Campbelltown Road Upgrade

Traffic and Transport Modelling - Peer Review

transportation planning, design and delivery

14S1105000 16/12/13

GTAconsultants

Campbelltown Road Upgrade

Traffic and Transport Modelling - Peer Review

Issue: B 16/12/13

Client: Roads and Maritime Services
Reference: 14S1105000

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A-Dr	04/10/13	Draft	Emma A Reeves	Reece Humphreys	Reece Humphreys	Reece Humphreys
A	20/11/13	Final	Emma A Reeves	Reece Humphreys	Reece Humphreys	RH
B	16/12/13	Updated with client comments	Emma A Reeves	Reece Humphreys	Reece Humphreys	

TIA/RSAMA – VIC 130913 v7.4)

GTAconsultants
MELBOURNE · SYDNEY · BRISBANE · CANBERRA
ADELAIDE · GOLD COAST · TOWNSVILLE
www.gta.com.au

Table of Contents

1. Introduction

1.1 Background

A traffic and transport assessment report has been prepared by AECOM (dated 11 March 2013) as part of the Campbelltown Road Upgrade proposal for the NSW Roads and Maritime Services (RMS). The purpose of the report was to assess the operational performance of key intersections and road network at the ultimate (2036) and staged (2026) design years. The Review of Environmental Factors (REF) was placed on public display from April 2013 and submissions related to traffic review have been received. This independent peer review was undertaken in response to community concerns and this review focuses only on the traffic and transport modelling elements of the assessment, mainly the SIDRA analysis, to determine their methodology as part of this assessment. The assessment also reviewed the operational impacts along Campbelltown Road to property, freight, public transport, pedestrians and cyclists.

GTA Consultants was commissioned by NSW RMS to undertake a peer review of the traffic assessment set out in the AECOM Report.

1.2 Purpose of This Report

The purpose of this report is to give Roads and Maritime Services a level of confidence that the assessment undertaken for REF followed standard traffic engineering and transport modelling industry practises, and that the recommendations and outcomes of the report are feasible in traffic and transport terms.

This peer review focuses on the following key areas of the AECOM Report:

i a general overview of the AECOM Report in relation to the subject corridor's context in the transport system
ii traffic generation, distribution and assignment methodologies adopted for the analysis
iii the use of the future year and forecasted volumes obtained from the Sydney Strategic Transport Model (SSTM)
iv the inputs and assumptions used as part of the SIDRA intersection analysis
v SIDRA intersection performance outputs
vi the use and interpretation of the items listed above.

1.3 Referenced Documents

In preparing this report, reference has been made to a number of background documents, including:

- Campbelltown Road Upgrade Review of Environmental Factors, Roads and Maritime Services, Traffic and Transport Modelling Assessment, AECOM, 11 March 2013
- Edmondson Park South Transport Management and Accessibility Plan, AECOM, 2010
- SIDRA files as provided by AECOM and RMS
- link volumes for the upgrade and no build scenarios
- other documents as nominated within this report.

2. Review of Traffic and Transport Modelling

2.1 Existing Traffic Data

A substantial amount of traffic data appears to have been obtained from a number of sources including:

- AADT Traffic Counts at permanent Roads and Maritime Services stations between 1996 and 2005
- Mid-block counting stations along Campbelltown Road in October 2011
- Manual traffic counts at key intersections on Campbelltown Road in October 2011

The locations of the count stations appears to be suitable for this study in that they provide a reasonable representation of the traffic conditions on Campbelltown Road. We note that the mid-block traffic volume data collated by RMS (former RTA) in October 2011 appears to be low in comparison to 2005 Annual Average Traffic Data (AADT), however we recognise data from the sampled week is a smaller sample compared to the permanent data type.

The report indicates that the count data is also used to determine the traffic distribution on Campbelltown Road. From the data and information obtained from AECOM, we are unable to verify how the distribution was used and how (or if) they were applied to determine future year flows. It is suggested that this be verified.

