatments have been identified for the intersections of Bute Road with Bowey Way (short channelised right turn) and a northern new road (basic shoulder widening). However, these may not be required should DIT accept a relocation of the speed zone changes to locate them within a 50 km/h zone

(which is considered appropriate given the increased residential development anticipated). Otherwise, there are no other notable treatments required on the adjacent road network to accommodate the additional traffic volumes.

A new internal road network will be required to provide property access for future allotments within the site. It is anticipated that the internal road network would comprise 'local roads' (with volumes less than 1,500 vehicles per day). The roads should be designed in accordance with relevant standards and guidelines to provide a low speed, walkable and cycle-able network.

2. BACKGROUND

2.1 AFFECTED AREA

The Affected Area comprises approximately 28.15 ha of land at the eastern side of the township of Kadina. The Affected Area is bound by (unmade) road reserves to the north and east, undeveloped land (zoned for residential) to the south and residential dwellings to the west. The Affected Area is illustrated in Figure 1.

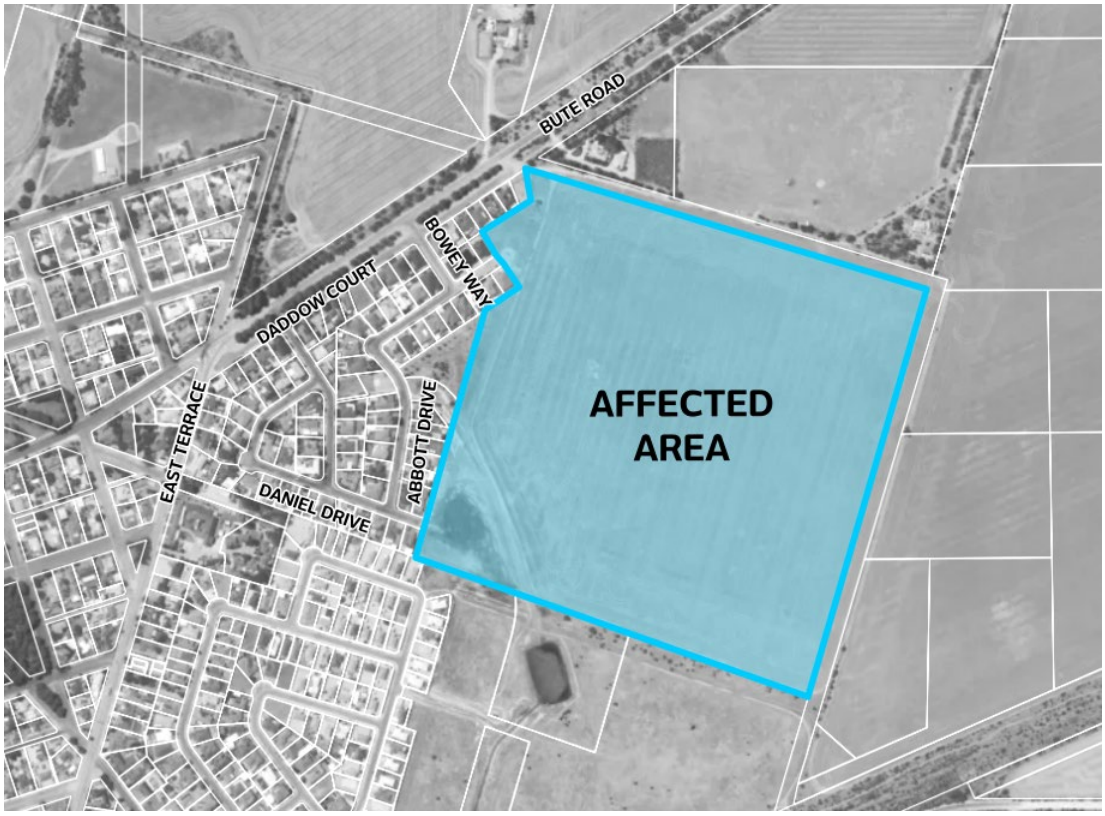

Figure 1 - Location of the Affected Area in respect to the adjacent road network

The Affected Area is currently utilised for agricultural purposes with no improvements/buildings within it. Informal access is provided via the north-western corner (via Daddow Court/Bute Road) and the south-eastern corner via the adjacent unmade road (access track). In addition, Daddow Court, Abbott Drive and Daniel Drive abut the Affected Area (and have been designed to accommodate future extensions into the Affected Area).

