28-34 Victoria Street East, Burwood

Development Application for Mixed Use Development

Traffic Impact Assessment

ROAD DELAY SOLUTIONS

DOCUMENT STATUS

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VSD DEVELOPMENTS Pty Ltd

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EXECUTIVE SUMMARY

Road Delay Solutions has been engaged by *VSD Developments Pty Ltd* to undertake the preparation of a Traffic Impact Assessment (TIA) in support of the Development Application (DA) for a mixed use development at 28-34 Victoria Street East, Burwood.

This TIA has been prepared to determine and reflect the traffic needs and any necessary mitigation treatments in support of the proposed development.

Road Delay Solutions has undertaken extensive consultation with Council officers to ensure the methodology and inputs used are in accordance with Council's exact requirements and expectations.

As a result of this consultation, this report has critically analysed and assessed the impacts of the Victoria Street East development on the Burwood Town Centre road network. Extensive mesoscopic and operational modelling has focused on and analysed the following four traffic scenarios, namely…

- → *2017 Calibrated base Year network and trip matrices, with no Victoria Street East development generation,*
- → *2017 road network and trip matrices plus the generation associated the Victoria Street East development,*
- → *2026 Base Year network and trip matrices ('Do Nothing'), and*
- → *2026 S94 road network and trip matrices plus Victoria Street East Development.*

The assessment, including Council's Section 94 infrastructure, reports the impact of traffic and pedestrian generation, aassociated with the proposed development, will not further impose on the town centre's road network operation, in particular, Shaftesbury Road.

THE SITE

The subject site is located at 28-34 Victoria Street East, Burwood, and is situated within the City of Burwood Local Government Area (LGA). The site seamlessly integrates with the surrounding Burwood Town Centre commercial and retail activities.

The Burwood LGA is situated in the inner western suburbs of Sydney. Being some 7.26 km^2 in area, it is one of the smallest LGA's in the state and has a relatively high population density.

Situated and fronting Victoria Street, to the north, the site is only some 340m north of the Burwood Railway Station and 155m south from bus stops on Shaftesbury Avenue, adjacent to the Westfield Shopping Complex.

Figure ES 1 *Victoria Street Site in Context*

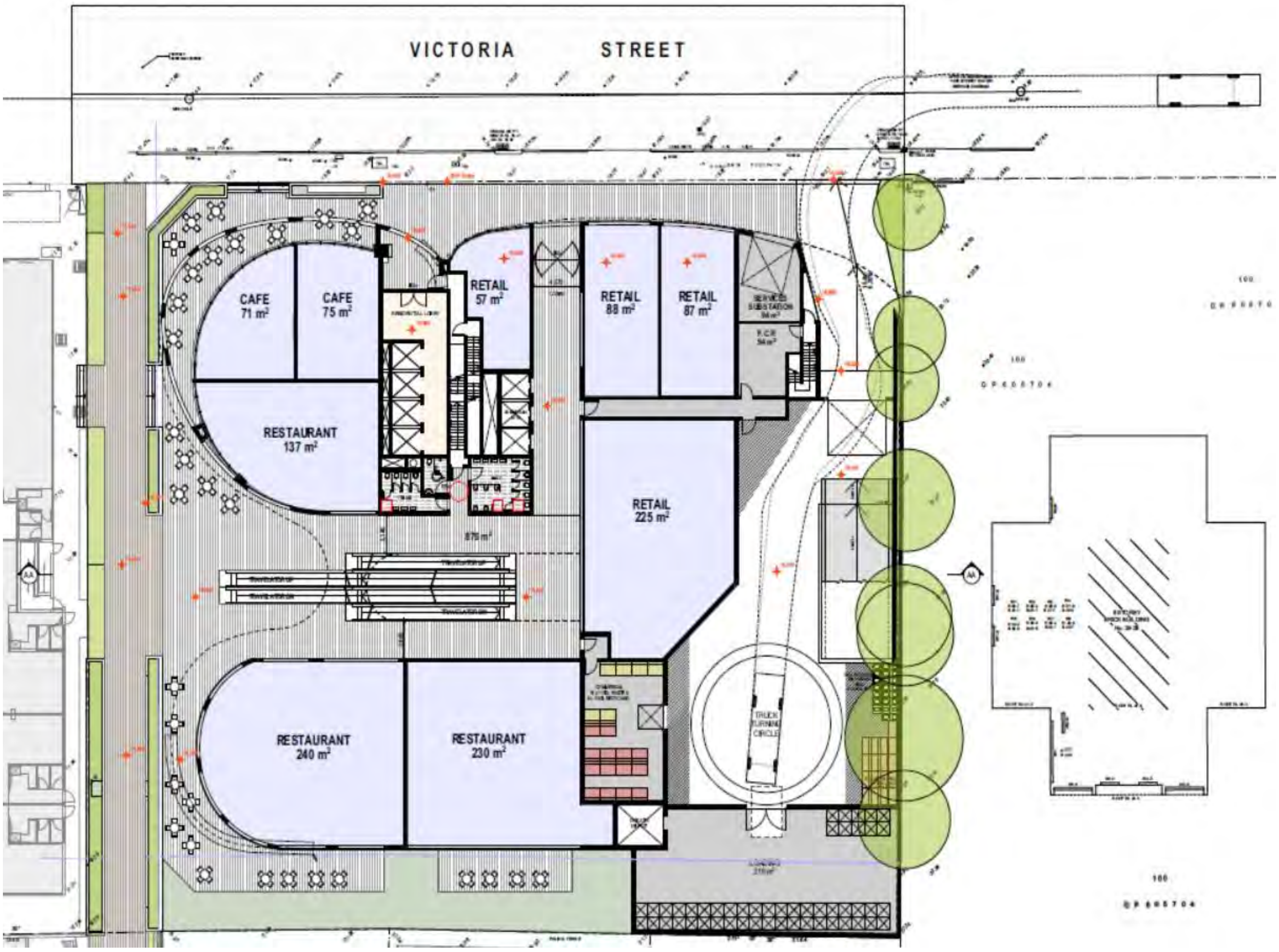
Source *vimeo.com, 2017*

PROPOSED DEVELOPMENT

The Development Application (DA) proposes the demolition of the existing structure(s) and construction of a mixed use development at 28-34 Victoria Street East, Burwood. The development is to incorporate...

- *179 residential apartments,*
- *2,070m² GFA - 1,749m² GLFA of restaurants/cafes floor space,*
- *457m² GFA - 400m² GLFA of specialty reatail floor space,*
- *1,981m² GFA – 1,283m² GLFA of supermarket floor space, and*
- *1,788m² GFA – 2,525m² GLFA of commercial floor space.*

Figure ES 2 The Development Footprint
Source Urban Link, 2019



Traffic Generation

Based on the RMS's *Technical Direction TDT 2013/04a* entitled *'Guide to Traffic Generating Developments Updated Traffic Surveys'*, hereby referred to as the '*Guide*', the Victoria Street East development will generate 1,555 vehicle trips daily, with a total of 475+5 vehicle trips, including 3 delivery/service vehicles and 2 heavy vehicles, occurring during the morning and evening commuter peak periods, combined.

Parking

The development provides for 229 residential vehicle parking spaces (incorporating 18 disabled spaces), 89 commercial/retail spaces, 4 motorbike spaces and provision for 60 bicycles, in accordance with the DCP, as amended 10 March 2015.

Figure ES 3 *Proposed Vehicle Generation*

Source *Road Delay Solutions, 2019*

VICTORIA STREET VEHICLE GENERATION TABLE															
Development Component	Area (Units &/or GLFA m^2)	Area (Units &/or GFA m^2)	Daily RMS Trip Rate	AM Peak Hour GLFA RMS Trip Rate/m^2	PM Peak Hour GLFA RMS Trip Rate/m^2	WE Peak Hour GLFA RMS Trip Rate/m^2	AM Peak Hour Generation (vph)	PM Peak Hour Generation (vph)	WE Peak Hour Generation (vph)	AM Outbound Trips (vph)	AM Inbound Trips (vph)	PM Outbound Trips (vph)	PM Inbound Trips (vph)	WE Outbound Trips (vph)	WE Inbound Trips (vph)
Residential Apartments	179		1.52	0.19	0.15	0.1	34	27	18	27	7	5	21	10	8
1 Bed Apartments	47														
2 Bed Apartments	105														
3 Bed Apartments	27														
Restaurants/Cafes	1,356	1,981	0.3	0.05	0.05	0.05	68	68	34	54	14	14	54	27	7
Retail Specialty Shops*	400	457	0.3403	0.059	0.059	0.075	24	24	30	11	13	13	11	17	14
Supermarket*	1,359	1,981	0.3403	0.059	0.059	0.075	80	80	102	36	44	44	36	56	46
Commercial	2,525	1,788	0.11	0.016	0.012	0.001	40	30	3	6	34	26	5	2	1
TOTAL			1,555				246	229	186	134	112	102	127	111	75

**The Supermarket and Specialty Shops generation rate is based on RMS Technical Direction TDT 2013/04a - 5.9vph/100m2 of GLFA given the proximity to Westfield and the higher demand by live in residents*

The retail GLFA excludes common areas such as walkways, garbage storage, unoccupied lobby areas and the shared stock storage provisions.

Figure ES 4 Parking Requirements

Source Road Delay Solutions, 2019

DEVELOPMENT SITE PARKING TABLE					
Development Component	Area (Units &/or GLFA m^2)	Area (*Units &/or GFA m^2*)	DCP		
			Units	*Rate*	*Provided*
Residential Apartments	179				
Residential Disabled (*forms part of residential parking*)	179		per 10 units unless demand requested	1	18
1 Bed Apartments	47		per unit	1	47
2 Bed Apartments	105		per unit	1	105
3 Bed Apartments	27		per unit	1.5	41
Visitor Parking	179		per 5 units	1	36
RESIDENTIAL VEHICLES					229
Supermarket and Retail Specialty Shops	1,759	2,438	1 space first 400m^2 then add 1 space per 40 m2 above first 400m^2 GLFA	1	35
Restaurants/Cafes #	1,749	2,070	1 space first 400m^2 then add 1 space per 40 m2 above first 400m2 GLFA	1	35
Takeaway#	0	0	per 3 seats	1	0
Commercial	2,525	1,788	1 space first 400 m^2 then add 1 space per 120 m^2 GFA		19
Commercial - Disabled **(Part of Commercial Parking)**			Item		3
RETAIL/COMMERCIAL MOTOR VEHICLES					**89**
Bicycles - Residential	179		1 per 3 units	1	60
Motorbikes - Residential	179		1 space per 50 units	1	4
MOTOR CYCLES AND BICYCLES SPACES					64

THE 2017 EXISTING SITUATION

Road Hierarchy

The road hierarchy, surrounding the development site is discussed below.

Burwood Road

The mesoscopic and operational modelling indicates that the Burwood Road route, both northbound and southbound, during both the AM and PM comuter peak periods between Victoria Street and Belmore Street, currently operates at a satisfactory Level of Service (LoS) ‘D’.

Due to queuing implications there is currently little remaining capacity along this road. This is further analysed below.

Occassional residual queues are reported from several sites back through the preceding intersections, impeding the coordinated traffic signal operations and the through movements.

The pedestrian phases along Burwood Road are demanded each cycle and necessitate significant time to clear before allowing left and right turn vehicle movements to be performed.

This is particularly evident, southbound, at the Burwood Road intersection with Railway Parade. With a trailing and repeat right turn from the central shared through and right lane, in conjunction with the inherent delay imposed by pedestrians on the left turn movement, ‘A’ phase can ‘*trap*’ southbound motorists if the right and left turn movements are held, concurrently.

The vehicle delays observed on Burwood Road, between George Street to the north and Clarence Street to the south, are the result of…

- → *The short distances between intersections, in close proximity to the railway station,*
- → *The incidence of pedestrian demand on cycle times and the occurance of the pedestrian ‘walk’ in each cycle,*
- → *Buses stopping,*
- → *The impacts of on street parking manouveres including drop off and pick up,*
- → *The single lane southbound approach prior to George Street, and*
- → *The lack of a dedicated right turn lane, southbound (existing shared through and right), at the Railway Parade intersection resulting in queueing back to the north through the preceding intersections.*

Operational analysis suggests that each intersection within the study area, in isolation, opearate within their respective vehicle capacities. However, congestion points, such as, the shared right turn and through movement southbound in Burwood Road from the centre lane at the Railway Parade intersection and the single lane, mid block, constraints imposed by on street parking, result in queueing both northbound and southbound along Burwood Road through the town centre.

These delays are typically inherent within built up town centre environments and are to be expected. Anecdotally, such vehicle congestion generally results in reduced vehicle speeds which may be conducive to improving pedestrian safety and reducing the severity of any occurring accidents while providing an unattractive route for through traffic.

The vehicle volumes on the competing parallel routes of Wentworth Road and Shaftesbury Road would appear to have increased more significantly than those on Burwood Road over the past years. Shaftesbury Road, in particular, reports a vehicle growth of approximately 10.3% over the past ten (10) years growing from some 1,652vph in 2000 to 1,825vph in 2016.

Shaftesbury Road

Shaftesbury Road is a major collector road with a four lane carriageway (two lanes in each direction) passing Victoria Street east.

On street parking is not permitted through this section and the sign posted, regulated, speed limit is 50km/hr.

Carrying a substantial traffic load, Shaftesbury Road serves as a dominant north south corridor providing access to the Westfield Shopping Complex and Burwood RSL. It is used by locals to avoid congestion on Burwood Road and as such, currently exhibits modest vehicle delays during the peak commuter periods at the signalised intersections between Railway Parade in the south and Wilga Street in the north.

The Wilga Street intersection provides only single through lanes both northbound and southbound through the intetrsection and capacity constraints are concerning with the introduction of traffic growth from development over the coming years.

Victoria Street

Victoria Street is a local road providing direct access to the Westfield Shopping Complex and facilitating access to traffic generated by the proposed development.

It also serves as a bus layover along its northern kerb line, adjacent to the Westfields Shopping Complex.

At Burwood Road, Victoria Street forms a T-Junction permitting right turn for buses only, and left turn entry while at Shaftesbury Road all movements are permissible at a four way traffic signal conrtolled intersection.

George Street

The section of George Street, located between Burwood Road and Shaftesbury Road is a local road, with single lane midblock capacity allowing one-way traffic only. The road is predominantly residential and experiences high pedestrian activity. On street parking is permitted on the southern side and is time restricted. The sign posted speed limit is 40km/hr.

The intersection with Shaftesbury Road, which is sign priority controlled (Giveway), allows for both left turn and right turn movements from George Sreet.

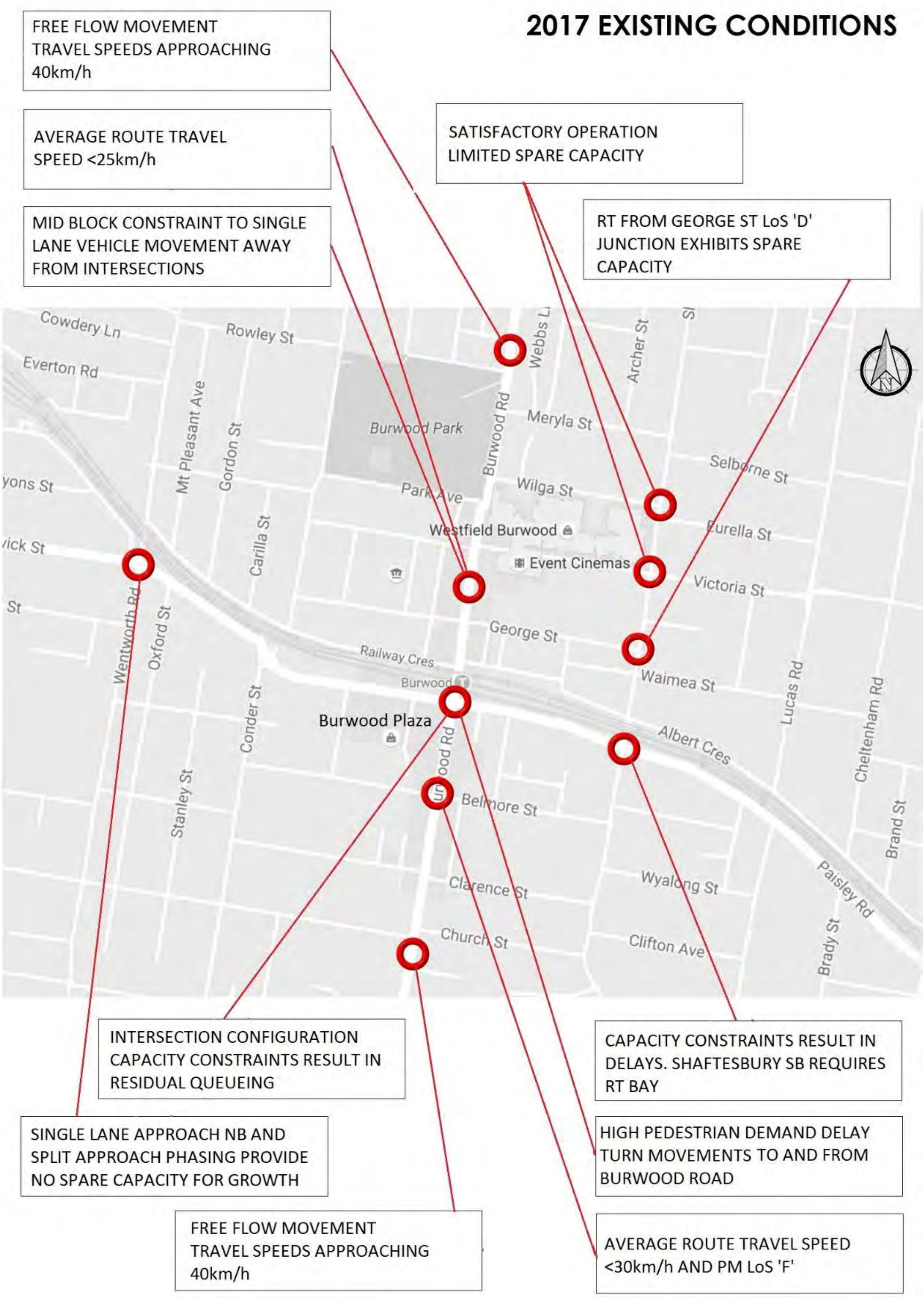
Wentworth Road

Wentworth Road is primarily a residential collector road running north south, parallel to the Burwood Town Centre and with a regulated speed of 50km/hr.