Further interrogation of the data utilised, and how it was utilised for the analysis may be warranted subject to the outcome of the items described further in the report.

2.2 Mid-block Capacity Assessment

The operational assessment includes a review of the theoretical mid-block assessment using Austroads Guide to Traffic Management Part 3.

We have undertaken a review of the mid-block Volume Capacity Ratio (V/C) calculations undertaken by AECOM and are satisfied that these are accurate. We concur with the conclusion and the results which suggest that the current traffic flow on Campbelltown Road is under capacity with exception of eastbound/northbound direction between Macdonald Road and the Hume Motorway On-Ramp.

2.3 Existing Intersection Performance

The operation of the key intersections along Campbelltown Road have been assessed by AECOM using *SIDRA INTERSECTION*[1], a computer based modelling package which calculates intersection performance. It is understood that some of the intersections were analysed by Roads and Maritime Services and the remaining prepared by AECOM. For the purposes of this report, all intersections are referred to as AECOM intersections.

Each model was developed based on the information and assumptions set out in the AECOM report. The following comments are provided in relation to the key assumptions adopted:

- Traffic volumes were based on manual traffic counts commissioned by Roads and Maritime Services in October 2011.

[1] Program used under license from Akcelik & Associates Pty Ltd.

- Intersection configurations were sourced from Roads and Maritime Services traffic signal plans, Road Browser and Google Earth 2011. It is recognised that verification of road layouts should still be undertaken using a detailed site inspection as operating conditions often differ from those gained from aerial photography checks and the like.
- The pedestrian volumes were estimated to be between 10 and 20 pedestrians per hour.
- Signal phasing information was obtained from Roads and Maritime Services traffic signal plans and SCATS Traffic Access Software. As per the above, a site inspection should be undertaken to confirm actual operating conditions, as often changes to SCATS operation are adopted without updating traffic signal plans.

We have interrogated the existing condition SIDRA models in terms of inputs and assumptions and have separated our comments into 'general' that apply to all models followed by specific comments on the intersections assessed.

General Comments on SIDRA analysis

- Peak flow factors of 100% appear to have been adopted in all options. A peak flow factor of 100% indicates that approach demands are constant over the entire peak hour. This in turn results in a reduced stated 95th percentile queue length thus understating its operation. Without access to the raw data, we are unable to verify whether or not the peak flow factors are suitable.
- Heavy vehicle percentages appear to have been based on the count information which is good practice.
- Some of the intersections had cycle times that were manually input (assumed to be based on SCATS) whilst other intersections used the cycle time determined by the software.
- Further to the above, some of the cycle times determined from the software are unreasonably low, resulting in unrealistic outputs such as queue lengths. In traffic signal operation, lower cycle times mean that vehicles have a shorter waiting time thus resulting in shorter queue lengths.
- It is unclear as to whether or not the outputs have been checked, verified or calibrated to actual observed on site conditions. This should be undertaken to verify lane utilisation, operation, queue lengths and cycle times.
- The north approach could be classed as "favourable" given its proximity to Camden Valley Way.
- From Google map street view, Campbelltown Road sign posted speeds appear to be 70km/hr south of Lawson Road and 80km/hr north of Lawson Road. However these needs to be validated by another source or site inspection as this data may be old. It is noted that the models have varying speed limits as stated in the following summary.
- In some instances, consideration of signal linking has not been taken into consideration. For example Glenfield Road is located in close proximity to Camden Valley Way which is likely to result in a "favourable" arrival type from the north, thus resulting in a lower overall queue length.