The Planning and Design Code identifies that the Affected Area is within a Deferred Urban Zone with the following Overlays currently applying:

- Affordable Housing;
- Hazards (Bushfire - Regional);
- Hazards (Flooding - Evidence Required);

- Key Outback and Rural Routes;
- Native Vegetation; and
- Water Resources.

2.2 ADJACENT ROAD NETWORK

The roads immediately adjacent the Affected Area (Daddow Court, Abbott Drive and Daniel Drive) are all 'local roads' under the care and control of the Copper Coast Council. The roads comprise typical local road cross sections including 15 m wide (approximate) road reserves and two-way road carriageways with widths in the order of 7.2 m to 8.0 m. Footpaths are generally provided on at least one side of these local roads. The general urban speed limit of 50 km/h applies on these local roads. Traffic volumes are not available for the adjacent local roads, however, based on the extent and type of development serviced by these roads it is anticipated that daily volumes would be less than 400 vehicles per day (and generally well below such a level).

As noted above, a number of these local roads terminate at the boundary of the Affected Area and allow for extension into it to service future development.

The adjacent local road network forms a looped network with broader access provided via two intersections on Bute Road. Bute Road is a rural arterial road under the care and control of the Commissioner of Highways (Department for Infrastructure and Transport). In the vicinity of the Affected Area, Bute Road comprises a 6 m wide (approximate) two-way carriageway with gravel shoulders either side. The speed limit on Bute Road varies with a 100 km/h zone north of the Affected Area, 80 km/h in the general vicinity of the Affected Area and a 50 km/h zone commences approximately 113 m south of the intersection Bute Road with Daddow Court/Bowey Way. DIT data indicates that the subject section of Bute Road accommodates 420 vehicles per day (vpd) of which 13% are commercial vehicles.

The two intersections on Bute Road with the local roads adjacent the Affected Area are both priority controlled (unsignalised) T-intersections. No formal turn treatments are provided at the intersections. Additionally, Daddow Court effectively functions as a service road to Bute Road (running parallel to it). The layout of the intersections of Daddow Court and both Bowey Way and McIntosh Road create four-way intersections approximately 20 m from the two intersections on Bute Road. There is no formal designation (signage or linemarking) that defines priority at these four-way intersections (which is a conflict risk and should be addressed regardless of the subject Code Amendment).

A review of the crash data from DIT (available for the 5-year period from 2017 to 2021) identifies no reported road crashes within the adjacent local roads nor on Bute Road in the vicinity of the Affected Area

2.3 PUBLIC TRANSPORT

Typical public transport services do not operate in Kadina. However, there are community transport services including the Copper Coast 'Dial-a-Ride' service (operating on Wednesdays and Fridays) and a Health Bus service (weekdays). Pick-up and drop-off for these services occurs in the township (Frances Street) abeit limited home access is available at times.

3. PROPOSED CODE AMENDMENT

3.1 REZONING AND POTENTIAL DEVELOPMENT

It is proposed to rezone the Affected Area from Deferred Urban Zone to Neighbourhood Zone. The rezoning will allow for the future division and development of the site for residential allotments and dwellings.

Based on preliminary concept planning, it is understood that a maximum of 250 dwellings could be accommodated within the Affected Area. This anticipated maximum yield has been adopted for the purposes of the transport investigations.

3.2 ACCESS PROVISIONS

It is anticipated that access to/from future development within the Affected Area could be achieved via:

- extension of the northern end of Daddow Court into the northern unmade road reserve and extension of a new formed road along the northern boundary of the Affected Area;
- connection of the northern end of Daddow Court and the (potential future) northern formed to a new intersection on Bute Road (further discussion in respect to this intersection option is provided below);
- extension of Abbott Drive into the Affected Area;
- extension of Daniel Drive into the Affected Area;
- formation of a new public road within the (unmade) road reserve on the eastern boundary of the Affected Area (which could connect to a new road along the Affected Area's northern boundary as well as other new internal roads within the Affected Area). This would only need to be formed if direct property access is proposed along the Affected Area's eastern boundary (as the 'eastern road' and associated connection south is not otherwise required from a capacity or traffic management perspective as demonstrated in the traffic impact assessment below); and
- potential connection to the undeveloped residential land to the south should it be developed in the future.