The intersection of Wentworth Road, Railway Parade and Morwick Street serves as a western gateway to the town centre. While the intersection is currently operating at a satisfactory LoS 'D', no spare vehicle capacity is exhibited at the site, largely due to the single lane approach northbound and the shared through and right turn lane southbound in Wentworth Road. The traffic signal site also operates under split approach phasing, adding to the burden of 'inter greens' to the cycle time.

Figure ES 5 2017 Existing Conditions Summary

Source Road Delay Solutions, 2017



GROWTH FORECASTS

Investigations into the traffic impacts associated with the Victoria Street East development have required the preparation of a mesoscopic, computer based, model.

The Bureau of Transport Statistics (*BTS*) have set the areas defining the Burwood Town Centre as Travel Zones TZ 910, 913 and 915.

The interpreted population data employed in the modelled trip matrices were drawn from TZs 910, 913 and 915 in August 2017…

- → *A residential population of 8,374 persons in year 2016 is anticipated to reach 11,714 by year 2026, being an increase of 3,340 persons,*
- → *Dwellings (homes and/or apartments) are set to reach 6,069 by 2026, an increase of 1,730 with an adopted occupancy rate of 1.93 persons, and*
- → *The current workforce of 4,353 is expected to reach 6,051 by year 2026.*

The analysis also determined that the *BTS* forecast dwellings of 6,069 is in fact marginally higher than Council's current anticipated growth level achieving only 5,565 dwellings by year 2026. The growth levels are presented in the following figures.

All projected traffic generation rates applied to developments within the town centre were based on the industry standard *RMS Guide to Traffic Generating Developments*.

The applied annual growth rate is considered to be a conservatively high estimation within the study area given that the town centre is already well established, with Burwood Road operating at or near capacity during the commuter peak periods.

Expectations are that with no change to the road network the reported growth on Burwood Road from the year 2026 will remain low, with vehicles utilising the spare capacity on the competing parallel routes.

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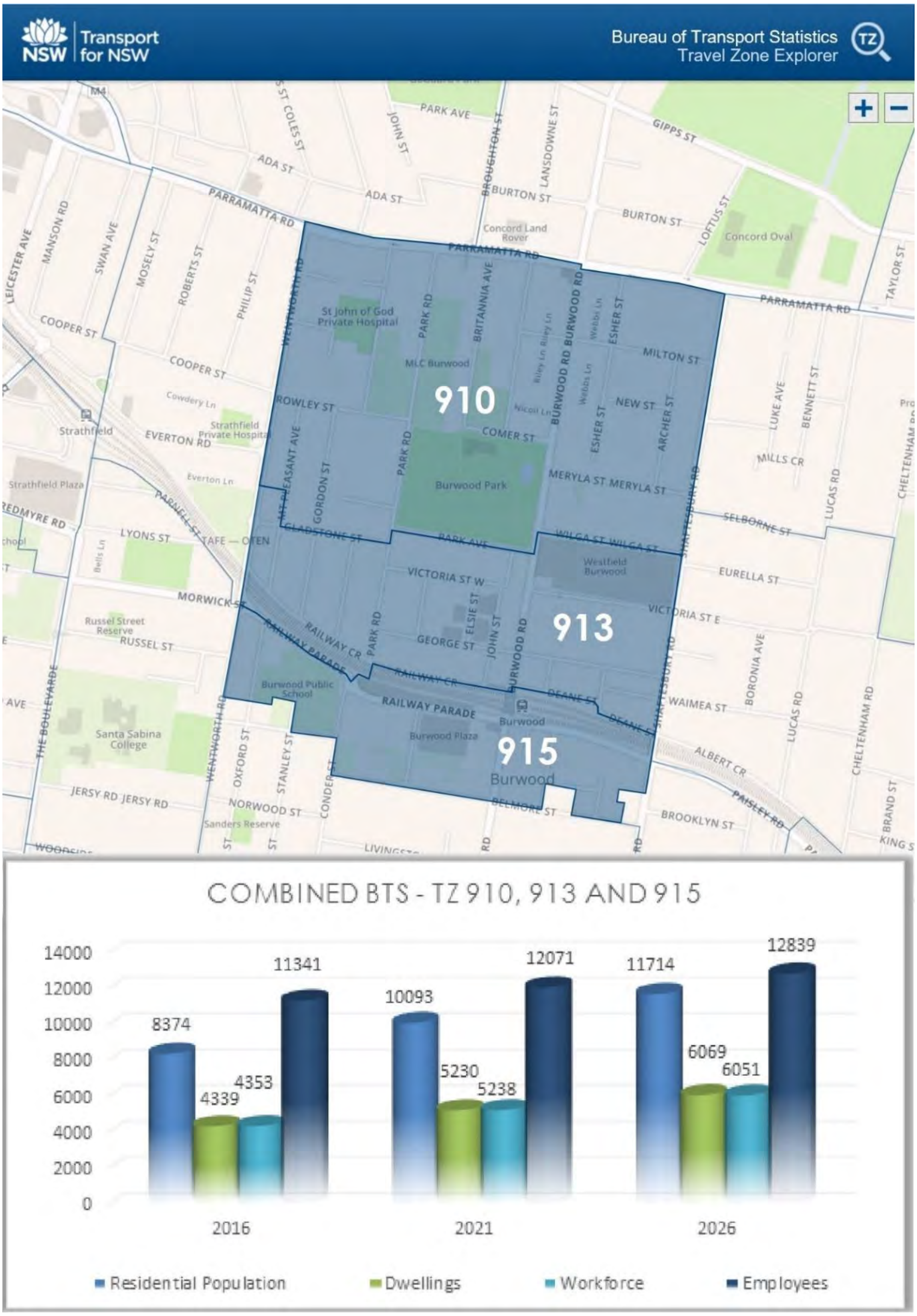
Expectations are that with no change to the road network, the reported growth on Burwood Road to the year 2026 will remain low, with vehicles utilising the spare capacity on the competing parallel routes.

Figure ES 6 Adopted Forecast Growth Projections

Source BTS, August 2017



THE MODELS

The calibrated base model has been run against three differing infrastructure scenarios to appreciate and compare the impacts associated with the Victoria Street East development site and Council's proposed Section 94 infrastructure. These include...

1. *2017 Base Year Model with Victoria Street East development traffic generation,*
2. *2026 'Do Nothing' - The future growth run on the current 2016 road network,*
3. *2026 Development Model – The 2026 S94 road network including the traffic generation from the Victoria Street East development.*

2017 Base Year and Development Traffic Generation

The proposed mixed use development is located on Victoria Street East with access primarily from Shaftesbury Avenue and secondary, via left turn only, from Burwood Road. Vehicle generate has been calculated at 246 vph during the morning peak hour period, 229 vph during the PM and 186 vph during the weekend peak.

Vehicles will arrive and depart the site via the following volumes...

AM Peak Arrivals

- → *6 vph from Burwood Road, and*
- → *90 vph from Shaftesbury Road*

AM Peak Departures

- → *150 vph to Shaftesbury Road*

PM Peak Arrivals

- → *29 vph from Burwood Road*
- → *110 vph from Shaftesbury Road*

PM Peak Departures

- → *90 vph to Shaftesbury Road*

WE Paeak Arrivals

- → *3 vph from Burwood Road*
- → *70 vph from Shaftesbury Road*

WE Peak Departures

- → *113 vph to Shaftesbury Road.*

The traffic generation, associated with the development, primarily impacts Shaftesbury Road at the intersection with Victoria Road East. The operation of the traffic signal controlled intersections along Shaftesbury Road, including Victoria Street East, report a satisfactory Los with the associated traffic generation from the development site.

2026 Base Year 'Do Nothing' Model

Year 2026 was nominated as the future assessment year which is conventional practice for this form of mixed use development. The year represents a practical timeframe within which some confidence in the understanding of likely development levels and prevailing traffic patterns can be made.

The future year 2026 growth matrices were effectively run on the current 2017 road network to develop an understanding of the likely traffic impacts resulting from the general metropolitan growth, and the planned Burwood town centre developments (*excluding Victoria Street East*), would have on the traffic network.

The Metropolitan arterial road network screen lines, including Parramatta Road and the Hume Highway, report an average growth in vehicular traffic of some 13.8% to year 2026.

Each of the three (3) key intersections, when operating in isolation, generally report an increase in the Degree of Saturation (DS) as a result of reduced capacity. However, each site retains a satisfactory LoS.

The 95th percentile queue lengths on Shaftesbury Road at Wilga Street is 407m northbound, while at Paisley Road it is 180m southbound.

Figure ES 7 Model Projected 10 Year Vehicle Growth
Source Road Delay Solutions, 2019

AVERAGE PROJECTED VEHICLE GROWTH TO YEAR 2026			
Road	AM PEAK	PM PEAK	WEEKEND PEAK
Burwood Road	3.4%	8.5%	6.8%
Shaftesbury Avenue	4.8%	9.1%	6.2%

It is considered that the level of congestion reported on Burwood Road is acceptable as it reduces the speed of vehicles within a highly pedestrianised town centre while reducing the attractiveness of the route to through traffic. Shaftesbury Road too exhibits reduced speed as a consequence of congestion.

The reported growth on Shaftesbury Road is greater than that on Burwood Road and suggests that the congested state of Burwood Road will be unattractive to motorists until such time as capacity constraints are reduced or eliminated.

It is apparent that with the anticipated metropolitan growth, Burwood Road will operate, at a LoS 'E'. Anecdotally, it can be supposed that Burwood Road is operating at or near its theoretical capacity and will allow for no further growth in vehichular traffic while the competing parallel route of Shaftesbury Road remains a viable option for motorists.

2026 Development with Section 94 Infrastructure Model

The development and S94 model for the Year 2026, was prepared inclusive of…

- → *The 2026 BTS growth rates,*
- → *Stage 1 of the West Connex project (M4 East – Homebush Bay Drive to Pomeroy Street/Tunnelled Pomeroy Street to City West Link Road), which is scheduled for opening in 2019,*
- → *Burwood Council's Section 94 Infrastructure treatments,*
- → *Supplemental identified road network treatments, and*
- → *The traffic generation from the Victoria Street East development.*

Figure ES 8 *Westconnex Stage 1 M4 East – M4 to City West Link Road*

Source *http://www.westconnex.com.au, 2017*

The Section 94 infrastructure plan and anticipated implementation dates are as follows…

- → *Future signalised right turn movement from Burwood Road, southbound, into Belmore Street, westbound, (2016-2018),*
- → *Upgrade to the signalised intersection at Burwood Road and Railway Parade, (2016-2018),*
- → *New traffic signals at the intersection of Railway Parade and Conder Street, (2016-2018),*
- → *Widening of Railway Parade east of Burwood Road (2024-2027),*
- → *New mid-block traffic signals in Wynne Avenue (2012-2015),*
- → *New traffic signals at Belmore Street and Wynne Avenue (2012-2015),*
- → *New traffic signals at Belmore Street and Conder Street (2012-2015),*
- → *Widening of Railway Parade adjacent to Victoria Street (after 2035),*
- → *Streetscape upgrades in Belmore Street, Conder Street, Wynne Avenue (2012 - after 2020), and*
- → *Shared zones in Conder Street and Clarendon Place (2016-2018).*

The intention of this model is to adopt the Section 94 and the previously identified supplemental infrastructure measures, as supported by Council. The model is to report the road network operation under the demands of year 2026 growth and the.

The model is specifically designed to shape the necessary mitigation treatments to sustain the proposed Victoria Street East development within the immediate Burwood town centre and surrounds. The model addresses the following objectives…

- → *The minimisation of impacts from development generated traffic on Burwood Road, Shaftesbury Road and local streets,*
- → *The optimisation of traffic operations on Shaftesbury Road during the commuter peak periods within the current road reserve constraints,*
- → *To maintain and/or improve pedestrian mobility and safety within the study area, and*
- → *Realise a traffic management outcome which supports the proposed development at 28-34 Victoria Street East.*

The Section 94 Infrastructure Plan outlines provision for modification to the Burwood Road intersection with Railway Parade. After dicussions with Council it is intended to retain the current movement conditions including the right turn from Burwood Road, southbound, into Railway Parade under the plan.

It has been reported from the modelling that with the introduction of the Section 94 improvements and the supplemental treatments, the operational performance of Burwood Road, both northbound and southbound will operate at a LoS 'E', further consolidating the view that Burwood Road is operating at capacity and the competing parallel route of Shaftesbury Road remains a viable alternative path into and out of the town centre, with motorists utilising side street entry to the centre (Burwood Road) and access to the available parking provisions.

Modelling supports Council's view that the Burwood Road intersection with Railway Parade and also with Belmore Street, should be retained in their current form as no significant improvement is reported with the relocation of the right turn movement, southbound, in Burwood Road from Railway Parade to Belmore Street, as reported in the body of this document.

No infrastructure treatments are required to sustain the level of traffic generation from the Victoria Street East development. The intersections of Shaftesbury Road with Victoria Street east and Wilga Street are reported as operating at a satisfactory LoS with the addition of 2026 growth levels, including the proposed Victoria Street east development.

Figure ES 9 2026 Supplemental Road Network Treatment

Source Road Delay Solutions, 2019

Identifier	Proposed Road Network Component	Priority in Relation to Development	Reasoning	Preliminary Budget Estimates
1	Widening of pedestrian crossings to 5m at select locations.	Nil	To increase the pedestrian capacity and attempt to reduce the incidence of demand for the pedestrian 'WALK' during each cycle.	$ 100,000.00
2	Retention of right turn for all vehicles, SB on Burwood Road at Railway Parade.	Nil	Afford buses access to the stops in Railway Parade on the northern side of Burwood Plaza.	$ -
3	Introduction of a pedestrian 'scramble' phase.	Nil	A pedestrian 'scramble' phase will reduce the impacts of pedestrian movements on the SB left turn movement in Burwood Road.	$ 350,000.00
4	Signalisation of Burwood Road intersection at Victoria Street East. Buses Only RT movement from Burwood Road NB (Interim measure).	Low	Would benefit the development after 2026 in formalising both bus and pedestrian movements. Intended to reduce the incidence of 'J' walking across Burwood Road and improve safety for pedestrians with the left turn entry to Victoria Street East.	$ 850,000.00

All preliminary budget estimates include… Design, Provision for Traffic, Project Management, stormwater, indicative cost for utility and services adjustment.
All preliminary budget estimates exclude… Legal fees pertaining to WAD(s), performance bonds, maintenance charges and temporary utility and service connections.

The development vehicle generation has been applied to the year 2026 trip matrices. The operational modelling reports a network LoS 'E' for the morning, evening and weekend peak periods.

Detailed assessment of each key intersection and the town centre route was undertaken to determine the impact on average vehicle delay, level of service and the resultant queue lengths. Generally, each intersection reports an operational LoS comparable with the current situation with slight increases in DS and AVD at the key intersections along Shaftesbury Road.

Traffic Signals at Burwood Road and Victoria Street East

The traffic signalisation of the Burwood Road intersection with Victoria Street East is intended to facilitate the right turn movement, northbound, for buses only (Interim measure). The site is proposed for construction after 2026. It is will enable access to bus layover provisions in Victoria Street East, adjacent to the Westfield Shopping Complex.

Bus priority and a 'B' signal lantern display is proposed at the Burwood Road intersection with Victoria Street East. The bus movement is proposed to occur during the intergreen period prior to 'A' phase. The site reports a LoS 'B' during the peak periods with the linked signal offsets from Wilga Street and Park Avenue.

The area around the site has been identified as a known 'J' walking location, and with the introduction of traffic signals, and the incorporation of controlled pedestrian crossings, improved pedestrian safety provisions are envisaged.

CONCLUSION

Road Delay Solutions has been engaged by *VSD Developments Pty Ltd* to undertake the preparation of a Traffic Impact Assessment (TIA) in support of the Development Application (DA) for a mixed use development at 28-34 Victoria Street East, Burwood.

Burwood is a dynamic LGA with the town centre constantly growing with planned residential, retail and commercial developments, some well into their construction phases. The Victoria Street East development is one of these.

Mesoscopic and operational modelling has reported that vehicular growth, particularly along Burwood Road is relatively static and any further growth within the Town Centre is shared with the competing parallel routes of Shaftesbury Road and Wentworth Road.

Shaftesbury Road in particular, provides a viable through traffic alternative between the Hume Highway to the south and Great Western Highway to the north, which removes pressure from Burwood Road.

Shaftesbury Road provides the primary access to and from the development and the intersection with Victoria Street East reports a satisfactory Level of Service when modelled in isolation, under the demands of the Victoria Street east traffic generation growth.

The Shaftesbury Road route, when modelled under traffic signal coordination and the S94 infrastructure treatments, reports a retained LoS ‘E’ which corresponds with the current performance level.

This assessment has concluded that the proposed Victoria Street East development does not trigger the need for any future infrastructure treatments.