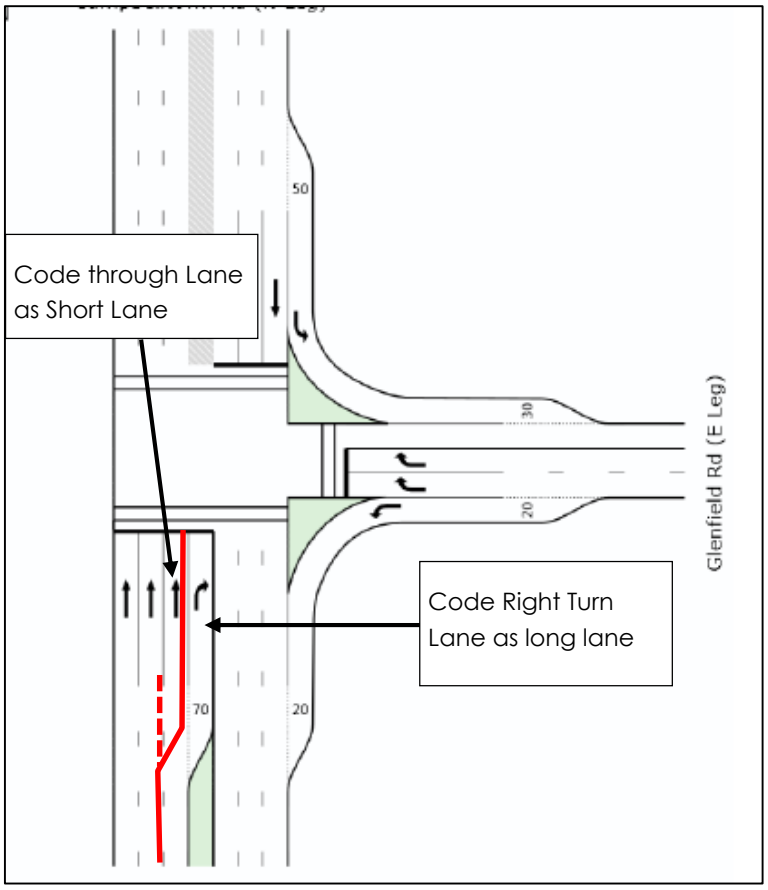
Campbelltown Road / Glenfield Road

- Based on a review of the aerial photograph, formal/signalised pedestrian crossings across Campbelltown Road do not exist, however these have been included in the analysis. The model should reflect the existing operation and configuration.
- The cycle time of 152 (AM) and 144 (PM) seconds that has been adopted for this intersection appears high, however it is recognised that this is probably due to signal

linking of the adjacent intersection of Camden Valley Way, as such this is considered acceptable.

- The Degree of Saturation (DOS) of 1.0 in the AM peak is due to the right turning phase overspilling. Whilst the modelling recognises that this is an issue, the coding should have used the inside through lane as a 'de-facto' right turn lane indicating that the intersection is actually not oversaturated. This is common practice with SIDRA in these types of arrangements.

Figure 2.1: Coding of Right Turn Lane with Overspill



- The right turn phase is filtered which is an uncommon practice across three opposing lanes. We note that this may actually occur in practice at this intersection, and should be verified.
- It has been modelled as 60km/hr along Campbelltown Road where it is understood to be 80km/hr. The speed limit needs to be validated.

Campbelltown Road / Beech Road

- "User given" phase times have not been used as part of this assessment. That is, the phase times have been determined by the software which could provide an unrealistic cycle time and operating conditions. It is suggested this be checked against on-site conditions or through SCATS.

Campbelltown Road / Ingleburn Gardens Drive

- "User given" phase times have resulted in Cycle times of 52 (AM) and 60 (PM) seconds for this intersection. As discussed previously, low cycle times result in shorter modelled queue lengths.

- The left turn slip lanes have pedestrian crossings that are not taken into account, whilst it is recognised that the pedestrian volumes are likely low, these may impact on the outputs provided.
- It has been modelled as 70km/hr along Campbelltown Road where it is understood to be 80km/hr. The speed limit needs to be validated.

Campbelltown Road / MacDonald Road

- "User given" phase times have been used for this assessment. As discussed previously, these low cycle times result in shorter queue lengths.

Summary

In summary, there are many issues highlighted above that would impact on the results presented as part of the analysis. It is recognised that the existing conditions results may not have a direct impact on the future year modelling due to volume and network changes, however these issues, when coupled together change the way the data and outputs are interpreted.