As noted above, there is potential for a connection to Bute Road at the northern end of the site (via the northern end of Daddow Court and/or a new formed road along the northern road reserve). During the site inspection, the presence of a crest in Bute Road to the north-east was identified. However, further review of sight distances available at this location (should a new intersection be provided) has identified that there would be more than sufficient sight distance provision

(in the order of 220 m Safe Intersection Sight Distance) as per the requirements of the Austroads' road design guidelines and the provisions of the Key Outback and Rural Routes Overlay. Accordingly, it is considered that an additional intersection in this location is appropriate and, taking into account the forecast volumes associated with future development of the Affected Area (assuming it is rezoned), desirable to assist with the distribution of traffic movements associated with it (refer Section 4 for further discussion on traffic volumes).

4. TRAFFIC ASSESSMENT

4.1 TRAFFIC GENERATION

Daily traffic generation rates in the order of 7.5 to 8.0 trips per dwelling are commonly applied and accepted for detached dwellings throughout South Australia (with 10% occurring during each of the am and pm peak hours). For conservatism, the higher of the above range (8.0 trips per dwelling) has been adopted for the following assessment.

On the basis of the above rates, it is forecast that future development of the Affected Area (for 250 dwellings) could generate in the order of 2,000 daily vehicle trips (or approximately 200 peak hour trips based upon 10% occurring during the peak hours).

4.2 TRAFFIC DISTRIBUTION

The vast majority (say 95%) of movements generated by the future residential development of the site would be anticipated to be distributed to/from the south (i.e. to/from the township) via Bute Road. The remaining 5% would be forecast to be distributed to/from the north via Bute Road. The distribution to Bute Road (particularly to/from the south) may reduce in the future should connections be provided through the undeveloped land to the south. Furthermore, the internal road layout would also impact the distribution of movements to/from the site. Generally, it is recommended that the road network reinforce the northern connection at the primary access to minimise distribution via the existing local roads (McIntosh Road or Bowey Way). Nevertheless, for conservatism, the following assessment it has been assumed all traffic is distributed to/from Bute Road via the connections to McIntosh Road (25% of new trips), Bowey Way (25% of new trips) and the new northern connection to Bute Road (50% of new trips).

In addition to the future movements, there are also traffic volumes associated with the existing residential area serviced by the road connections between Daddow Court and Bute Road. The adjacent (existing) residential area serviced by these connections accommodates 88 residential allotments (with no other connections providing broader accessibility for this area). Assuming the same trip generation rate adopted above, there could be in the order of 704 daily movements associated with the existing allotments (including allowance for future dwellings on vacant lots). These movements would be distributed via the existing connections to Bute Road. For the purposes of this assessment it has been assumed that 60% of these movements occur via McIntosh Road and 40% occur via Bowey Way (in reality, a small number may also occur via the informal connection at the northern end of Daddow Court).

Based on the above assumptions, an assessment of the future daily traffic volumes has been undertaken. Additionally, an assessment has also been made

of the potential distribution of the total future peak hour movements to/from these connections. The peak hour assessment has been based on the typical assumption that 10% of daily trips occur in both the am and pm peak hours. Additionally, it has been assumed that 30% of the am peak hour volumes will be ingress movements and 70% egress movements (and vice versa during the pm peak hour).

On the basis of the above assumptions and the anticipated access arrangements, Figure 2 illustrates the forecast distribution of the peak hour movements via the existing and future road network.