Figure ES 10 Burwood Town Centre Intesection Operational Performances

Source Road Delay Solutions, 2019

VICTORIA STREET EAST SIDRA INTERSECTION PERFORMANCES

Model	17AM4Q	17PM3E	17AMWE6	17AM7V	17PM7V	17AMWE7V	26AM7V	26PM7V	26AMWE7V	26AMD7	26PMD7	26WE7
	2017 Existing			2017 'with Development'			2026 'Do Nothing' Base			2026 'With Section 94 Road Network and Victoria Street Development'		
	AM	PM	WE	AM	PM	WE	AM	PM	WE	AM	PM	WE
Burwood Road and Victoria Street East												
DS	0.154	0.167	0.154	0.167	0.148	0.163	0.224	0.425	0.264	0.143	0.162	0.157
AVD *(sec)*	0.8	1.2	1.1	0.8	1	1.1	1.7	2.9	1.9	1.1	1.1	1.2
LOS	A	A	A	A	A	A	A	A	A	A	A	A
Burwood Road, Deane Street and Railway Crescent												
DS	0.827	0.668	0.679	0.642	0.669	0.847	0.49	0.531	0.72	0.455	0.536	0.799
AVD *(sec)*	16.3	13.3	13.1	13.1	13.3	17.3	14	15.5	13.4	19.6	15.9	15.7
LOS	B	A	A	A	A	B	A	B	A	B	B	B
Burwood Road and Railway Parade												
DS	0.823	0.836	0.791	0.843	0.834	0.875	0.817	0.934	0.83	0.808	0.922	0.92
AVD *(sec)*	31.3	21.9	21	27.7	21.6	23.5	35	46.6	28.9	35.4	44.3	44.2
LOS	C	B	B	B	B	B	C	D	C	C	D	D
Burwood Road and Belmore Street												
DS	0.87	0.656	0.877	0.791	0.743	0.663	0.796	0.92	0.75	0.65	0.943	0.875
AVD *(sec)*	22.1	16.5	20.4	19.1	19.6	29.1	30.8	44.6	21.7	29.5	42.5	36.1
LOS	B	B	B	B	B	C	C	D	B	C	D	C
Shaftesbury Road and Wilga Avenue												
DS	0.867	0.867	0.789	0.959	0.807	0.897	0.996	0.872	0.8	0.908	0.814	0.796
AVD *(sec)*	17.6	21.2	19.6	45.9	22.2	30.7	55.5	22.1	32.6	31.6	24.4	26.6
LOS	B	B	B	D	B	C	D	B	C	C	B	B
Shaftesbury Road and Victoria Street												
DS	0.892	0.826	0.791	0.691	0.71	0.87	0.653	0.544	0.864	0.753	0.741	0.873
AVD *(sec)*	25.5	23.2	22.6	36.5	25.5	38.8	32.2	30.2	26.4	35.4	34.3	33.9
LOS	B	B	B	C	B	C	C	C	B	C	C	C
Shaftesbury Road and George Street												
DS	0.175	0.188	0.197	0.203	0.209	0.235	0.229	0.288	0.248	0.48	0.684	0.697
AVD *(sec)*	0.6	0.6	0.7	0.2	0.3	0.4	0.6	1.1	1.5	2.3	3	3.5
LOS	A	A	A	A	A	A	A	A	A	A	A	A
Shaftesbury Road, Railway Parade and Paisley Street												
DS	0.861	0.836	0.836	0.836	0.749	0.738	0.957	0.746	0.871	0.78	0.823	0.813
AVD *(sec)*	38.5	41.6	37.5	29.8	28.7	30.9	51.4	38	43.7	36.7	40.4	28.7
LOS	C	C	C	C	C	C	D	C	D	C	C	C
Burwood Road and George Street												
DS	0.195	0.162	0.167	0.175	0.168	0.151	0.169	0.19	0.19	0.155	0.199	0.193
AVD *(sec)*	0.7	0.6	0.9	0.8	0.7	0.8	0.9	0.7	0.9	1.3	1.1	1.1
LOS	A	A	A	A	A	A	A	A	A	A	A	A

Figure ES 11 Modelled Vehicle Projections

Source *Road Delay Solutions, 2019*

MESOSCOPIC MODEL HOURLY TRAFFIC VOLUME PROJECTIONS

Model	1	2	3	4	5	6	7	8	9	10	11	12
ROAD LINK	17AM4O	17AM7V	26AM7V	26AMD7	17PM3E	17PM7V	26PM7V	26PMD7	17AMWE6	17AMWE7V	26AMWEB	26WE7
BURWOOD RD SB N WILGA ST	544	544	554	462	319	334	373	300	360	357	350	240
WILGA ST EB	366	360	292	285	453	500	482	446	549	535	465	417
WILGA ST WB	454	453	443	355	545	453	447	419	494	504	387	452
PARK AVE EB	437	458	501	346	426	546	578	404	513	508	500	497
PARK AVE WB	320	309	305	312	313	375	319	295	296	299	222	253
BURWOOD RD NB S PARK AVE	437	441	467	387	350	464	508	529	437	408	482	504
BURWOOD RD SB S PARK AVE	512	533	641	412	475	409	687	338	475	473	565	364
BURWOOD RD SB N GEORGE ST	459	477	512	384	380	304	433	256	385	368	395	302
GEORGE ST EB	95	82	126	162	160	58	345	477	71	71	456	442
GEORGE ST WB W BURWOOD RD	77	64	51	33	107	53	27	8	64	43	31	13
RAILWAY CRES WB	110	84	88	63	51	55	74	32	67	68	80	40
DEANE ST WB	88	66	44	34	203	70	129	68	74	52	46	38
BURWOOD RD NB N RAILWAY PDE	582	555	594	481	483	547	611	591	540	512	600	616
RAILWAY PDE EB W BURWOOD RD	409	426	460	317	397	290	479	260	359	342	370	270
RAILWAY PDE WB E BURWOOD RD	425	415	495	347	349	525	664	493	456	474	578	484
RAILWAY PDE EB E BURWOOD RD	342	309	373	227	371	367	457	342	393	398	446	348
BURWOOD RD NB S RAILWAY PDE	502	475	442	403	399	430	445	315	494	465	489	288
BURWOOD RD SB S RAILWAY PDE	290	312	305	199	273	209	213	162	299	279	240	180
BURWOOD CENTRAL NB	11	11	8	11	12	12	11	12	11	11	10	11
BURWOOD CENTRAL SB	11	11	12	12	22	22	23	23	13	13	14	14
RAILWAY PDE EB W WYNNE AVE	368	335	423	415	451	407	446	617	458	460	496	707
RAILWAY PDE WB W WYNNE AVE	513	508	557	632	565	711	904	816	471	485	462	666
RAILWAY PDE EB W CONDER ST	517	484	693	725	501	447	971	622	563	565	1007	958
RAILWAY PDE WB W CONDER ST	518	502	1074	714	520	711	979	845	454	470	690	656
BELMORE ST EB W BURWOOD RD	193	205	168	226	345	331	343	317	368	357	390	308
BELMORE ST WB W BURWOOD RD	215	215	290	476	171	228	353	494	204	189	325	597
BELMORE ST WB E BURWOOD RD	172	173	200	373	217	216	301	428	164	152	236	481
BELMORE ST EB E BURWOOD RD	125	127	114	183	173	177	104	151	150	189	100	140
WYNNE AVE NB N BELMORE RD	143	150	399	458	123	148	562	598	130	127	398	476
WYNNE AVE SB N BELMORE RD	166	155	393	302	347	149	424	383	136	139	586	415
CONDER ST NB S BELMORE ST	311	315	314	361	188	192	259	196	265	246	346	250
CONDER ST SB N BELMORE ST	169	166	210	326	209	196	229	143	237	238	234	342
BELMORE ST WB E CONDER ST	111	109	106	82	234	241	234	252	184	174	161	153
BELMORE ST EB E CONDER ST	170	183	150	149	135	141	173	100	214	206	263	148
WENTWORTH NB S RAILWAY	250	317	215	174	267	464	287	224	249	249	208	238
WENTWORTH SB S RAILWAY	358	340	315	281	416	637	484	578	523	521	429	439
RAILWAY WB E WENTWORTH	520	505	1077	714	522	726	993	845	459	474	693	656
RAILWAY EB E WENTWORTH	526	494	703	725	490	448	971	622	571	574	1014	958
WENTWORTH SB N RAILWAY	611	581	723	795	728	962	1257	1024	818	823	1025	985
MORWICK EB W WENTWORTH	589	530	534	279	476	444	481	301	641	636	689	535
SHAFTESBURY NB S RAILWAY	532	536	493	614	522	517	472	564	600	639	353	515
SHAFTESBURY SB S RAILWAY	546	489	506	588	570	530	620	772	637	596	690	848
PAISLEY EB E SHAFTESBURY	375	334	297	155	340	376	283	39	370	362	260	88
PAISLEY WB E SHAFTESBURY	472	423	450	351	379	363	550	305	440	403	365	334
SHAFTESBURY NB N RAILWAY	680	673	696	779	720	635	574	731	726	766	538	717
SHAFTESBURY SB N RAILWAY	610	573	615	634	743	775	707	841	685	681	883	941
RAILWAY WB W SHAFTESBURY	337	331	413	270	325	406	608	387	314	327	471	362
SHAFTESBURY SB N WILGA	592	572	536	696	841	529	480	615	640	610	402	708
WILGA EB W SHAFTESBURY	154	153	109	65	132	154	106	46	154	166	70	73
SHAFTESBURY NB S WILGA	776	740	764	975	516	677	581	711	714	761	483	663
SHAFTESBURY SB N VICTORIA	430	389	311	491	763	488	429	550	577	548	344	558
VICTORIA WB E SHAFTESBURY	563	347	290	472	267	384	363	452	426	488	317	413
SHAFTESBURY NB S VICTORIA	739	722	765	773	660	605	625	625	738	754	542	635
VICTORIA EB W SHAFTESBURY	199	211	126	162	494	500	345	477	463	535	456	442

MODEL IDETIFIERS AND DESCRIPTION

1	17AM4Q	2017 AM PEAK CALIBRATED BASE MODEL
2	17AM7V	2017 AM PEAK VICTORIA ST DEVELOPMENT MODEL
3	26AM7V	2026 AM PEAK VICTORIA ST 'DO NOTHING' MODEL
4	26AMD7	2026 AM PEAK VICTORIA ST SECTION 94 MODEL
5	17PM3E	2017 PM PEAK CALIBRATED BASE MODEL
6	17PM7V	2017 PM PEAK VICTORIA ST DEVELOPMENT MODEL
7	26PM7V	2026 PM PEAK VICTORIA ST 'DO NOTHING' MODEL
8	26PMD7	2026 PM PEAK VICTORIA ST SECTION 94 MODEL
9	L7AMWE6	2017 WEEKEND PEAK CALIBRATED BASE MODEL
10	'AMWE7V	2017 WEEKEND PEAK VICTORIA ST DEVELOPMENT MODEL
11	AMWE7V	2026 WE PEAK VICTORIA ST 'DO NOTHING' MODEL
12	26WE7	2026 WEEKEND PEAK VICTORIA ST SECTION 94 MODEL

TRAFFIC IMPACT ASSESSMENT

1. INTRODUCTION

1.1 Currently

Road Delay Solutions has been engaged by *VSD Developments Pty Ltd* to undertake the preparation of a Traffic Impact Assessment (TIA) and Parking Study in support of the Development Application (DA) for a mixed use development at 28-34 Victoria Street East, Burwood.

The City of Burwood Local Government Area (LGA) is situated in the inner wester suburbs of Sydney. Being some 7.26 km^2 in area, it is one of the smallest local government areas in the state and has a relatively high population density.

Bordered by Concord Council (*Parramatta Road*) to the north, Canterbury Council (*Cooks River*) to the south, Strathfield Council (*The Boulevarde*) to the the west and Ashfield Council to the east, Burwood Town Centre is approximately 12km west of the Sydney CBD.

The Town Centre consists of a dense mix of residential, retail and commercial activities. With considerable development interest and current planning proposals, there is potential for a significant increase in traffic during the already heavily congested commuter peak periods. Burwood Road, in particular, exhibits high congestion levels resulting in the increasing use of the current parallel routes such as Shaftesbury Road and Wentworth Road and further filtering through to the lower order east west roads such as, but not limited to, Victoria Street East, George Street, Deane Street, Wilga Street and Park Street.

Plans for further development under the potential in the LEP, including Victoria Street East, need to address the concerns of the local community with regard to traffic and parking impacts. Measures may be required to manage traffic volumes in residential streets but also on the higher order road network whilst maintaining amenity for residents, businesses, pedestrians, cyclist and buses.

The Burwood Town Centre is identified by the Bureau for Transport Statistics (BTS) as Travel Zones (TZ) 910, 913 and 915.

Figure 1 BTS Travel Zones – Burwood Town Centre

Source Transport For NSW - BTS, 2017

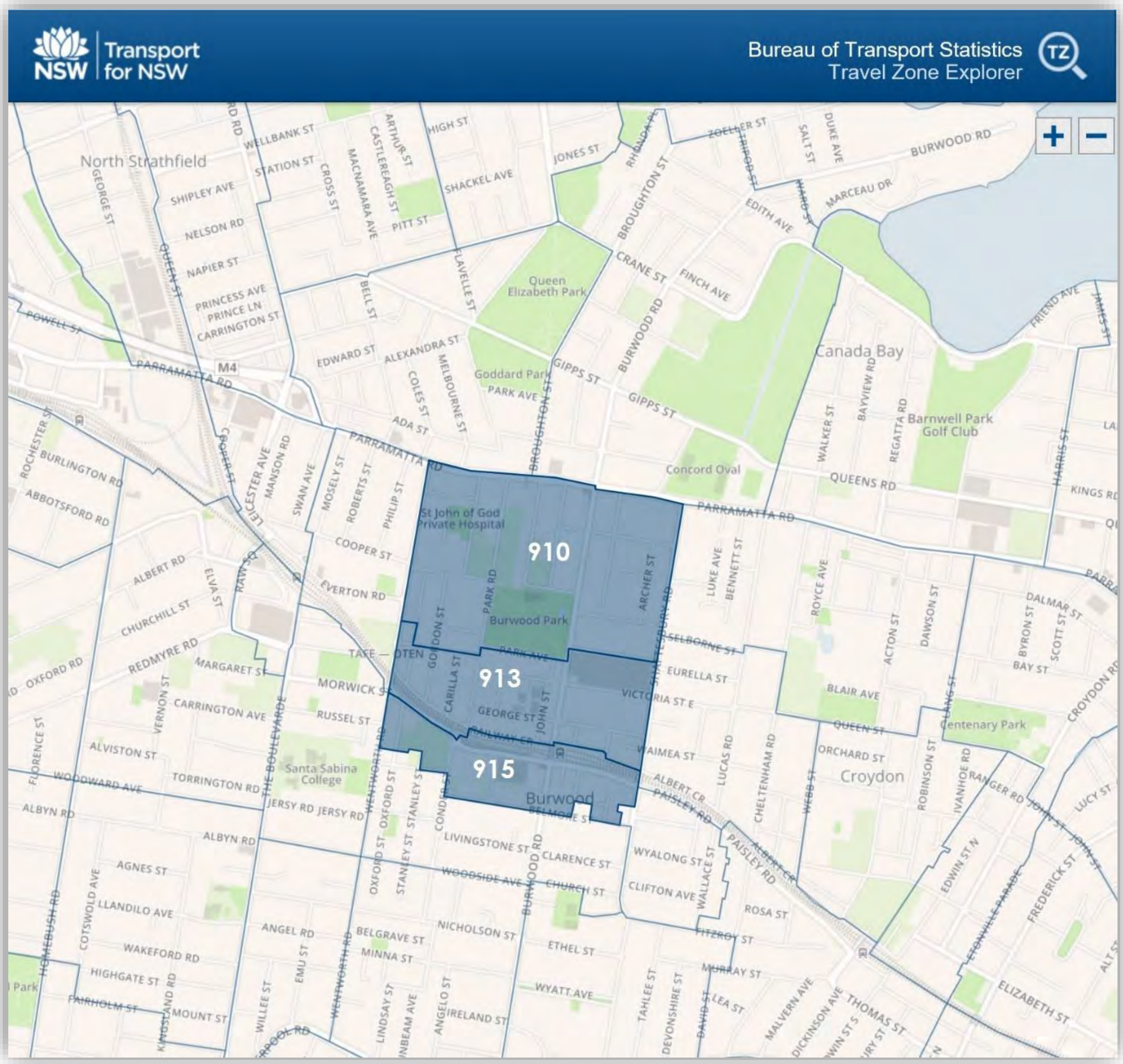


Figure 2 *Looking West on Victoria Street*

Source *Google Street View, 2019*

1.2 The Site

The subject site is located at 28-34 Victoria Street East, Burwood, and is situated within the City of Burwood Local Government Area (LGA). The site seamlessly integrates with the surrounding Burwood Town Centre commercial and retail activities.

Situated and fronting Victoria Street East, to the north, the site is only some 340m north of the Burwood Railway Station and 155m south from bus stops on Shaftesbury Avenue, adjacent to the Westfield Shopping Complex.

Figure 3 Victoria Street East Site in Context

Source vimeo.com, 2016

1.2 The Development

The Development Application (DA) proposes the demolition of the existing structure(s) and construction of a mixed use development at 28-34 Victoria Street East, Burwood. The development is to incorporate…

- *179 residential apartments,*
- *2,070m² GFA - 1,749m² GLFA of restaurants/cafes floor space,*
- *457m² GFA - 400m² GLFA of specialty reatail floor space,*
- *1,981m² GFA – 1,283m² GLFA of supermarket floor space, and*
- *1,788m² GFA – 2,525m² GLFA of commercial floor space.*

1.3 Study Purpose

The purpose of this report is to qualify the impacts and recommend any necessary traffic infrastructure and parking strategy to adequately manage the performance of the Burwood Town Centre road network under the projected cumulative demands of the proposed development and anticipated future background growth in vehicular and pedestrian traffic to the horizon year 2026.

The year 2026 is commonly utilised in the assessment of developments for which planning and growth data is readily available from various government sources.