Nevertheless, we note that updating the models with the issues highlighted above are not likely to result in any major fundamental changes to outcomes of the report.

2.4 Strategic Modelling

The future year volumes for the assessment where obtained from a combination of the Roads and Maritime Services EMME strategic model (Sydney Strategic Transport Model SSTM) as well as the Edmondson Park TMAP report.

The SSTM is a two hour AM and PM peak model that covers the Sydney metropolitan area. For studies such as this, it is good practice that model refinements are undertaken such as network refinements and zone desegregation as this enables the model within the study area to more accurately reflect the operating conditions of the network.

The importance and need for a check or validation of the strategic modelling suitability is important to ensure that future year increases are relative and sensible. An example of this is observed in the count data in Table 8 of the AECOM report which indicated that Campbelltown Road currently has 1,900 vehicles per hour, whilst the modelled volumes in Table 9 indicates two way volumes in the order of 2,300 vehicles per hour. This discrepancy may result in an overestimate (or underestimate) in growth on Campbelltown Road for future forecasting.

With regard to the land use, we recognise that the report discusses forecast population changes, this is covered by LGA's only and does not indicate specifically where the land use change occurs. As such, these may change the future year travel patterns.

2.5 Future Year Modelling Data and Sources

As the AECOM report states, growth rates have been determined from the SSTM and TMAP report. Whilst link plots have been provided, the actual and resultant turning movements have not been provided, as such are unable to be verified.

Upon review of the SIDRA models, there are some discrepancies in volumes that may require further justification.

For example, the existing right turning volumes at the Glenfield Road intersection is in the order of 322 vehicle movements, by 2026 this drops to approximately 50 vehicle movements (AM peak). It

is considered unrealistic that this volume would drop so significantly, particularly with increased land use, and as such is questionable.

The growth rate of 1.8% and 1.1% per annum for the linear growth appears reasonable for these types of growth areas.

The sensitivity analysis of 30% reduction in traffic attractors and generators appears reasonable. Our interpretation of how this has applied to the modelling via the sensitivity analysis is that all turning movements have been reduced by 30%. Whilst a 'blanket' approach to the reduction may be a simple way to assess such an outcome, it does not cater for the possibility of through trips or trips outside of the study area, which could have impacts on the outcomes of the analysis.