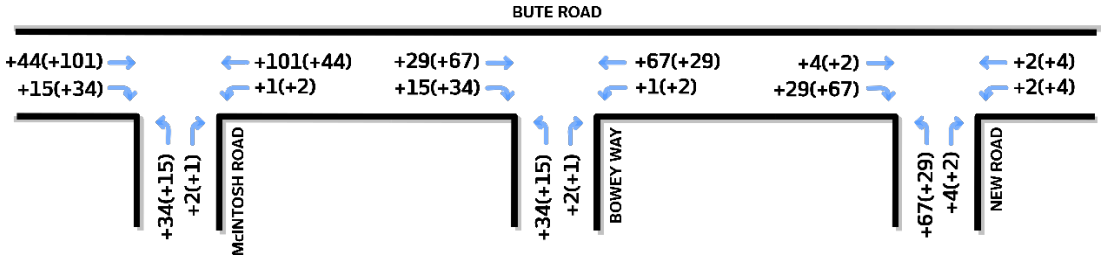

Figure 2 - Forecast distribution of additional am and (pm) peak hour movements

4.3 TRAFFIC IMPACT

Based on the above forecasts, Table 1 illustrates the forecast total future volumes on the key local roads providing access to the Affected Area. As noted above, the distributions via McIntosh Road and Bowey Way have been conservatively assessed and the impacts could be reduced (if desired) through the design of the internal road network (i.e. focussing the distribution of movements to/from the new northern connection).

Table 1 - Forecast existing and future daily traffic volumes

Road	Existing Forecast	Additional Forecast	Total Future Traffic
McIntosh Road	422 vpd	+ 500 vpd	922 vpd
Bowey Way	282 vpd	+ 500 vpd	782 vpd
New Northern Connection	0 vpd	+1,000 vpd	1,000 vpd

The above forecasts indicate that the existing connections and the new northern connection will accommodate volumes less than 1,500 vpd (the typical amenity limit adopted for local roads). These connections will accommodate the highest volumes in the adjacent residential road network, with volumes progressively reducing closer to the Affected Area. This means that all existing roads located between Bute Road and the Affected Area, as well as those within it, would function as 'local roads'. The future development of the Affected Area (in line with the anticipated yields) would not change the nature nor function of the adjacent existing roads. Should the internal road layout within the site achieve a greater

distribution of traffic to/from the northern connection, lower volumes would be realised for McIntosh Road and Bowey Way than conservatively forecast above. In such a case, higher volumes would be distributed via the new northern connection, however this would likely still accommodate less than 1,500 vpd. The ultimate distribution of traffic and associated impacts can be reviewed further as part of future land division applications once the road layout has been determined.

In respect to Bute Road, the highest distribution of daily traffic movements will be to/from the south-west (i.e. to/from the township). The highest impact would be the section south-west of McIntosh Road where the proposal would distribute in the order of 1,900 additional vehicle movements per day. Noting this section currently accommodates approximately 1,200 vpd, there would be a future volume in the order of 3,100 vpd on it. Such volumes are well within the levels associated with regional arterial roads. Again, the proposal would not change the nature nor function of Bute Road. Further discussion on peak hour conditions and specific traffic control provisions are discussed in Section 4.4 below.

Further west, the additional volumes would be distributed via both East Terrace and Graves Street (with the additional volumes less than that identified for the adjacent section of Bute Road). It is considered the additional volumes would be adequately accommodated on the broader network.

4.4 EXTERNAL INFRASTRUCTURE

Based on the forecast peak hour volumes, an assessment has been prepared of the Austroads' warrants for turn treatments at the intersections of Bute Road with McIntosh Road, Bowey Road and the new northern connection. Based on the requirements of the Austroads' road design guidelines, all three intersections align with the requirement for Basic Auxiliary Left and Right (BAL/BAR) turn treatments. Such a treatment is the lowest form of treatment identified by the Austroads' guidelines and effectively comprises shoulder widening to allow for throughbound vehicles on a priority approach to pass others being turned into a minor leg at an intersection.

Given the McIntosh Road/Bute Road intersection is located within the section of Bute Road to which a 50 km/h speed limit applies, the current intersection layout is considered appropriate (i.e. it would be unusual to provide designated shoulders within an urban road environment and not considered necessary given the low speeds).