This assessment has been predicated on a computer based mesoscopic model and Sidra operational modelling by intersection control method, focusing on the Burwood Town Centre and the operation of the road network under both existing and future conditions.

1.4 The Assessment Process

This report has adopted a four (4) tier, systematic approach to assessment of the road network operation under both the existing and anticipated future conditions. The approach taken is graphically presented below, with the key tasks outlined for each tier.

Figure 4 *The Assessment Process*

Source *Road Delay Solutions, 2017*

DATA COLLECTION AND COLLATION

- Traffic counts collected via video surveillance
- Travel time surveys
- Public transport route and frequency
- Pedestrian and cyclist demand and desire lines
- Road network feature catalogue
- Scats data
- Traffic signal design layouts
- Catalogue all future growth and development sourced from BTS Zone Explorer and Council
- Determine historic vehicle growth levels to 2016
- Catalogue of Section 96 infrastructure improvements
- Present results within the report

BASE YEAR MODEL CREATION / CALIBRATION

- Road network preparation
- Model parameter determination
- Development of year 2016 trip matices and zone allocations
- Base year 2016 model calibration and assessment
- Present results within the report

SCENARIO AND MITIGATION TREATMENT

- Development of future year 2026 trip matrices
- Future year 2026 *'Do Nothing'* mesoscopic model
- Future 2026 *Section 94* mesoscopic model
- Future year 2026 *'With Development'* mesoscopic model
- Operational Sidra assessment of intersection operation
- Determination of infrastructure requirements with development
- Pedestrian mobility strategy
- Loading dock management strategy
- Present results within the report

CONCLUSION AND RECOMMENDATIONS

- Reiterate the proposed level of development under the Planning Proposal
- Outline the impacts of the development on the road network and transport system
- Recommend a framework of infrastructure necessary to sustain the planned growth and development

2. EXISTING CONDITIONS

2.1 Road Network

The study area is generally bounded by Parramatta Road (GWH) to the north, Shatesbury Road to the east, Nicholson Parade to the south and Wentworth Road to the west.

The Burwood Town Centre is dominated by a grid like network of varying order roads. The following figure presents the current Road Hierachy as defined in Burwood City Council's (BCC) Development Control Plan (DCP).

This study focuses on a number of principle road corridors within the Burwood Town Centre, being...

- → *Burwood Road,*
- → *Shaftesbury Road, and*
- → *Victoria Street.*

Burwood Road

Burwood Road is the primary road corridor through the Burwood Town Centre, connecting Parramatta Road in the north to the Hume Highway and Georges River Road in the south. The road generally provides a four (4) lane undivided carriageway catering for a single through lane and on street parking lane in each direction, clear of intersections.

Key intersections on Burwood Road are signalised, including Wilga Street, Park Street, Railway Parade and Belmore Street with a 40km/hr speed limit through the town centre.

Shaftesbury Road

Shaftesbury Road is a major collector road with a four lane carriageway (two lanes in each direction) between Victoria Street and George Street.

On street parking is not permitted through this section and the sign posted, regulated, speed limit is 50km/hr.

Carrying a significant traffic load, Shaftesbury Road serves as a significant north south corridor providing access to the Westfield Shopping Complex and Burwood RSL. It is used by locals to avoid congestion on Burwood Road and as such, currently exhibits modest vehicle delays of some 55 seconds during the peak commuter periods at the signalised intersections between Railway Parade in the south to Wilga Street in the north.

Victoria Street

Railway Parade runs parallel to and south of the railway line, through the town centre. It forms part of a connection between Croydon and Ashfield in the east and Strathfield in the west. Providing a four lane carriageway, with two traffic lanes in each direction, Railway Parade accommodates bus stops on both sides of the carriageway, including indented bus bays on the northern side in close proximity to Burwood Central.

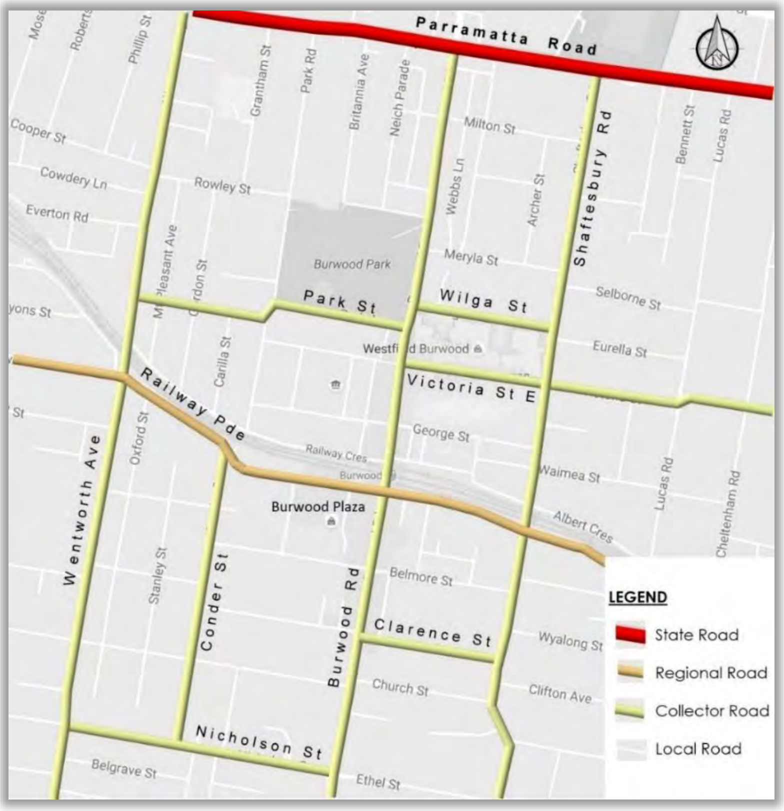
George Street

George Street between Burwood Road and Shaftesbury Road is a local road with single lane midblock capacity allowing one-way traffic only, adjacent to the development site. The road is predominantly residential and experiences high pedestrian activity. On street parking is permitted on the southern side and is time restricted. The sign posted speed limit is 40km/hr.

The intersection with Shaftesbury Road, which is sign priority controlled (Giveway), allows for both left turn and right turn movements from George Sreet. The right turn movement from George Street currently reports a LoS 'C'.

Figure 5 *Road Hierarchy*

Source *BCC DCP, Amended 2015*



Observations made during the peak periods indicate that a number of intersections in the town centre are operating near capacity during the commuter peak periods, particularly along Burwood Road.

The vehicle delays observed on Burwood Road, between Victoria Street to the north and Clarence Street to the south, are the result of…

- *The short distances between intersections, in close proximity to the Burwood railway station,*
- *The incidence of pedestrian demand on cycle times and the occurance of the pedestrian 'walk' in each cycle,*
- *Buses stopping,*
- *The impacts of on street parking manouveres including drop off and pick up,*
- *The single lane southbound approach prior to George Street, and*
- *The lack of a dedicated right turn lane, southbound (existing shared through and right), at the Railway Parade intersection resulting in queueing back to the north through the preceding intersections.*

Sidra analysis suggests that each Burwood Road intersection, in isolation, opearate within their respective vehicle capacities. However, with the shared right turn and through movement from the centre lane at the Railway Parade intersection and the single lane mid block constraints imposed by on street parking, queueing has been observed both northbound and southbound along Burwood Road through the town centre.

In conjunction with the capacity constraints, pedestrian demands have an impact on the timing offsets between subsequent signal sites.

These delays are typically inherent within built up town centres and are to be expected. Anecdotally, such vehicle congestion generally results in reduced vehicle speeds which may be conducive to improving pedestrian safety and reducing the severity of any occurring accidents while providing an unattractive route for through traffic.

The vehicle volumes on the competing parallel routes of Wentworth Road and Shaftesbury Road would appear to have increased more significantly than those on Burwood Road over the past years. Shaftesbury Road, in particular, reports a vehicle growth of approximately 10.3% over the past ten (10) years growing from some 1,652vph in 2000 to 1,825vph in 2016.

Site observation indicates that the Westfield Burwood is one of the largest attractors within the town centre and that some 80% of vehicles arriving at the shopping complex do so from Shaftesbury Road. Conversely, 78% of vehicles were recorded leaving the complex via Shaftesbury Road.

2.2 Public Transport Provisions

Rail

Burwood Town Centre delivers significant public transport choice with the Burwood Railway Station located centrally within the centre and numerous bus services to the Sydney CBD and regional centres.

Sydney Trains offer services from Burwood Railway Station to the Sydney CBD operate at 9-10 minute intervals, daily, with a trip duration of some 12 minutes.

The station services the following rail lines…

- → *T1 North Shore Line (Berowra to Parramatta via the Sydney CBD)*
- → *T1 Northern Line Hornsby and Epping to Sydney CBD via Strathfield),*
- → *T1 Western Line Emu Plains and Richmond to the Sydney CBD), and*
- → *T2 Inner West and South Line Campbelltown to the Sydney CBD via Granville).*

Council have outlined desired upgrades to the Burood Railway Station which is to focus on functional Urban design and capabilities. It is envisaged these changes, combined with the State Government's commitment to increase the capacity of the rail network by some 60% under the Long Term Master Plan to 2021 should ensure the station's capacity to manage the anticipated Burwood Town centre growth levels to year 2026.

Bus

Local bus services are provided by Sydney Buses. These services link Burwood with surrounding areas. There are major bus stops on Railway Parade adjacent to the site, at Burwood station, as well as other stops on Burwood Road. Bus services provide links to surrounding areas and include…

- → *Route 407: Burwood – Strathfield,*
- → *Route 408: Burwood – Rookwood Cemetery,*
- → *Route 415: Campsie, Strathfield, Burwood, Chiswick,*
- → *Route 458: Burwood, Strathfield, Rhodes, Ryde,*
- → *Route 461: Burwood, Parramatta Road, city, Domain,*
- → *Route 463: Burwood, Bayview Park,*
- → *Route 466: Cabarita, Burwood, Strathfield, Ashfield,*
- → *Route 490: Drummoyne, Burwood, Kingsgrove, Hurstville,*
- → *Route 492: Drummoyne, Burwood, Kingsgrove, Rockdale,*
- → *Route 525: Parramatta, Newington, Burwood, and*
- → *Route 526: Sydney Olympic Park Wharf, Newington, Strathfield.*

A bus layover can be defined as a holding location for terminating bus services where buses may park before commencing a scheduled run. While Burwood Town Centre generally provides informal bus layover areas, currently Sydney Buses utilise on street, kerb side, availability in Victoria Street East, Shaftesbury Road, Railway Parade and Victoria Street.

Figure 6 *Extract from Council Media Release Burwood Railway Station*

Source *Burwood City Council, 2005*

MEDIA RELEASE **30 November, 2005**

BURWOOD COUNCIL

heritage ▪ progress ▪ pride

Burwood Station upgrade plan provides direction for city renewal

Council plans for the much-needed upgrade of Burwood Railway Station, with a strong focus on functional urban design, will set the benchmark for future development in the Town Centre.

In a briefing to the Burwood Chamber of Commerce today, Burwood Mayor John Faker outlined proposed concept development plans for the Railway Station which would contribute to the existing and future built form of the Town Centre.

The plans maximise opportunities for public space and public domain improvements, as well as improve the accessibility and safety of commuters.

Highlights of the Railway Station development plan commissioned by Council include:

- Relocation of the major east-west pedestrian crossing of Burwood Road from Railway Parade corner to align with station concourse;
- Opening up existing concourse area to general north-south pedestrian movement;
- Creation of a new public open space to the north of the station;
- Relocation of the main station entry to the northern side;
- Creation of new space under tracks for retail and ticketing facilities;
- Doubling the access points to platforms via stairs and lifts;
- Creation of a new public open space north of the Post Office to a landscaped area with café;
- New pedestrian underpass lined with retail outlets under Railway Parade and Burwood Road linking Station with Post Office area and Burwood Hotel;

Further Highlights of public domain plans also include proposed conversion of Deane Street (on the northern boundary of the Station) into a pedestrian mall, and the creation of a bus/taxi interchange nearby.

Cr Faker said Council commissioned the plans in 2004 to illustrate the integration of a preferred upgrade option for the Burwood Town Centre.

"Council has done all the hard work in planning for this vital upgrade. All that's needed now is for the State Government to approve them and agree on a funding mechanism to make it happen.

2.3 Pedestrians and Cyclists

The Burwood Town Centre typically accommodates high pedestrian activity with the railway station being one of the main focal points. Just over 50% of residents within the town centre utilise rail as their transport mode for journey to work (JTW).

With a residential workforce of some 4,238 persons[1], 4% travel by bus to work. Combined with retail, commercial and recreational activities, pedestrian demand within the town centre is high and is catered for by generally 3.7m wide footways, unsignalised, marked, foot crossings, and signalised crossings.

Site inspections have revealed a significant level of J-walking and mid block crossing of Burwood Road between George Street and Park Avenue, signifying a potential requirement for an additional, controlled, crossing point. There are plans to signalise the intersection of Burwood Road with Victoria Street East, post 2026. This will provide the needed pedestrian crossing point and reduce the incidence of J-walking.

Select location pedestrian fencing, along Burwood Road and Railway Parade, direct pedestrians to the correct signalised crossings. The DCP requires all future developments, within the town centre, must maintain pedestrian safety, scale and amenity.

[1] *BTS Travel Zone Explorer (based on the 2011 Census Data) Bureau of Transport Statistics, 2016*