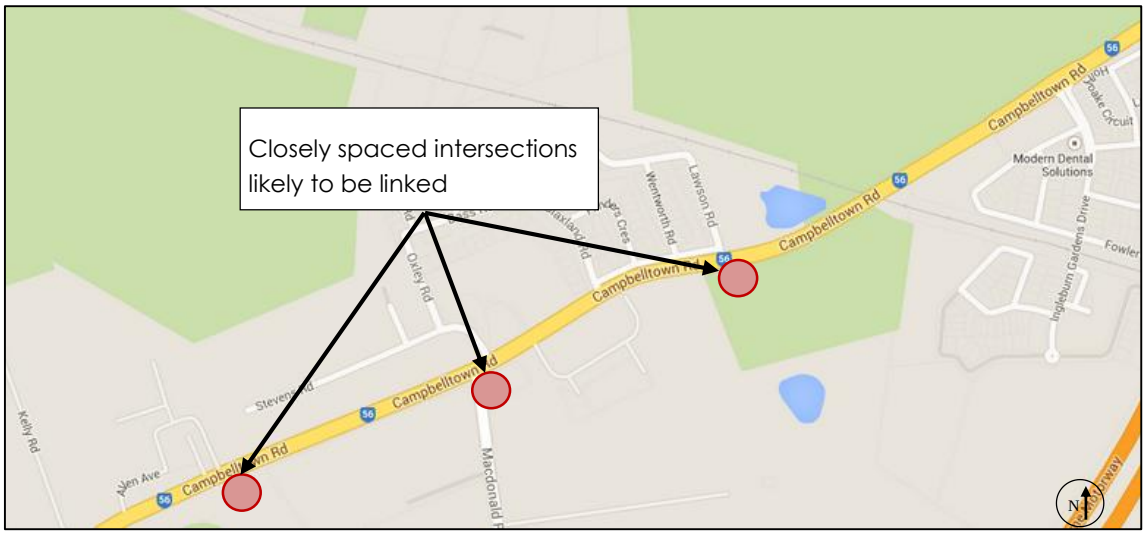
2.6 Traffic assessment

The future year (2026 and 2036) models have been interrogated in terms of inputs and assumptions and we have separated the 'general' comments that apply to all models followed by specific comments on the intersections assessed. It is recognised that the majority of the comments apply to both the 2026 and 2036 models however this review has a larger focus on the 2026 results due to the repetitive nature of the items identified.

General Comments on SIDRA analysis

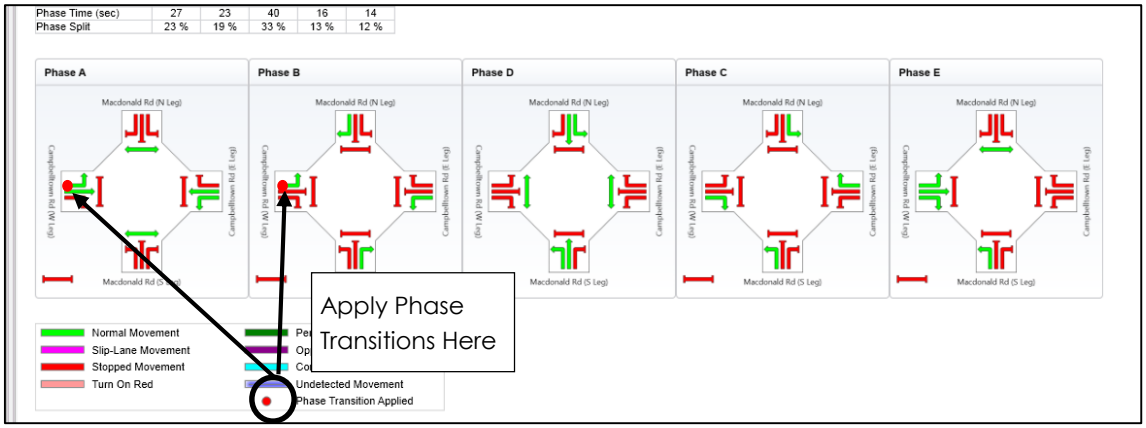
- As with the existing conditions, Peak flow factors of 100% have been adopted in all options. A peak flow factor of 100% indicates that approach demands are constant over the entire peak hour. This in turn results in a reduced stated 95th percentile queue length thus understating its operation. Typically it is good practice for peak flow factors of 95% to be adopted, particularly where it is expected that congestion is alleviated (which is assumed in this case at this location).
  The US Highway Capacity Manual (HCM) 2010, Chapter 18 recommends 92 per cent if total entering volume ≥ 1,000 veh/h and 0.90 if total entering volume < 1,000 veh/h.
  This in turn results in a reduced stated 95th percentile queue length thus understating its operation. Typically, peak flow factors of 95% are adopted for these models, particularly where it is expected that congestion is alleviated.
- Heavy vehicle percentages are inconsistent throughout the models, and are no higher than 2% in most cases. It is unclear as to the justification of a reduction in these percentages in the future year models, particularly as this information is provided for the existing conditions.
- The linking of intersections does not appear to have been considered. By 2026, the new intersection of Lawson Road, Macdonald Road and East Town Centre Road will be spaced within 400 – 500m of one another. At this spacing, it is likely that SCATS will link the operation of these intersections, requiring them to operate using the same cycle times. These are likely to be in excess of 100 seconds per cycle. As stated previously, longer cycle times result in longer queue lengths, and the anticipated volumes through this section may have downstream impacts on one another.