The forecast volumes for the intersection of Bute Road with Bowey Road would warrant provision of a short channelised right turn lane – CHR(s) treatment – based on the current 80 km/h speed limit (with only basic auxiliary treatment required for the left turn). For the new intersection (northern access) with Bute

Road, the volumes would only warrant the basic BAL and BAR treatments. The BAL and BAR treatments will effectively require in the order of 3.0 m of shoulder adjacent the traffic lanes on each approach (and, desirably, would be sealed). A greater distribution of movements via the northern intersection (depending on the future internal road layout provided within the Affected Area) could result in a warrant for a CHR(s) treatment and this could be confirmed as part of future land division application(s). As with the Bowey Way intersection, such a treatment would not be required if the speed limit is reduced to 50 km/h at this location (regardless of a higher distribution via this intersection).

Notwithstanding the above, it is considered that with increased residential development serviced by the subject section of Bute Road, there would be reasonable justification for relocation of the speed zone changes further to the north-east to result in these two intersections (and, desirably, the northern intersection) being within a 50 km/h. If this was achieved, it is considered that standard urban intersection layouts could be adopted (i.e. Bowey Way/Bute Road intersection could remain as per the current arrangement). Most notably, the separated/channelised right turn treatment for the intersection of Bowey Way/Bute Road would not be warranted with a reduced speed limit. During consultation, DIT would not commit to relocation of the speed zones but advised this could be considered in the future should the rezoning be undertaken and as development is planned and designed.

SIDRA analysis has been prepared for the three intersections to further consider future conditions (detailed results are provided in Appendix A). To provide a worst-case assessment, it has been assumed that no passing opportunities on the approaches are provided (i.e. no allowance for channelised or basic widening treatments). The SIDRA analysis indicates that the future peak hour volumes will be easily accommodated with negligible impact on through bound movements on Bute Road. All movements at each intersection will be associated with a Level of Service 'A' (the best Level of Service achievable).

In addition to the intersection treatments on Bute Road, it is noted that the intersections of Daddow Court with both McIntosh Road and Bowey Way form four-way intersections. The intersections currently have no traffic control defining priority at the intersections. This is a conflict risk which would be increased with the additional traffic generated by future development of the Affected Area. It is recommended that Give Way holding bars and signage be assigned on the Daddow Court approaches to the two intersection (giving priority to vehicles travelling between Bute Road and Bowey Way or McIntosh Road) to ameliorate this risk. Such a treatment should be undertaken regardless of the Code Amendment proposal.

Additional external works will be required within the unmade road reserve to the north and east of the Affected Area (where required for either direct property access and/or connections to the future internal road network within the Affected Area). Given the construction of this road would effectively form part of the internal network, it should be designed and constructed in line with the provisions outlined in Section 4.5.

4.5 INTERNAL INFRASTRUCTURE

Future development of the Affected Area (should it be rezoned) would require a new public road network. While subject to ultimate yields, given the access provisions available and forecast volumes, it is anticipated that the future roads would all function as 'local roads' (i.e. with traffic volumes less than 1,500 vpd). The internal road network could therefore adopt similar design provisions (such as cross sections) as that adopted for the adjacent existing residential development to the west (i.e. Abbott Drive, Daniel Drive etc.).

The future road network should:

- avoid creation of four-way intersections (or where proposed be appropriately treated – i.e. with a roundabout);
- include adequate turnaround provisions for any dead-end roads including allowance for fire appliance access as per the Hazards (Bushfire – Regional) Overlay and the *"Minister's Code - Undertaking Development in Bushfire Protection Areas"*;
- include allowance for footpaths on at least one side of each road provided;
- consider opportunities for cyclist facilities and connectivity (given the anticipated 'local road' nature of the network, cyclists can share the footpaths with pedestrians or road carriageway's with vehicles, however there may be opportunities for shared paths within proposed open space areas);
- ensure roads and intersections are designed to adequate accommodate commercial vehicles for movements such as refuse collection and emergency services access;
- ensure sufficient opportunities for on-street parking. The Planning and Design Code's 'Design in Urban Areas' section identifies a Deemed-to-Satisfy/Designated Performance Feature for 0.33 on-street spaces per dwelling. Whether or not this DTS/DPF criteria will ultimately apply to the Affected Area, such a level is considered a reasonable benchmark; and
- allow for adequate access to/from each allotment in line with the provisions for driveways/crossovers as outlined in the Planning and Design Code.