Figure 7 Burwood Road J-Walking

Source Road Delay Solutions, 2017

Figure 8 *City Rail Network*

Source *Transport Sydney Trains, 2019*

Figure 9 Bus Network Routes 407 and 408

Source Transport Sydney Trains, 2019

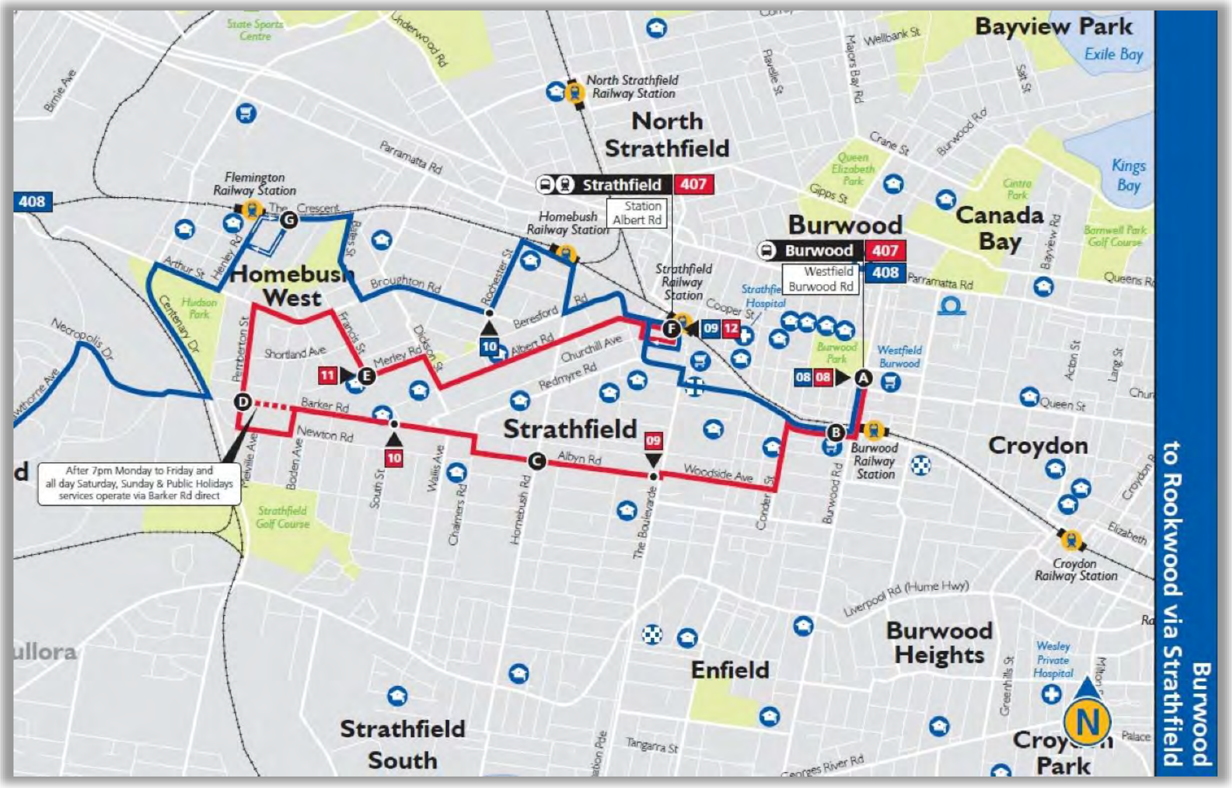


Figure 10 Bus Network Route 461

Source Transport Sydney Trains, 2019

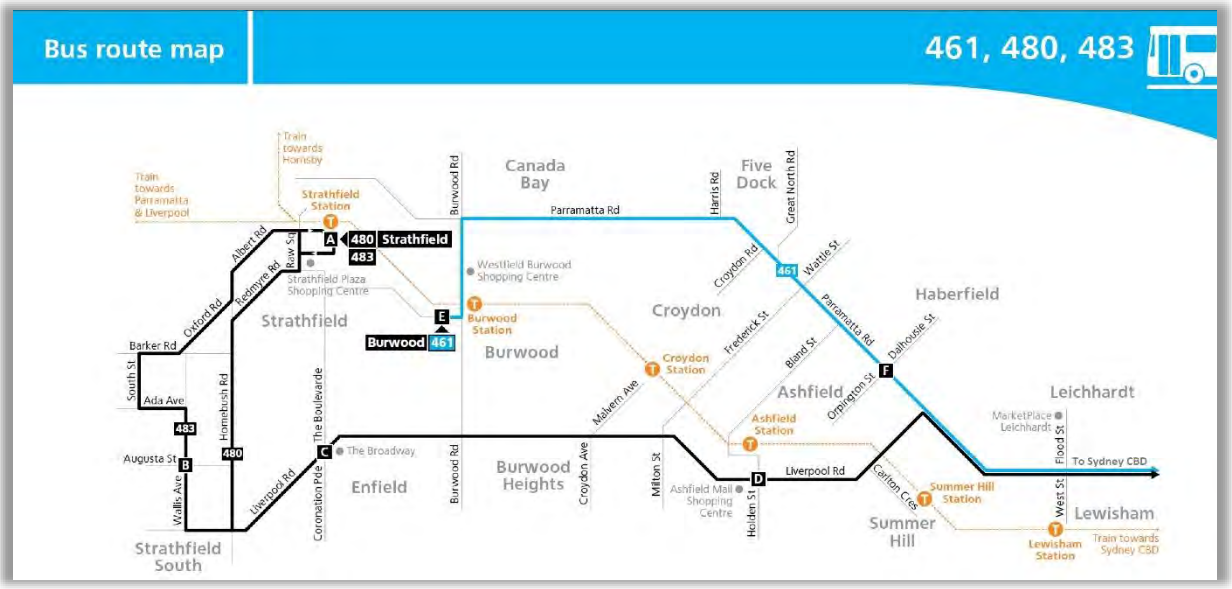


Figure 11 *Bus Network Route 415*

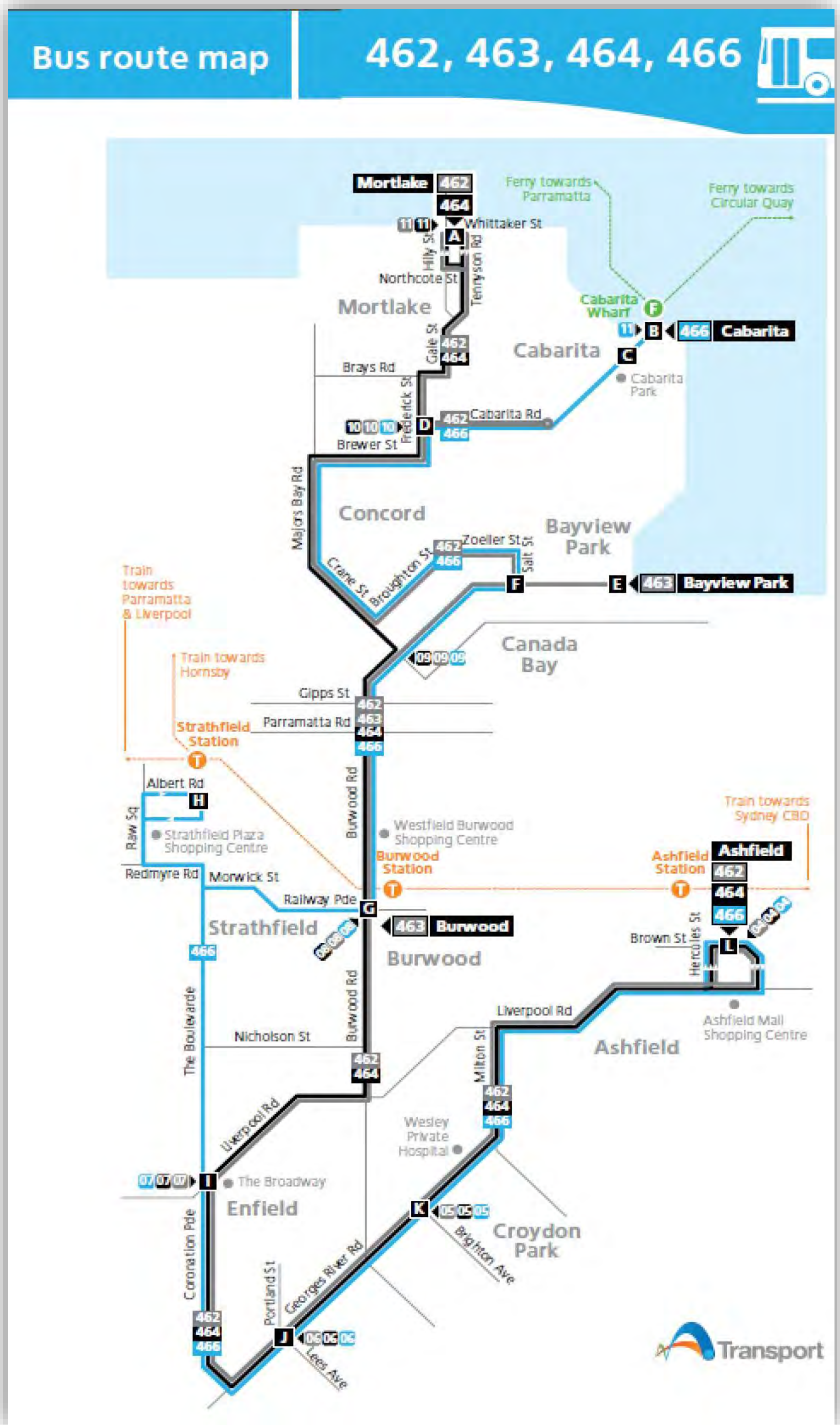
Source *Transport Sydney Trains, 2019*

Figure 12 *Bus Network Route 458*

Source *Transport Sydney Trains, 2017*

Figure 13 *Bus Network Route 463 and 466*

Source *Transport Sydney Trains, 2017*



2.4 Parking

Parking activities has a significant impact on the movement of traffic within the Burwood Town Centre.

Burwood Council undertook a parking survey in December 2011[2] to better understand the impacts of a newly implemented parking strategy. From the survey, computer based models were developed to understand the different factors influencing parking choice in Burwood Town Centre. This study has drawn from the fore mentioned survey in appreciating the behaviour of motorists and their impacts in utilising the available town centre parking provisions.

Parking choice is provided and catered for by Council in various forms, such as…

- → *The use of formalised controlled parking stations,*
- → *Free, timed on street parking,*
- → *Metered on street parking,*
- → *Metered off street car parking, and*
- → *Private property parking.*

The pursuit of parking and the associated parking manoeuvres by motorists, given the available on street parking along Burwood Road and within the side streets, impedes the movement of through traffic and increases travel times.

Parking cost and the proximity to rail, bus, retail and commercial services heavily influence the attractiveness of parking choice. The free on street parking in Burwood Road is consistently full and desired by motorists accessing the adjacent retail, commercial and service operations.

[2] *'Parking Behaviour of Burwood Town Centre', Alex Karki, 2015*

Figure 14 *Burwood Town Centre Parking*

Source *'Parking Behaviour of Burwood Town Centre', Alex Karki, 2015*

3. DATA COLLECTION

3.1 Data Sources

A broad range of data has been collected in preparing this assessment…

- → *Traffic counts at key intersections (Austraffic, 2016),*
- → *Traffic Counts at key intersections on Shaftesbury Road ROAR Data 2017),(*
- → *Origin and destination to confirm traffic patterns (Road Delay Solutions, 2017),*
- → *Travel time surveys along Burwood Road (Road Delay Solutions, 2017),*
- → *Parking occupancy rates (Road Delay Solutions, 2017),*
- → *Bus routes and frequency (State Buses, 2017),*
- → *Train routes and frequency (Sydney Trains, 2017),*
- → *Road network catalogue (Road Delay Solutions, 2017), and*
- → *Traffic signal operation SCATS data (RMS, 2000, 2005, 2017).*

Traffic data from previous studies and papers have been utilised to derive historical growth and variations in traffic patterns within the Burwood Town Centre…

- → *'Parking Behaviour of Burwood Town Centre', Alex Karki, 2015,*
- → *'Burwood Town Centre Proposed Bus Strategy, URS, 2007,*
- → *'Burwood Town Centre Bus Strategy - Review and Analysis', Parsons Brinkerhoff, 2006,*
- → *'Burwood Town Centre Growth', Transport and Traffic Planning Associates, 2005, and*
- → *'Burwood Town Centre & Environs – Preparation of Traffic Model', Parsons Brinkerhoff, 2004.*

3.2 Traffic Counts

The existing morning (AM), evening (PM) and Saturday (WE) traffic data has been collected and collated by *Austraffic on Thursday 9 June, 2016, and Saturday 11 June, 2016*, and *ROAR Data* on Thursday 20 July 2017 and Saturday 22 July 2017, for…

- → *The weekday AM commuter peak 8:00am till 9:00am,*
- → *The weekday PM commuter peak 4:00pm till 6:00pm, and*
- → *The weekend Saturday AMWE peak 12.00 till 1:00pm.*

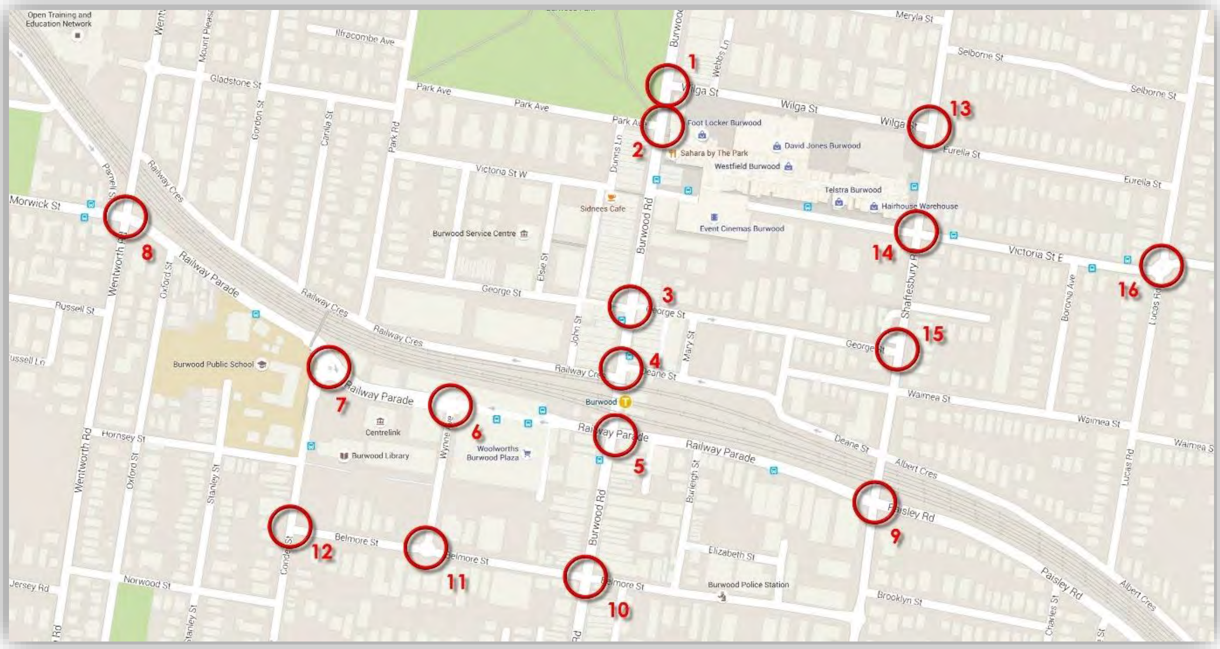
Traffic surveys were conducted over 2 hours during each commuter peak at the following intersections…

1. *Burwood Road and Wilga Street,*
2. *Burwood Road and Park Avenue,*
3. *Burwood Road and George Street,*
4. *Burwood Road, Deane Street and Railway Crescent,*
5. *Burwood Road and Railway Parade,*

6. *Railway Parade and Wynne Avenue,*
7. *Railway Parade and Conder Street,*
8. *Railway Parade, Wentworth Road, and Morwick Street,*
9. *Shaftesbury Road, Railway Parade and Paisley Street,*
10. *Burwood Road and Belmore Street,*
11. *Belmore Street and Wynne Avenue,*
12. *Belmore Street and Conder Street,*
13. *Shaftesbury Road and Wilga Street,*
14. *Shaftesbury Road and Victoria Street,*
15. *Shaftesbury Road and George Street, and*
16. *Victoria Street, Lucas Road and Queen Street.*

Figure 15 *Traffic Count Locations*

Source *Road Delay Solutions, 2017*



Appendix A presents the traffic survey data utilised in the coding and calibration of the base year 2017 model.

Given the nature of the trip matrix development process and traffic zone placement, the collected traffic flows had to be '*balanced*'. Typically, this consisted of minor adjustments to specific turn movements to ensure that adjacent intersections had consistent upstream and downstream volumes.

These ‘gains and losses’ occur when vehicles leave the carriageway into individual driveways, park on street or turn into intermediate side streets between the counted intersections. This fine level of detail is, typically, not accommodated in computer based mesoscopic traffic models.

3.3 Travel Time Surveys

Travel time data was collected along Burwood Road, between Wilga Street in the north to Belmore Street in the south, on Thursday 9 June, 2016 during the morning and evening commuter peak periods and Saturday 11 June, 2016 between 11am and 1pm.

Travel time data was collected along Shaftesbury Road, between Wilga Street in the north and Clarence Street in the south, on Thursday 20 July, 2017 during the morning and evening commuter peak periods and Saturday 22 July, 2017 between 11am and 1pm.

Travel times were collected every 15 minutes over a two (2) hour period in each of the peak periods, averaged, and then compared against the modelled travel time outputs for the routes assessed…

ROUTE 1 – Burwood Road Northbound

- → *Belmore Street northbound to Wilga Street.*
- →

ROUTE 2 – Burwood Road Southbound

- → *Wilga Street southbound to Belmore Street.*
- →

ROUTE 3 – Shaftesbury Road Northbound

- → *Clarence Street northbound to Wilga Street.*
- →

ROUTE 4 – Shaftesbury Road Southbound

- → *Wilga Street southbound to Clarence Street.*

Figure 16 *Travel Time Corridors*

Source *Google Maps, 2017*

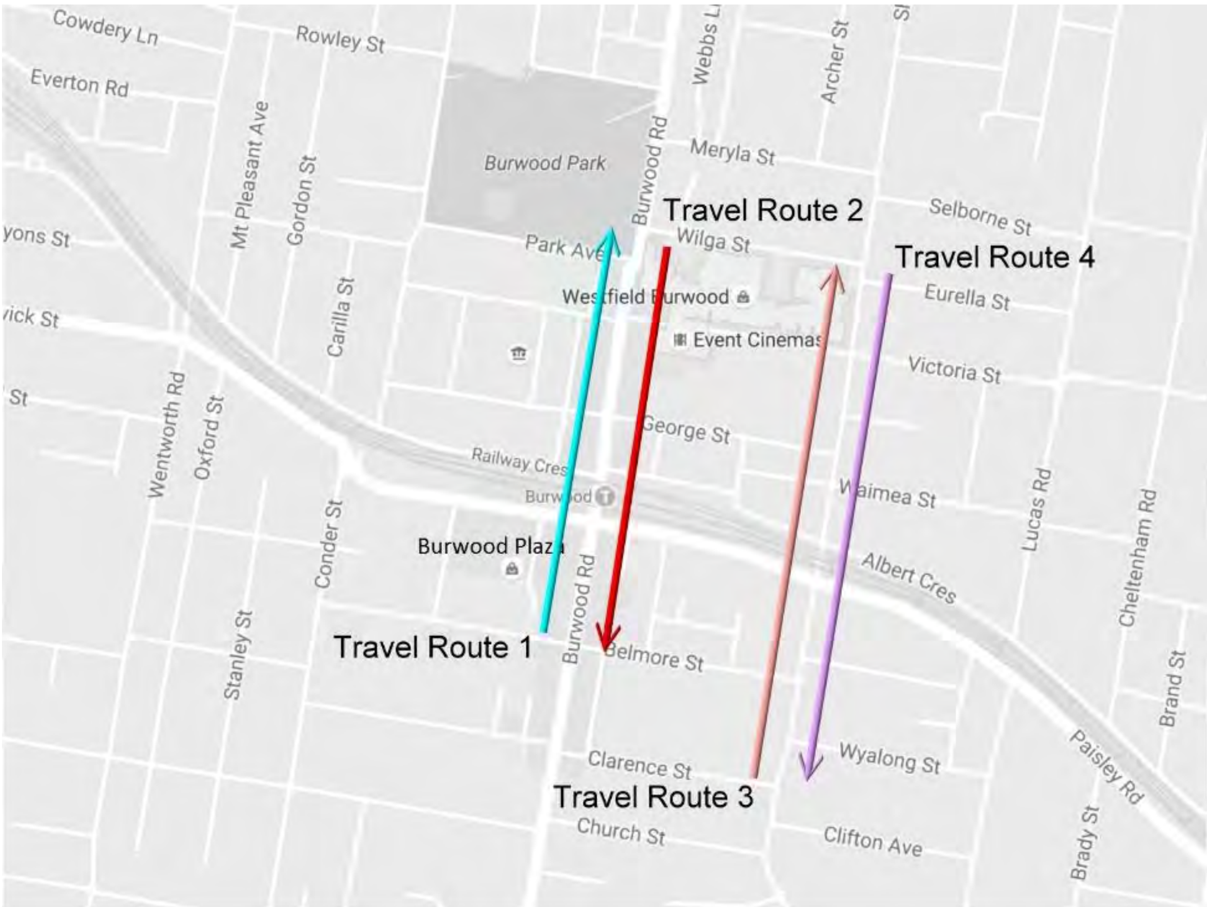


Table 1 *2017 Calibrated Travel Route 1*

Source *Road Delay Solutions, 2017*

ROUTE 1	AVG SURVEYED		MODEL 16AM28		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 8539 BELMORE STREET						
RAILWAY PARADE	0.9	10.00	0.78	11.25	0.15	-13.33%
RAILWAY CRESCENT	1.1	13.64	1.08	13.67	0.25	-1.82%
GEORGE STREET	1.3	14.77	1.17	16.29	0.32	-10.00%
VICTORIA STREET EAST	1.4	18.00	1.27	19.82	0.42	-9.29%
PARK AVENUE	1.9	16.11	1.72	17.94	0.51	-9.47%
WILGA STREET	2.0	16.80	1.77	18.94	0.56	-11.50%
TOTALS	2.0	14.89	1.77	16.32	0.56	-11.50%

ROUTE 1	AVG SURVEYED		MODEL 16PM23		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 8539 BELMORE STREET						
RAILWAY PARADE	0.76	11.84	0.71	12.50	0.15	-6.58%
RAILWAY CRESCENT	1.04	14.42	0.99	15.00	0.25	-4.81%
GEORGE STREET	1.8	10.67	1.08	17.74	0.32	-40.00%
VICTORIA STREET EAST	1.2	21.00	1.18	21.44	0.42	-1.67%
PARK AVENUE	1.71	17.89	1.62	19.00	0.51	-5.26%
WILGA STREET	1.78	18.88	1.68	20.03	0.56	-5.62%
TOTALS	1.78	15.78	1.68	17.62		-5.62%

ROUTE 1	AVG SURVEYED		MODEL 16AMWE17		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 8539 BELMORE STREET						
RAILWAY PARADE	0.77	11.69	0.71	12.50	0.15	-7.79%
RAILWAY CRESCENT	1.04	14.42	0.96	15.47	0.25	-7.69%
GEORGE STREET	1.07	17.94	1.05	18.25	0.32	-1.87%
VICTORIA STREET EAST	1.18	21.36	1.15	21.99	0.42	-2.54%
PARK AVENUE	1.71	17.89	1.59	19.36	0.51	-7.02%
WILGA STREET	1.78	18.88	1.65	20.39	0.56	-7.30%
TOTALS	1.78	17.03	1.65	17.99		-7.30%

Note The Modelled travel speeds are corrected to reflect mid block and downstream intersection vehicle delay(s) and congestion.