Figure 2.2: Closely Spaced Intersections



- Some of the intersections had cycle times that were manually input (assumed to be based on SCATS) whilst other intersections used the cycle time determined by the software. There are inconsistencies in the cycle times adopted across the network.
- Phase transitions should be coded into the model between phases. A phase transition is when a movement runs in two phases concurrently, the model recognises then as a continuous phase, whilst in reality they are likely to have a period of 'red' between cycles.

Figure 2.3: Application of Phase Transition



- Arrival type has not been considered in any of the closely spaced intersections.
- It appears that the same speed limit has been adopted as the existing condition, the proposed sign posted speeds are not clear from the information provided.

Campbelltown Road / Glenfield Road

- Further to the comment on the existing conditions, pedestrian movements are provided at this intersection. In addition, the double right turn movement from Glenfield Road operates at the same time as the pedestrian phase which is unsafe practice.
- Heavy vehicle proportions are lower than the existing conditions. It is suggested these be verified.
- The future right turn volumes into Glenfield Road are much lower than existing, however the storage length has increased to 160m.

- The cycle time of 80 seconds (AM peak) adopted has been determined from the software package. This is unlikely given that the intersection is located close to the Camden Valley Way intersection. This is further supported by the existing conditions cycle times of 152 seconds.

Campbelltown Road / Beech Road

- Cycle times of 160 seconds and 140 seconds have been adopted for the AM and PM peak periods. The expected future year volumes are quite high and as such the intersection is likely to be linked via SCATS to the Glenfield Road intersection.
- Heavy vehicle percentages of 2% are inconsistent with existing conditions.

Campbelltown Road / New Macdonald Road

- Cycle times of 110 seconds and 105 seconds for the AM and PM peak appear sensible. Lower cycle times are conducive for pedestrians in that there is less wait time.
- The phases adopted have the pedestrian phase and right turn phase running at the same time, resulting in an unsafe outcome. Whilst changing this may not impact on the outcome of the results, it is unrealistic in its input.

Campbelltown Road / Croatia Avenue

- Cycle times of 90 seconds have been adopted in both peak periods. It is recognised that lower cycle times are better for pedestrian accessibility and this cycle time may be unrealistic.
- Heavy vehicle percentage of 4% has been adopted on Campbelltown Road and 0% has been adopted on Croatia Avenue. Whilst these figures may appear reasonable (based on 2011 data at Campbelltown Road/Macdonald Road), justification of the values should be stated.

Campbelltown Road / East Town Centre Road

- Cycle times of 90 seconds and 135 seconds for the AM and PM peak have been adopted. Refer to comment above regarding intersection linking and phase times.
- Heavy vehicle percentage of 4% has been adopted on Campbelltown Road and 0% has been adopted on East Town Centre Road. Whilst these figures may appear reasonable (based on 2011 data at Campbelltown Road/Macdonald Road), justification of the values should be stated.

Campbelltown Road / Ingleburn Gardens Drive

- Cycle times of 140 seconds have been adopted in both peak periods. Refer to the comment above regarding intersection linking, most likely with Macdonald Road as the controlling or primary intersection.
- The left turns are fully controlled, it is not clear as to the reasoning for this (perhaps sight lines) and this should be verified.