APPENDIX A

SIDRA RESULTS

MOVEMENT SUMMARY

Site: 101 [FUPM - BUTE RD X NEW ROAD (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: New Road (S)															
1	L2	All MCs	31	2.0	31	2.0	0.021	5.7	LOS A	0.1	0.6	0.11	0.54	0.11	52.5
3	R2	All MCs	2	2.0	2	2.0	0.021	6.3	LOS A	0.1	0.6	0.11	0.54	0.11	52.2
Approach			33	2.0	33	2.0	0.021	5.7	LOS A	0.1	0.6	0.11	0.54	0.11	52.5
East: Bute Rd (E)															
4	L2	All MCs	4	2.0	4	2.0	0.022	5.6	LOS A	0.0	0.0	0.00	0.06	0.00	56.8
5	T1	All MCs	36	13.0	36	13.0	0.022	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	59.4
Approach			40	11.8	40	11.8	0.022	0.6	NA	0.0	0.0	0.00	0.06	0.00	59.1
West: Bute Rd (W)															
11	T1	All MCs	106	13.0	106	13.0	0.100	0.0	LOS A	0.4	2.8	0.10	0.24	0.10	57.4
12	R2	All MCs	71	2.0	71	2.0	0.100	5.7	LOS A	0.4	2.8	0.10	0.24	0.10	54.7
Approach			177	8.6	177	8.6	0.100	2.3	NA	0.4	2.8	0.10	0.24	0.10	56.3
All Vehicles			249	8.3	249	8.3	0.100	2.5	NA	0.4	2.8	0.08	0.25	0.08	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [FUAM - BUTE RD X MCINTOSH RD (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Mcintosh Rd (S)															
1	L2	All MCs	65	2.0	65	2.0	0.056	6.5	LOS A	0.2	1.5	0.34	0.59	0.34	51.8
3	R2	All MCs	4	2.0	4	2.0	0.056	7.3	LOS A	0.2	1.5	0.34	0.59	0.34	51.5
Approach			69	2.0	69	2.0	0.056	6.5	LOS A	0.2	1.5	0.34	0.59	0.34	51.8
East: Bute Rd (E)															
4	L2	All MCs	2	2.0	2	2.0	0.142	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	57.3
5	T1	All MCs	252	13.0	252	13.0	0.142	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			254	12.9	254	12.9	0.142	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Bute Rd (W)															
11	T1	All MCs	116	13.0	116	13.0	0.085	0.0	LOS A	0.2	1.6	0.16	0.19	0.16	58.2
12	R2	All MCs	28	2.0	28	2.0	0.085	7.6	LOS A	0.2	1.6	0.16	0.19	0.16	55.5
Approach			144	10.8	144	10.8	0.085	1.5	NA	0.2	1.6	0.16	0.19	0.16	57.6
All Vehicles			467	10.6	467	10.6	0.142	1.5	NA	0.2	1.6	0.10	0.15	0.10	57.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [FUPM - BUTE RD X MCINTOSH RD (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Mcintosh Rd (S)															
1	L2	All MCs	28	2.0	28	2.0	0.022	5.9	LOS A	0.1	0.6	0.22	0.54	0.22	52.1
3	R2	All MCs	2	2.0	2	2.0	0.022	7.3	LOS A	0.1	0.6	0.22	0.54	0.22	51.9
Approach			31	2.0	31	2.0	0.022	6.0	LOS A	0.1	0.6	0.22	0.54	0.22	52.1
East: Bute Rd (E)															
4	L2	All MCs	4	2.0	4	2.0	0.067	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	57.2
5	T1	All MCs	116	13.0	116	13.0	0.067	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach			120	12.6	120	12.6	0.067	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
West: Bute Rd (W)															
11	T1	All MCs	241	13.0	241	13.0	0.175	0.0	LOS A	0.4	3.3	0.12	0.16	0.12	58.3
12	R2	All MCs	65	2.0	65	2.0	0.175	6.4	LOS A	0.4	3.3	0.12	0.16	0.12	55.5
Approach			306	10.7	306	10.7	0.175	1.4	NA	0.4	3.3	0.12	0.16	0.12	57.7