ROAD DELAY SOLUTIONS

Table 2 2017 Calibrated Travel Times Route 2

Source Road Delay Solutions, 2017

ROUTE 2	AVG SURVEYED		MODEL 16AM28		Distance km	TIME Diff %
	TIME *(minutes)*	SPEED *km/hr*	TIME *(minutes)*	SPEED *km/hr*		
Start Node = 10096 WILGA STREET						
PARK AVENUE	0.28	10.71	0.28	10.00	0.05	0.00%
VICTORIA STREET EAST	0.48	17.50	0.4	21.10	0.14	-16.67%
GEORGE STREET	0.54	26.67	0.5	29.14	0.24	-7.41%
RAILWAY CRESCENT	0.71	26.20	0.73	25.89	0.31	2.82%
RAILWAY PARADE	1.5	16.40	1.41	17.56	0.41	-6.00%
BELMORE STREET	1.9	17.78	1.75	19.23	0.56	-7.41%
TOTALS	1.9	19.21	1.75	20.49	0.56	-7.41%
ROUTE 2	AVG SURVEYED		MODEL 16PM23		Distance km	TIME Diff %
	TIME *(minutes)*	SPEED *km/hr*	TIME *(minutes)*	SPEED *km/hr*		
Start Node = 10096 WILGA STREET						
PARK AVENUE	0.31	9.68	0.28	12.50	0.05	-9.68%
VICTORIA STREET EAST	0.39	21.54	0.4	15.00	0.14	2.56%
GEORGE STREET	0.61	23.61	0.5	17.74	0.24	-18.03%
RAILWAY CRESCENT	0.85	21.88	0.7	21.44	0.31	-17.65%
RAILWAY PARADE	1.52	16.18	1.38	19.00	0.41	-9.21%
BELMORE STREET	1.87	17.97	1.74	20.03	0.56	-6.95%
TOTALS	1.87	18.48	1.74	17.62		-6.95%
ROUTE 2	AVG SURVEYED		MODEL 16WE17		Distance km	TIME Diff %
	TIME *(minutes)*	SPEED *km/hr*	TIME *(minutes)*	SPEED *km/hr*		
Start Node = 10096 WILGA STREET						
PARK AVENUE	0.27	11.11	0.28	10.00	0.05	3.70%
VICTORIA STREET EAST	0.43	19.53	0.4	21.10	0.14	-6.98%
GEORGE STREET	0.62	23.23	0.5	29.14	0.24	-19.35%
RAILWAY CRESCENT	0.8	23.25	0.73	26.88	0.31	-8.75%
RAILWAY PARADE	1.48	16.62	1.41	17.90	0.41	-4.73%
BELMORE STREET	1.74	19.31	1.76	19.34	0.56	1.15%
TOTALS	1.74	18.84	1.76	20.73		1.15%

Note The Modelled travel speeds are corrected to reflect mid block and downstream intersection vehicle delay(s) and congestion.

Table 3 2017 Calibrated Travel Times Route 3

Source Road Delay Solutions, 2017

ROUTE 3	AVG SURVEYED		MODEL 16AM28		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 10092 CLARENCE ST						
BELMORE ST	0.27	37.78	0.25	49	0.17	-7.41%
RAILWAY PDE	0.58	26.90	0.54	28.34	0.26	-6.90%
DEANE ST	0.62	34.84	0.64	33.36	0.36	3.23%
WAIMEA ST	0.78	35.38	0.75	37.03	0.46	-3.85%
GEORGE STREET	0.81	37.04	0.79	38.3	0.5	-2.47%
VICTORIA ST EAST	1.27	28.82	1.24	29.33	0.61	-2.36%
WILGA STREET	1.4	31.08	1.35	31.92	0.72	-2.88%
TOTALS	1.4	33.12	1.35	35.33	0.72	-2.88%

ROUTE 3	AVG SURVEYED		MODEL 16PM23		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 10092 CLARENCE ST						
BELMORE ST	0.21	48.57	0.2	50.00	0.17	-4.76%
RAILWAY PDE	0.64	24.38	0.62	24.60	0.26	-3.13%
DEANE ST	0.74	29.19	0.73	29.57	0.36	-1.35%
WAIMEA ST	0.82	33.66	0.83	33.35	0.46	1.22%
GEORGE STREET	0.89	33.71	0.87	34.67	0.5	-2.25%
VICTORIA ST EAST	1.32	27.73	1.29	28.31	0.61	-2.27%
WILGA STREET	1.51	28.61	1.4	30.90	0.72	-7.28%
TOTALS	1.51	32.26	1.4	33.06		-7.28%

ROUTE 3	AVG SURVEYED		MODEL 16AMWE17		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 10092 CLARENCE ST						
BELMORE ST	0.21	48.57	0.22	50.00	0.17	4.76%
RAILWAY PDE	0.54	28.89	0.51	30.06	0.26	-5.56%
DEANE ST	0.65	33.23	0.61	35.04	0.36	-6.15%
WAIMEA ST	0.78	35.38	0.72	38.61	0.46	-7.69%
GEORGE STREET	0.8	37.50	0.76	39.86	0.5	-5.00%
VICTORIA ST EAST	1.3	28.15	1.26	28.99	0.61	-3.08%
WILGA STREET	1.48	29.19	1.37	31.58	0.72	-7.43%
TOTALS	1.48	34.42	1.37	36.31		-7.43%

Note The Modelled travel speeds are corrected to reflect mid block and downstream intersection vehicle delay(s) and congestion.

Table 4 2017 Calibrated Travel Times Route 4

Source Road Delay Solutions, 2017

ROUTE 4	AVG SURVEYED		MODEL 16AM28		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 4798 WILGA ST						
VICTORIA STREET EAST	0.48	13.75	0.49	13.75	0.11	2.08%
GEORGE STREET	0.61	21.64	0.59	21.87	0.22	-3.28%
WAIMEA ST	0.65	24.00	0.63	24.42	0.26	-3.08%
DEANE ST	0.79	27.34	0.74	29.39	0.36	-6.33%
RAILWAY PDE	1.18	23.39	1.14	24.26	0.46	-3.39%
BELMORE ST	1.31	25.19	1.23	26.73	0.55	-6.11%
CLARENCE ST	1.5	28.42	1.4	30.8	0.72	-7.89%
TOTALS	1.5	23.39	1.4	24.46	0.72	-7.89%
ROUTE 4	AVG SURVEYED		MODEL 16PM23		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 4798 WILGA ST						
VICTORIA STREET EAST	0.44	15.00	0.45	15.00	0.11	2.27%
GEORGE STREET	0.54	24.44	0.55	23.48	0.22	1.85%
WAIMEA ST	0.68	22.94	0.64	24.34	0.26	-5.88%
DEANE ST	0.8	27.00	0.74	29.31	0.36	-7.50%
RAILWAY PDE	1.27	21.73	1.23	22.61	0.46	-3.15%
BELMORE ST	1.4	23.57	1.31	25.03	0.55	-6.43%
CLARENCE ST	1.58	27.34	1.48	29.06	0.72	-6.33%
TOTALS	1.58	23.15	1.48	24.12	0.72	-6.33%
ROUTE 4	AVG SURVEYED		MODEL 16AMWE17		Distance km	TIME Diff %
	TIME (minutes)	SPEED km/hr	TIME (minutes)	SPEED km/hr		
Start Node = 4798 WILGA ST						
VICTORIA STREET EAST	0.51	12.94	0.54	12.50	0.11	5.88%
GEORGE STREET	0.63	20.95	0.64	20.20	0.22	1.59%
WAIMEA ST	0.76	20.53	0.68	22.67	0.26	-10.53%
DEANE ST	0.84	25.71	0.79	27.57	0.36	-5.95%
RAILWAY PDE	1.21	22.81	1.16	23.90	0.46	-4.13%
BELMORE ST	1.35	24.44	1.25	26.36	0.55	-7.41%
CLARENCE ST	1.58	27.34	1.42	30.42	0.72	-10.13%
TOTALS	1.58	22.10	1.42	23.37	0.72	-10.13%

Note The Modelled travel speeds are corrected to reflect mid block and downstream intersection vehicle delay(s) and congestion.

Results indicate a maximum difference of <10.5% between the collated field data and modelled travel times. *RMS* guidelines require average modelled travel times to have a differential not greater than 15% or one (1) minute from the observed travel times for the entire route collected.

3.4 Origin and Destination Survey

A simple number plate survey was undertaken to determine the travel patterns of motorists travelling along Burwood Road.

The data was used for comparison and calibration with select link data from the base year 2016 model. The model, once calibrated, reported a maximum route difference, compared with the collected field data, of some 16.6%, being the northbound route (D to A) on Burwood Road during the morning peak. Generally, all other routes yielded an absolute average difference less than 7.5%.

Figure 17 O/D Survey Boundary and Locations

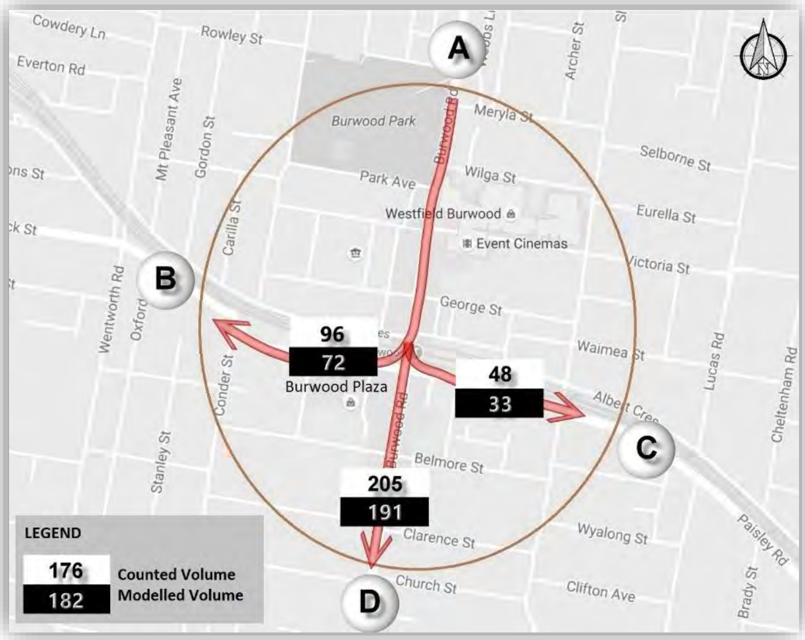
Source Road Delay Solutions, 2017

Figure 18 Northbound O/D Survey

Source Road Delay Solutions, July 2017

Figure 19 Southbound O/D Survey

Source Road Delay Solutions, July 2017



3.5 Vehicle Growth to 2017

To determine the historic vehicle growth on Burwood Road, data has been drawn from previous studies and compared with the volumes presented in the collected traffic counts at select intersections.

Figure 20 AM Vehicle Growth

Source Road Delay Solutions, 2017

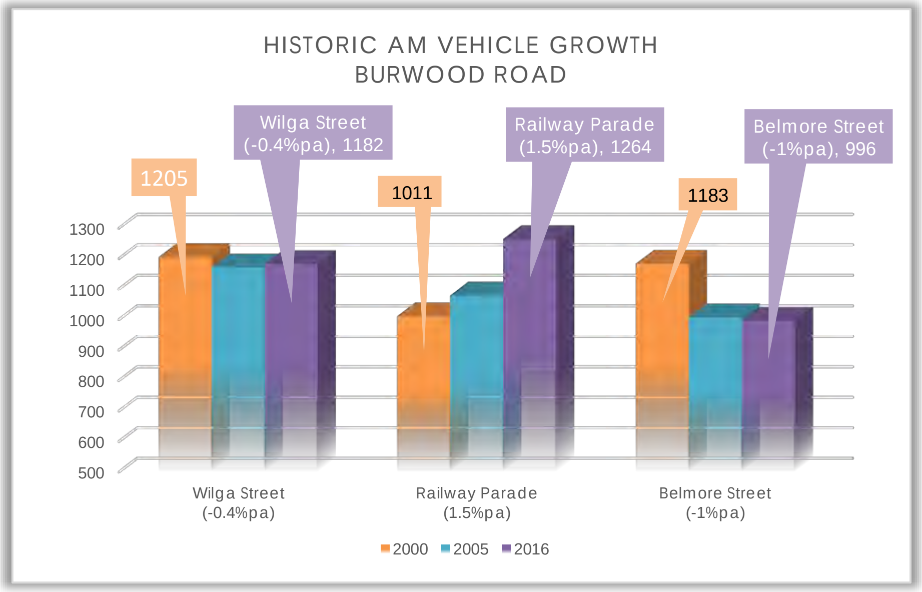
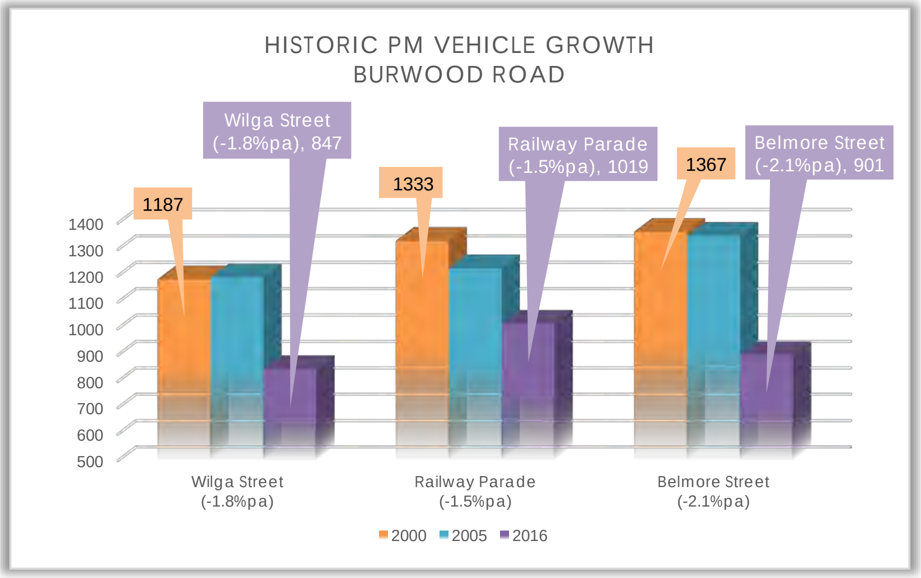


Figure 21 PM Vehicle Growth

Source Road Delay Solutions, 2017



All indicators suggest that there has been a negative vehicle growth on Burwood Road over the past 17 years.

3.6 Mode Share

Residents within the Burwood Town Centre have a significant mode choice and rely heavily on the available rail and bus services during the commuter peak periods.

The current predominant available transport mode choices for Jpurney to Work (JTW) have been catalogued from those available within, or adjacent to, the town centre, and as defined within the *BTS* TZs 913 and 915.

The latest Household Travel Survey (HTS) data indicates that the average weekday trips have grown by 1.0% between 2009/10 and 2010/11, which was slower than the 1.6% rate of population growth in the Sydney Statistical Division (SSD).

The private motor vehicle remains the dominant mode of transport embraced by the wider Sydney community. However, the *BTS* reports the town centre exhibits a significant public transport share, with a higher than metropolitan average of 56% of JTW trips attributed to the available train and bus modes.

In line with NSW 2021 targets, growth in public transport trips has been higher than growth in private vehicle passenger trips. Vehicle driver trips have increased by 1.5%, while train and bus trips increased by 2.6% and 2.3%, respectively. These inherent increases can be attributed to increased traffic congestion on the arterial road system, greater frequency of public transport services and improved intermodal/interchange provisions. This is clearly evident within the Burwood Town Centre, and in particular on Burwood Road, with the reported average reduction in vehicle growth since year 2000.

With a walking distance of only 340m between the Victoria Street site and Burwood Railway Station, combined with the convenience of available bus provisions, public transport remains the dominant mode choice for JTW by residents within, and in close proximity to, the town centre.