2.7 Likely Impact of Issues identified

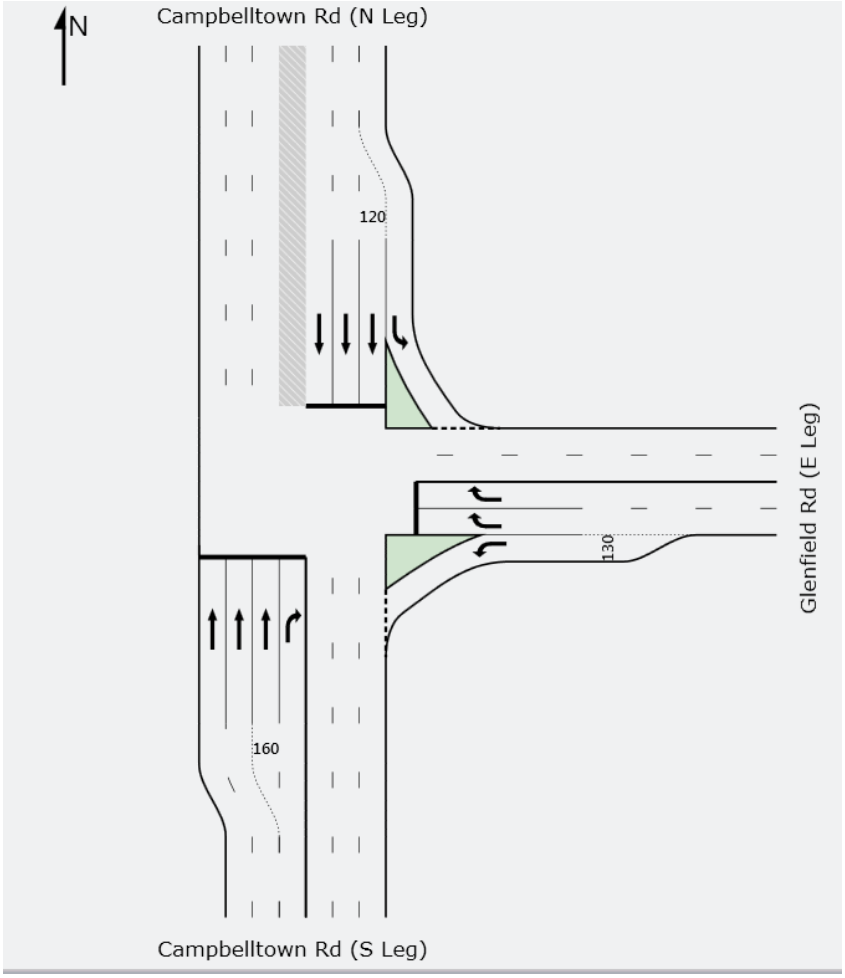
There are a number of issues with the analysis that have been identified in this report. In isolation, each of the issues are likely to have a minor impact on the model outcomes or results, however when factoring in multiple updates to the SIDRA models, the resultant outputs are likely to changes as a result.

To demonstrate the impact of the issues highlighted, the intersection of Glenfield's Road in 2036 has been updated as follows:

- Fully controlled right turn into Glenfield Road (noting this will be required to be confirmed on site).
- Cycle time of 152 seconds, similar to existing conditions and the likely cycle time of Camden Valley Way.
- The peak flow factor has been reduced to 95%.
- Heavy vehicle percentages have been adopted per the existing arrangement.
- The right turn volume has been increased to the existing levels (assumption).
- Signposted speeds of 70kph have been adopted.
- Re-coding of the left turn lane on Campbelltown Road north approach as a defacto normal lane and short through lane.
- Re-coding of the right turn lane on Campbelltown Road south approach as a defacto normal lane and short through lane.
- Approach type from the north as "favourable" noting that this is the off peak direction so may need some further justification.

The proposed Campbelltown Road / Glenfield Road intersection layout modelled in SIDRA is shown in Figure 2.4 and the comparison of results shown in Figure 2.1 thereafter.

Figure 2.4: Proposed Campbelltown Road / Glenfield Road Intersection Layout



A comparison of the reported 2036 DOS and queue length values in AM peak period is provided in the following table.

Table 2.1: Impact of Suggested Changes at Glenfield Road – AM Peak

Approach	AECOM DOS	GTA DOS	AECOM Longest Queue (m)	GTA Longest Queue (m)
South	0.580	0.720	115	227
East	0.627	0.720	84	178
North	0.879	0.732	196	209

It is clear that the changes proposed have a profound or stated impact on DOS and more importantly, queue length. This is obviously important in this regard, as queue lengths are used to determine lane lengths etc. Also, the results show that the queue length to the north may impact operation of the Camden Valley Way Intersection.

A full intersection summary is provided in Appendix A.