All Vehicles			457	10.6	457	10.6	0.175	1.4	NA	0.4	3.3	0.09	0.15	0.09	57.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [FUAM - BUTE RD X BOWEY WAY (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Bowey Way (S)															
1	L2	All MCs	55	2.0	55	2.0	0.043	6.2	LOS A	0.2	1.2	0.28	0.56	0.28	52.0
3	R2	All MCs	3	2.0	3	2.0	0.043	6.7	LOS A	0.2	1.2	0.28	0.56	0.28	51.7
Approach			58	2.0	58	2.0	0.043	6.2	LOS A	0.2	1.2	0.28	0.56	0.28	51.9
East: Bute Rd (E)															
4	L2	All MCs	2	2.0	2	2.0	0.103	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.3
5	T1	All MCs	182	13.0	182	13.0	0.103	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
Approach			184	12.9	184	12.9	0.103	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
West: Bute Rd (W)															
11	T1	All MCs	87	13.0	87	13.0	0.065	0.0	LOS A	0.2	1.2	0.14	0.18	0.14	58.2
12	R2	All MCs	24	2.0	24	2.0	0.065	6.8	LOS A	0.2	1.2	0.14	0.18	0.14	55.4
Approach			112	10.6	112	10.6	0.065	1.5	NA	0.2	1.2	0.14	0.18	0.14	57.6
All Vehicles			354	10.4	354	10.4	0.103	1.5	NA	0.2	1.2	0.09	0.15	0.09	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [FUPM - BUTE RD X BOWEY WAY (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Bowey Way (S)															
1	L2	All MCs	24	2.0	24	2.0	0.018	5.8	LOS A	0.1	0.5	0.19	0.54	0.19	52.2
3	R2	All MCs	2	2.0	2	2.0	0.018	6.8	LOS A	0.1	0.5	0.19	0.54	0.19	52.0
Approach			26	2.0	26	2.0	0.018	5.9	LOS A	0.1	0.5	0.19	0.54	0.19	52.2
East: Bute Rd (E)															
4	L2	All MCs	3	2.0	3	2.0	0.051	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	57.2
5	T1	All MCs	87	13.0	87	13.0	0.051	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach			91	12.6	91	12.6	0.051	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
West: Bute Rd (W)															
11	T1	All MCs	173	13.0	173	13.0	0.136	0.0	LOS A	0.4	3.0	0.12	0.19	0.12	58.0
12	R2	All MCs	65	2.0	65	2.0	0.136	6.1	LOS A	0.4	3.0	0.12	0.19	0.12	55.2
Approach			238	10.0	238	10.0	0.136	1.7	NA	0.4	3.0	0.12	0.19	0.12	57.2
All Vehicles			355	10.1	355	10.1	0.136	1.6	NA	0.4	3.0	0.09	0.17	0.09	57.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [FUAM - BUTE RD X NEW ROAD (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: New Road (S)															
1	L2	All MCs	71	2.0	71	2.0	0.049	5.7	LOS A	0.2	1.4	0.13	0.54	0.13	52.4
3	R2	All MCs	4	2.0	4	2.0	0.049	5.9	LOS A	0.2	1.4	0.13	0.54	0.13	52.2
Approach			75	2.0	75	2.0	0.049	5.7	LOS A	0.2	1.4	0.13	0.54	0.13	52.4
East: Bute Rd (E)															
4	L2	All MCs	2	2.0	2	2.0	0.027	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	57.1
5	T1	All MCs	46	13.0	46	13.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.7
Approach			48	12.5	48	12.5	0.027	0.2	NA	0.0	0.0	0.00	0.03	0.00	59.6
West: Bute Rd (W)															
11	T1	All MCs	36	13.0	36	13.0	0.038	0.0	LOS A	0.1	1.1	0.11	0.28	0.11	57.1
12	R2	All MCs	31	2.0	31	2.0	0.038	5.7	LOS A	0.1	1.1	0.11	0.28	0.11	54.4
Approach			66	7.9	66	7.9	0.038	2.6	NA	0.1	1.1	0.11	0.28	0.11	55.8
All Vehicles			189	6.8	189	6.8	0.049	3.2	NA	0.2	1.4	0.09	0.32	0.09	55.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.