Planners invariably work on the basis that commuter bus users will walk no more than 400 metres from home to the nearest stop. Data suggests travellers will walk further to catch a train.

Travel surveys have shown the median walk distance to a bus in heavily built up areas of Sydney and Melbourne is some 500 metres, with only 25% walking more than 800 metres.

The data, anecdotally, suggests that train travellers infrequently elect to walk more than 800 metres if the prevailing pedestrian environment is condusive.

Therefore, the maximum walk distance to a station has been adopted as 800 metres within the model.

Bicycle to train is an ever growing opportunity for both efficiency and health choices. This may offer some relief from commuter traffic generation but it is considered negliable in this instance as no significant cycle provisions are currently provided at the railway station.

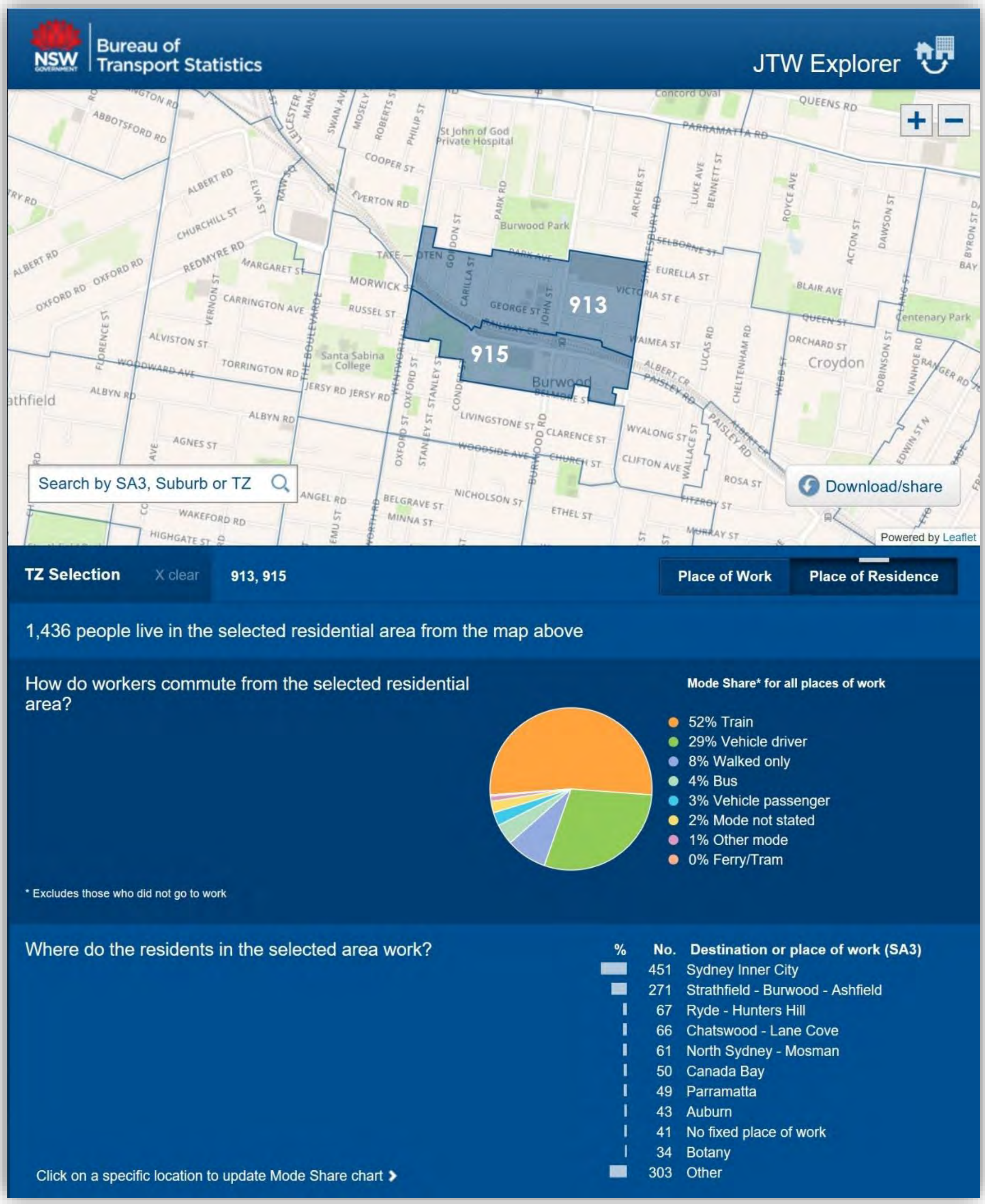
It can therefore be concluded that…

- → *The distance between the Victoria Street East site and Burwood Railway Station will promote public transport mode choice with future population growth within the town centre,*
- → *The public transport network provides significant opportunity for a reduction in the dependence in private vehicle usage, and*
- → *Retail and commercial patrons also have significant opportunity to employ public transport modes.*

While all indicators would suggest that the current public transport services within the town centre provide significant opportunity for mode shift, none has been adopted in the mesoscopic modelling for the Victoria Street East development. The full traffic generation of 328vph during the AM commuter peak and 297vph during the PM has been incorporated into the model trip matrices to provide a conservative '*worst case*' assessment.

Figure 22 Burwood Town Centre JTW Mode Share

Source BTS JTW Exporer, 2017



4. THE MESOSCOPIC MODEL

The *Netanal* model for the Burwood Town Centre has been utilised to determine the impact(s) of this development. The mopdel defines travel demand between zonal pairs, represented as assimilated traffic movements, throughout the Sydney Metropolitan Area. The program incrementally assigns vehicular traffic onto a computer based road network, developing link demand forecasts on each modelled section of road.

Netanal is a mesoscopic assignment model utilising intersection congestion levels and delays in the determination of a motorists' route choice.

4.1 Route Selection

Route selection between zonal pairs is determined on the basis of the shortest travel cost ('*time is money*'), considering the inherent intersection delays, and associated parameters, incurred along possible routes, the road hierarchy, various behavioural characteristics and a number of empirical social economic considerations. Parameters such as link capacity, speed, gap acceptance, phase timings at signalised intersections, toll charges and distance are coded into the model, by the user, from which the program determines the relative vehicular delays on each competing route, selecting, after undertaking a prescribed number of iterations, the route with the shortest travel time and/or least delay. Costs and travel time are relative within the Netanal model. Time penalties are applied to turn movements, stops and delays, etc… which in turn have a corresponding travel cost.

In the most general form, this 'cost' represents a combination of factors which the program takes into account when choosing routes through the road network. The most important of these factors are time and distance. Also where tolls are charged for the use of a specific section of road, these costs are included in the driver's route choice and are based on a driver's willingness to pay the toll based upon published data from the *RMS* and *BTS*.

The process which *Netanal* employs to determine the 'cost' of travel on competing paths, equates heavily to travel time. Time penalties for turning manoeuvres, vehicle delays, and tolls each increase the cost and time of travel on competing routes.

Toll value, on a specific link, is included indirectly by converting the monetary toll value to time (in minutes) based on the driver's perceived value of time and socio economic proclivity to pay the toll. This 'time value of the toll' is applied as a 'penalty' to the link and is known as the Toll Diversion Penalty (TDP).

The premise on which the future year modelling has been based, specifically the route selection process, is the current value of time. Toll values, toll diversion penalties and socio economic decision making defaults, have not been increased with CPI or standard of living projections beyond the current year.

4.2 Incremental Assignment

In order to reflect the impact of intersection congestion on route selection, *Netanal* assigns the traffic from the trip table as a series of equal increments. This process is outlined below…

- → *The process commences by identifying competing routes with the shortest travel times, for each origin-destination zone pair, with no traffic using the roads (ie based on sign-posted speed limits, green lights, etc). Known colloquially as increment 0 (zero), the link and intersection delays, accumulated over the modelled one hour period, are tabulated for later reference.*
- → *The first incremental run of the model imposes the time delays recorded during Increment 0 and adds the delays to the travel time of each route. During the increment, routes yielding the lowest travel time between zonal pairs are chosen. Again the resultant delays on each route, inclusive of intersections, are recorded by the program.*
- → *Each subsequent increment performs ongoing route selection based on recorded delays and the resultant route travel times. As delays stabilise, so too does the route selection within the model, until the optimum number of increments are run.*

At the completion of the nominated number of incremental runs, the optimum routes and vehicle demands, on each link, are reported.

Incremental convergence is employed to determine the projective stability and optimum number of increments to be adopted for a model run. The process of incremental convergence involves the running of sensitivity models reflecting a differing number of increments, with the projected volumes on a select number of key links, reported.

Once the differential change between the projected volumes, on each reported link, minimises, the model is considered stable and the resultant number of increments are utilised in the project model runs.

For this project, 20 increments were found to provide stability in link demand.

4.3 Assignment Calculations

Netanal calculates travel time on the basis of the capacity related, geometric and operational characteristics of roads and intersections defining the road network. The following are specifically incorporated in the calculation of road network and route operations for the mid-block section of each link.

4.4 Speed-flow relationships

As traffic volume increases, speeds on roads decrease and the relationships within the *Netanal* software take this into account. The speed is based on the ratio of the traffic flow to the nominated road capacity. *Netanal* assumes free flow conditions on links up to a set value for the degree of saturation (DS). This value is set to equal 90%. When traffic flows on a particular link exceeds the DS set value, the speed drops according to a speed flow relationship, to the power of four.

4.5 Transit Lanes

The proportion of traffic using the transit and non-transit lanes on a section of road is based on *RMS* surveys of Epping Road, Military Road and Victoria Road. This surveys reported that the transit lanes operated to a maximum of 50% of the adjacent trafficable lane. Illegal use was reported as 25% while the DS of the adjacent lane was below 0.75.

With an increase above 0.75 in the adjacent lane, a proportionate increase in the illegal use of the transit lane results. *Netanal* applies this principle on all transit lanes, within the model.

The program assumes a 40% maximum usage of T3 transit lanes while the DS of the adjacent lane remains below 0.75. The program further assumes the illegal usage of a T3 lane is the same as that of a T2.

Bus lanes, and bus stops can be included as part of the network. *Netanal* can report on travel time changes on these routes.

4.6 Ancillary Effects on Road Network Operation

On-street parking, speed limits, LATM devices (eg speed humps, raised thresholds, road narrowings, etc…), pedestrian crossings and toll plazas all add time/cost penalties during the route selection choice.

4.7 Tollways

A delay of seven seconds per vehicle is applied at toll plazas that have manual or automatic payment collection at the toll plaza. Manual and automatic toll collection has ceased in Sydney. Replaced by electronic tolling, no toll plaza delay is invoked within the model. Consideration must be given to any reduced speeds at a specified toll location, where signposted. This is done by specifying the regulated speed on the link through toll point within the model so as to accurately model the vehicle travel time.

Tolls are collected in dollars but have the effect of making a route less attractive by an invoked time penalty. Therefore, the toll cost must be converted to a time value that can be attributed to the relevant route within *Netanal* to reflect additional travel time in the route selection choice. This conversion factor is the TDP, and is expressed in minutes per dollar.

Those network characteristics which may vary across a 24hr time of day operation, such as transit lanes, bus lanes, parking restrictions, toll fees, turn prohibitions, etc… are included in the network definition and further impact on the assignment route selection.

Intersection delay, calculated within the model, employs the *Austroad's* and *AARB* established formulae for the control of intersections operating as give way or stop sign, roundabout or traffic signals. For the latter the benefits of Sydney's coordinated signal control system, SCATS, on improved traffic flow, is incorporated. *SCATES* are run to dynamically emulate the SCATS operation at all signalised intersections, so designated, within the model. A '*cost*' penalty is added to the travel time to represent the delay that is associated with any pedestrian conflict at a marked crossing and/or any left turns and/or opposing traffic for right turns.

Netanal specifically calculates both the mid-block capacity and intersection performance. The model is therefore able to calculate queue lengths based on lane availability by time of day when traffic demand exceeds capacity and incorporate this queuing delay in the calculation of travel time during route choice.

If the travel time remains lower on a particular route with queues, *Netanal* will continue to assign traffic to that route until such time as the queue results in a time delay that makes an alternative route more attractive.

4.8 Projected Intersection Turn Movements

Netanal produces the hourly intersection turn movement demands at each node (intersection) within the mesoscopic model. These specific outputs have been employed in this project to provide the critical projected turn movements, within the study area, to enable the operational micro analysis, utilising the *Sidra* program, at key intersections.

Inherently, the predictive nature of mesoscopic modelling and the location of zone generators is one of the primary factors impacting on the volume of traffic reported at each intersection. Zones harbour vehicle generation based on land use within a precinct boundary, generally representing several hectares. Zones are often located within the model based upon, but not limited to…

- → *Their context within the precinct in relation to the primary direction of traffic flow to and from the zone,*
- → *Generally, central within a zone boundary (subject to finer disaggregation as land use dictates),*
- → *Representation of a major vehicle generator within the precinct, such as school, large apartment block, shopping centre, car park, significant commercial operation, recreational grounds, etc… , and*
- → *To allow the even distributiuon of traffic onto the arterial road network while limiting the intrusion of through traffic within local communities, unless identified from field observations.*

In some instances, the zone location may propagate errors at some intersections, in close proximity to high vehicle generation. A zone may be located so as to avoid the unwanted or unkikely trip diversion or '*rat runs*' within a local precinct attempting to access the arterial road network.

Significant effort is placed on locating the zones within the model to effectively assign vehicles onto the road network.

4.9 The SIDRA Model

SIDRA is utilised in this report to verify the mesoscopic model outputs and enable the assessment of lane based vehicle operation within the road network. The affects of oversaturation, upstream and down stream lane blockages at multiple intersections by differing intersection control methods are assessed diligently and without bias.

SIDRA provides the means by which to assess and report the Network Route and Intersection operations concurrently. The results presented in this report reflect the findings reported from the *SIDRA* models following exportation of the projected turn volumes and residual queue lengths from the *Netanal* model.

5. 2017 MODEL CALIBRATION

5.1 General

This section provides a concise framework for the verification, validation and calibration of the base year 2017 traffic model, assimilating the current study area road network and it's operational conditions.

Mesoscopic modelling lies between large strategic macro modelling and detailed microsimulation modelling, and is used to model relatively large areas (e.g. at the suburb level) while capturing detailed intersection operation effects on congestion and driver route choice. A mesoscopic traffic model has been created as part of this study using the *Netanal* software, which allows for the capacity and queuing effects of each intersection within the network to be assessed, as well as the cumulative effects of this congestion on adjacent intersections and route choice throughout the network.

The model utilises land use information and its traffic generation as inputs, along with road network details such as intersection geometry and road link speeds, number of lanes and capacity limitations. The model then calculates delays for the available routes through the network from each origin "zone" to each destination "zone" and assigns the generated traffic to the network based on comparable travel times. This allows intersection performance outputs (delays, levels of capacity usage, turning volumes etc.) and network travel times to be extracted, along with a range of other statistics valuable for option comparison.

A detailed outline of the software operation is provided earlier in this report.

5.2 Input Data

Appendix A presents the current traffic volumes collected by *Austraffic* and *ROAR Data* in vehicles per hour, travelling on the surrounding road network. This data has been utilised in the calibration procedure of the mesoscopic model to align the projected model volumes with the current traffic flow and distribution, within the study area.

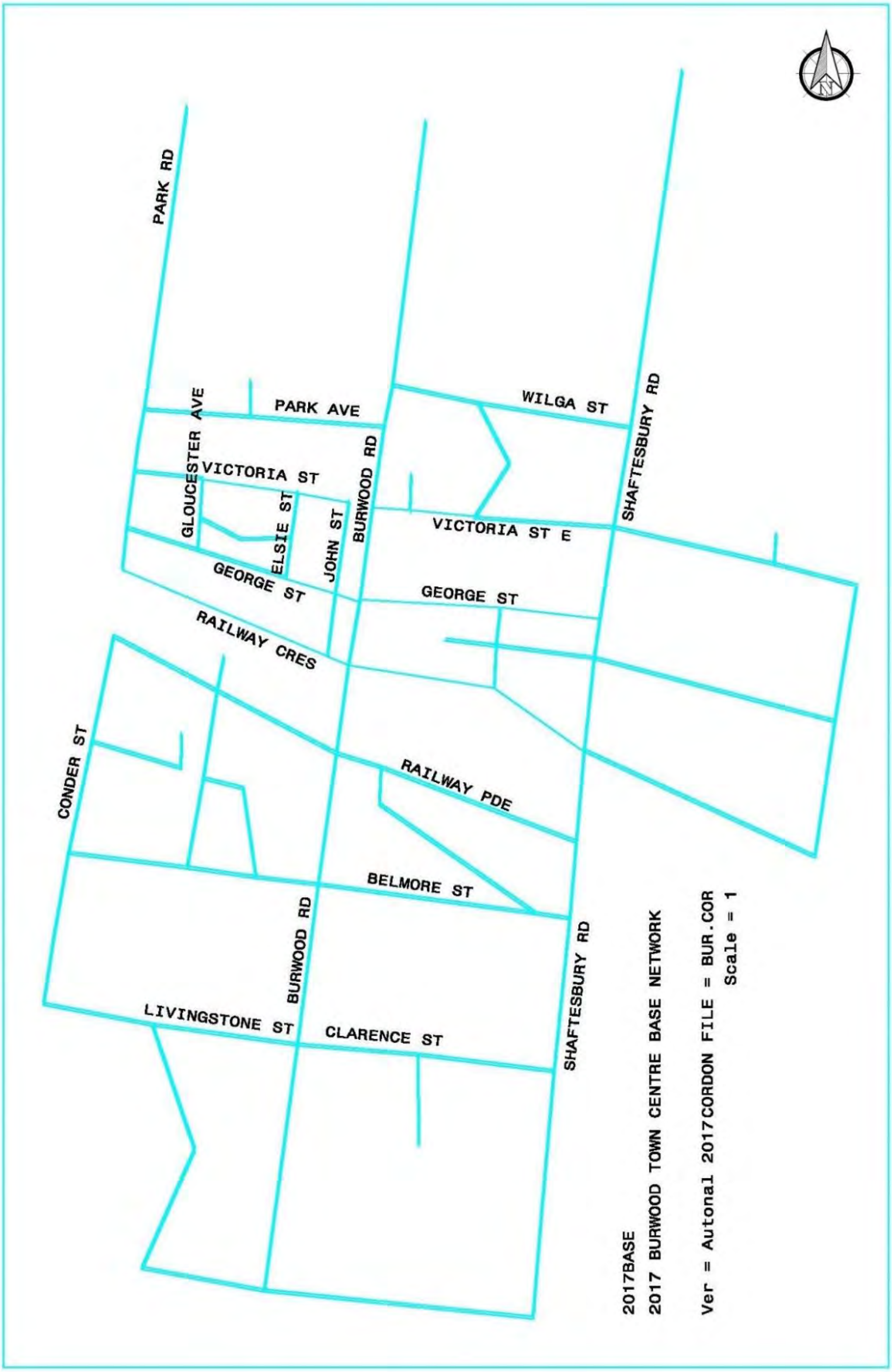
A detailed audit and catalogue of the town centre road network, and surrounds, has been undertaken ensuring the accuracy of the network platform onto which the developed morning, evening and Saturday peak trip matrices have been assigned.