3. Conclusions and Recommendations

Based on the analysis and discussions presented within this report, the following comments are made:

i Minimal data was provided in terms of future year traffic volumes, and this was unable to be verified.

ii The SIDRA models include a number of inconsistencies ranging from input data and Peak Flow Factor values, heavy vehicle percentages and cycle times. These are detailed within the body of this report.

iii The linking of intersections and impacts of upstream and downstream conditions should be taken into consideration, particularly the proposed closely spaced intersections either side of Macdonald Road.

In summary, it is our view that the results provided from the SIDRA analysis are not acceptable and as such not suitable for use. It is recommended that the items listed in this report be verified and updated prior to being adopted for further use and planning as part of this study.

Appendix A

SIDRA Intersection Results

MOVEMENT SUMMARY

Site: 2036 AM Peak

Campbelltown Rd and Glenfield Rd 2036 AM Peak
Signals - Fixed Time Cycle Time = 152 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Campbelltown Rd (S Leg)											
2	T	1967	3.0	0.606	16.3	LOS B	31.6	226.9	0.61	0.56	39.8
3	R	339	5.3	0.720	62.9	LOS E	22.8	167.1	0.97	0.86	22.1
Approach		2306	3.3	0.720	23.1	LOS B	31.6	226.9	0.66	0.60	35.6
East: Glenfield Rd (E Leg)											
4	L	74	8.6	0.101	12.7	LOS A	1.4	10.2	0.31	0.66	44.7
6	R	725	6.0	0.720	60.8	LOS E	24.2	177.9	0.96	0.86	22.5
Approach		799	6.2	0.720	56.4	LOS D	24.2	177.9	0.90	0.84	23.6
North: Campbelltown Rd (N Leg)											
7	L	678	5.0	0.520	9.1	LOS A	4.2	30.8	0.11	0.63	48.2
8	T	1186	15.0	0.732	44.6	LOS D	26.4	208.5	0.85	0.75	26.0
Approach		1864	11.4	0.732	31.7	LOS C	26.4	208.5	0.58	0.71	31.3
All Vehicles		4969	6.8	0.732	31.7	LOS C	31.6	226.9	0.67	0.68	31.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Processed: Tuesday, 19 November 2013 4:55:23 PM
SIDRA INTERSECTION 5.1.13.2093
Project: X:\14S1100-1199\14S1105000 Traffic Peer Review - Campbelltown Road\Modelling\Campbelltown Rd_Glenfield RdRH.sip
8000056, GTA CONSULTANTS, ENTERPRISE

SIDRA INTERSECTION

Melbourne

A Level 25, 55 Collins Street
PO Box 24055
MELBOURNE VIC 3000
P +613 9851 9600
F +613 9851 9610
E melbourne@gta.com.au

Sydney

A Level 6, 15 Help Street
CHATSWOOD NSW 2067
PO Box 5254
WEST CHATSWOOD NSW 1515
P +612 8448 1800
F +612 8448 1810
E sydney@gta.com.au

Brisbane

A Level 4, 283 Elizabeth Street
BRISBANE QLD 4000
GPO Box 115
BRISBANE QLD 4001
P +617 3113 5000
F +617 3113 5010
E brisbane@gta.com.au

Canberra

A Unit 4, Level 1, Sparta Building, 55 Woolley Street
PO Box 62
DICKSON ACT 2602
P +612 6263 9400
F +612 6263 9410
E canberra@gta.com.au

Adelaide

A Suite 4, Level 1, 136 The Parade
PO Box 3421
NORWOOD SA 5067
P +618 8334 3600
F +618 8334 3610
E adelaide@gta.com.au

Gold Coast

A Level 9, Corporate Centre 2
Box 37
1 Corporate Court
BUNDALL QLD 4217
P +617 5510 4800
F +617 5510 4814
E goldcoast@gta.com.au

Townsville

A Level 1, 25 Sturt Street
PO Box 1064
TOWNSVILLE QLD 4810
P +617 4722 2765
F +617 4722 2761
E townsville@gta.com.au

www.gta.com.au

GTAconsultants