Generally, the network characteristics catalogued were…

- *Road hierarchy,*
- *Road alignment,*
- *Number of lanes by peak period,*
- *Transit corridors,*
- *Regulated link speeds,*
- *Intersection control modes,*
- *Traffic signal timing offsets,*
- *Gap acceptance timing,*
- *Turn penalties pertaining to intersection geometries, and*
- *Lane capacities.*

Figure 23 *Mesoscopic Road Network Cordon*

Source *Road Delay Solutions, 2019*



5.3 2017 Base Year Model

The geographic region modelled (*Sydney Statistical Division or Sydney SD*) is represented by a trip matrix (*trip table*), that details the individual travel demands between origin and destination pairs. Each distinct area representing a trip origin or end is called a '*Zone*'. The Sydney *Netanal* model contains some 998 zones, following disaggregation. These elements define areas of homogenous land use (eg. residential, industrial, retail, commercial, education, airports, hospitals), enclosed and linked, by physical features such as major roads, railways and rivers, which is known as the network.

The trip table specifies the number of car and truck trips travelling between zones, within the modelled area. The boundaries of these zones for the Sydney Metropolitan Area were originally defined in 1996, by the *NSW Department of Transport's Transport Data Centre* (TDC), and have been generic across all traffic and transport modelling activities undertaken in Sydney. New boundaries were defined by *TDC* in 2006 and again in 2011, with an equivalency table, prepared by the *TDC*, employed to rationalise the current projected land use and trip distribution patterns with the *Netanal* zonal structure.

The current trip matrices employed in the *Netanal* models have been imported from those prepared by *TDC* but have had been subjected to extensive disaggregation to better define land use and vehicle generation patterns.

The assignment process, described above, essentially determines the anticipated route selection made by motorists between the '*origin*' and '*destination*' zones during a designated time period. The total number of trips between all the zonal pairs produces the projected traffic volumes reported by the model. *Netanal* model's the road network assignment over a 1hour period.

The current and future year trip matrices, originally produced by the *BTS* in October 2014 (*Revised in October 2016 and supplemented by the BTS Zone Explorer*), have been developed from a 4 step travel model established on forecast population and employment projections throughout the Metropolitan Area and assigned to a computer based transport network.

Extensive disagregation of the vehicle distribution and trip demands between zonal pairs has been undertaken by *Road Delay Solutions* for the one (1) hour morning and evening peak travel trip tables to accurately reflect and assimilate the operation of the Sydney Metropolitan road network.

The land use assumptions adopted in the year 2017 trip matrices, conform with those published by *TDC* and have been further advanced through numerous calibration processes throughout the Sydney Metropolitan area.

5.4 Verification

Verification is the process of determining if the computer code, that implements the modelling logic, produces the desired output for a given set of input data and/or parameters.

A model is considered successful if the outputs are consistent, in terms of both magnitude and direction, with results from the direct application of the logic on which the code within the software is based.

The *Netanal* software package produces travel forecasts generally based upon travel time and cost rather than shortest distance and/or 'gravity' principles.

Netanal determines the invoked link and intersection delays predicated upon capacity and intersection control method, during a model assignment run, to effectively produce travel times between origins and destinations.

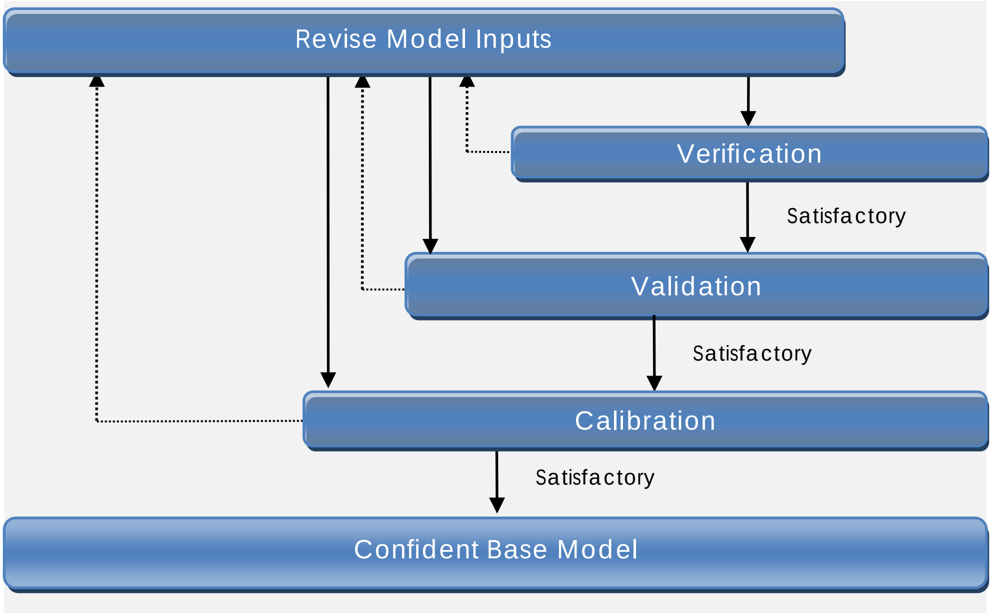
Based on these times, route selection within the model is influenced by the determined travel times on each modelled or alternate route. Preferred travel routes will be those yielding the lowest travel times, with a direct correlation to the vehicle operating costs.

Each intersection within the model is run at the operational level to determine the respective vehicle delays through the intersection and these are in turn added to the link delays.

The *Netanal* model has been verified by the former *RTA*, with reference found in *Part 2* of the '*Economic Analysis Manual*'.

Figure 24 *The Correctness Procedure*

Source *Road Delay Solutions, 2017*



5.5 Validation

The term applied to the fundamental method of assessing the effectiveness of the calibration procedure and its underlying principles in achieving an acceptable level of calibration.

To assess the model calibration, a formula known as the '*GEH Statistic*'[3] has been employed to rationalise the differential between the modelled and actual counted traffic volumes, on selected turn movements and links.

Turns and links with low volumes and a higher differential between the modelled and counted volumes, while possibly exhibiting a high percentage of inaccuracy, are considered less critical than links accommodating higher volumes. The GEH Statistic balances the relative priority of each link based on the counted volume, during the model calibration process. The GEH statistic is computed by the *Netanal* program.

[3] The GEH Statistic named after Geoffrey E. Havers, who invented it in the 1970s while working as a transport planner in London, England. In a mathematical form it is similar to a chi-squared test, but is not considered a true statistical test. Rather, it is an empirical formula that proves useful for a variety of traffic analysis purposes.

Figure 25 The GEH Statistic

Source Road Delay Solutions, 2017

$$GEH = \sqrt{\frac{(E-V)^2}{(E+V)/2}}$$

where… E = Predicted model volume V = Actual field counted volume

Four criteria were used to ensure the model was adequately calibrated (as per the RMS guidelines)…

- → *A minimum of 90% of turn volumes with a GEH < 5,*
- → *A minimum of 95% of link volumes with a GEH < 5,*
- → *No volumes yielding a GEH > 10, and*
- → *A minimum R-squared value of 0.9 for both link and turn volumes.*

A range of GEH targets have been realistically set to achieve the prescribed Level of Accuracy (LoA), noted in the calibration synopsis. The targets highlight the percentage and weighted degree of difference between modelled volumes and the collected field data. For link volumes, a GEH value of 5 or less was adopted for the model and is presented in the report.

The figure below describes the components of the GEH Statistic and the typical targets employed in the calibration of the base year models.

Figure 26 A Typical GEH Output

Source Road Delay Solutions, 2017

68 of the 89 count locations report a GEH of 5 or less

A target 60% of the modelled volumes in the calibration summary should have a GEH of 5 or less

The 68 modelled volumes, with a GEH of 5 or less, equate to 76% of the total 89 count locations

	Counts	%
GEH <= 5 Target = > 60	68	76
GEH <= 7 Target = > 80	78	88
GEH <= 10 Target = > 95	86	97
GEH <= 12 Target = 100	89	100
GEH > 12 Target = 0	0	0
Total Counts		89

Note: The above figure is indicative only. It presents a representation of the typical turn volume results for a hyperthetical model. The actual GEH results for this project are presented in the following section.

5.6 Calibration

Defined as the process of model parameter and input manipulation to achieve a prescribed differential between actual local traffic volumes and those modelled.

Calibration is, fundamentally, the transparent production of output, controlled by the value of input parameters on the basis of available field data. The success or failure of the calibration process, is determined by the accurate and logical evaluation of the collected and available field data employed in the selected input parameters.

From the collected intersection counts, all turn movements at the counted intersection and links at the mid block count locations have been calibrated, individually, to ensure the integrity of the trip distribution and volume flows within the study area and surrounds.

Table 5 2017 GEH Calibrated Link and Turn Results

Source Road Delay Solutions, 2017

Accuracy	AM Peak Turns	PM Peak Turns	WE Peak Turns
GEH >= 10	0%	0%	0%
GEH >= 5 <= 10	8%	5%	9%
GEH < 5	92%	95%	91%
An R-squared value, in excess of 0.961 was achieved for the AM, PM and WE modelled peak periods			
Accuracy	AM Peal Links	PM Peak Links	WE Peak Links
GEH >= 10	0%	0%	0%
GEH >= 5 <= 10	0%	0%	0%
GEH < 5	100%	100%	100%

.

The calibration synopsis of traffic flows, on key routes, was output from the base 2017 AM, PM and WE peak models for the purpose of brevity. The *Calibration Synopsis* clearly shows that the link volumes achieved the required level of accuracy, in accordance with *RMS* guidelines.

The zonal information, contained within the matrices, has been disaggregated in accordance with data collated during various studies conducted by *Road Delay Solutions Pty Ltd*, generally yielding a mean absolute screen line calibration Level of Accuracy (LoA) of some 15-20%.

The traffic volume calibration process for this project has adopted a standard deviation of 15% of the absolute mean, constituting an accepted LoA within the study area, while a deviation of 25% defines the LoA through the Sydney SD.

It should be noted that the *Netanal* program is a mesoscopic demand model, which reflects the total volume of traffic on a link, including residual traffic queues at the end of the modelled one-hour time period. This is in contrast to the counted volume, collected in the field data, which only records those vehicles passing a given point during the same period.

Unless the residual queue is added to the count volume, it is safe to assume, that a count location will frequently report a lower traffic volume than those projected within the model, where significant vehicle queues exist at a site.

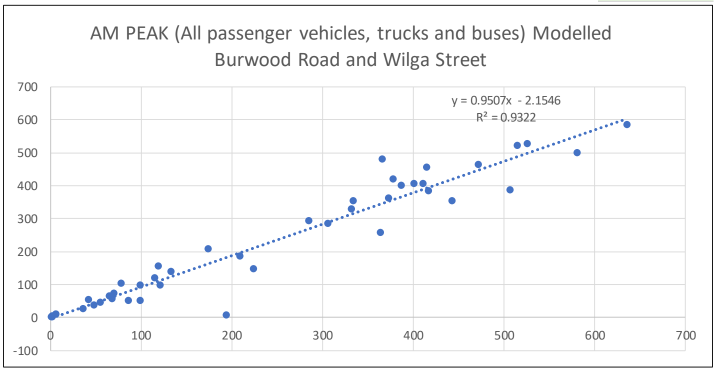
Discrepancies between adjacent intersection counts (known as gains and losses) are to be expected and an error in the order of some 3-4% was exhibited by the collected field data on Burwood Road and Shaftesbury Road.

Table 6 *2017 AM Peak Calibrated Turn Synopsis*

Source *Road Delay Solutions, 2017*

AM PEAK (All passenger vehicles, trucks and buses)

Location	Observed	Modelled	ABS Diff	% Diff	GEH
Burwood Road and Wilga Street					
Burwood Rd NB to Burwood Rd Thru	515	521	6	1%	0
Burwood Rd SB to Burwood Rd Thru	415	454	39	9%	1
Burwood Rd NB to Wilga St RT	285	293	8	3%	0
Burwood Rd SB to Wilga St LT	78	102	24	31%	3
Wilga St WB to Burwood Rd LT	332	327	-5	-2%	0
Wilga St WB to Burwood Rd RT	174	207	33	19%	2
Burwood Road and Park Avenue					
Burwood Rd NB to Burwood Rd Thru	472	462	-10	-2%	0
Burwood Rd SB to Burwood Rd Thru	378	418	40	11%	1
Burwood Rd NB to Park Ave LT	36	25	-11	-31%	4
Burwood Rd SB to Park Ave RT	373	362	-11	-3%	0
Park Ave EB to Burwood Rd LT	334	353	19	6%	1
Park Ave EB to Burwood Rd RT	115	119	4	3%	0
Burwood Road and George Street					
Burwood Rd NB to Burwood Rd Thru @ George St	526	525	-1	0	0
Burwood Rd SB to Burwood Rd Thru @ George St	401	405	4	0	0
Burwood Road and Deane Street					
Burwood Rd NB to Burwood Rd Thru	636	585	-51	0	1
Burwood Rd SB to Burwood Rd Thru	411	405	-6	0	0
Deane St WB to Burwood Rd LT	65	64	-1	0	0
Deane St WB to Burwood Rd RT	68	57	-11	0	2
Burwood Road and Railway Parade					
Burwood Rd NB to Burwood Rd Thru	581	499	-82	0	2
Burwood Rd SB to Burwood Rd Thru	306	284	-22	0	1
Burwood Rd NB to Railway Pde LT	55	46	-9	0	2
Burwood Rd SB to Railway Pde LT	70	73	3	0	0
Burwood Rd SB to Railway Pde RT	86	51	-35	0	5
Railway Pde EB to Burwood Rd LT	209	186	-23	0	1
Railway Pde EB to Burwood Rd Thru	364	257	-107	0	3
Railway Pde WB to Burwood Rd LT	48	38	-10	0	2
Railway Pde WB to Burwood Rd Thru	387	399	12	0	0
Railway Parade, Wynne Avenue and Access Road					
Railway Pde EB into Access RD LT	6	8	2	33%	3
Railway Pde eEB into Railway Pde Thru	507	387	-120	-24%	3
Railway Pde EB into Wynne Avenue RT	121	96	-25	-21%	2
Wynne Ave NB into Railway Pde LT	133	139	6	5%	0
Wynne Ave NB into Access Rd Thru	2	2	0	0%	0
Wynne Ave NB into Railway Pde RT	42	53	11	26%	2
Railway Pde WB into Wynne Ave LT	99	98	-1	-1%	0
Railway Pde WB into Railway Pde Thru	417	384	-33	-8%	1
Access Rd SB into Railway Pde LT	2	3	1	50%	4
Access Rd SB into Railway Pde Thru	1	1	0	0%	0
Access Rd SB into Railway Pde RT	6	8	2	33%	3
Railway Parade and Conder Street					
Railway Pde EN into Railway Pde Thru	443	354	-89	-20%	2
Railway Pde EN into Conder St RT	119	156	37	31%	3
Conder St NB into Railway Pde LT	224	146	-78	-35%	4
Conder St NB into Railway Pde RT	194	7	-187	-96%	19
Railway Pde WB into Conder St LT	99	50	-49	-49%	7
Railway Pde WB into Railway Pde Thru	366	479	113	31%	3



AM PEAK (All passenger vehicles, trucks and buses)

Location	Observed	Modelled	ABS Diff	% Diff	GEH
Wentworth Road, Railway Parade and Morwick Street					
Wentworth Rd NB into Wentworth Rd Thru	230	116	-114	-50%	7
Wentworth Rd NB into Railway Pde RT	8	10	2	25%	2
Railway Pde WB into Wenworth Rd LT	42	2	-40	-95%	18
Railway Pde WB into Morwick St Thru	306	429	123	40%	3
Railway Pde WB into Wenworth Rd RT	269	97	-172	-64%	9
Wentworth Rd SB into Railway Pde LT	240	188	-52	-22%	2
Wentworth Rd SB into Wentworth Rd Thru	332	357	25	8%	1
Wentworth Rd SB into Railway Pde RT	72	53	-19	-26%	3
Morwick Rd EB into Wentworth Rd LT	257	256	-1	0%	0
Morwick Rd EB into Railway Pde Thru	342	321	-21	-6%	1
Shaftesbury Road, Paisley Street and Railway Parade					
Railway Pde EN into Shaftesbury Rd LT	136	122	-14	-10%	1
Railway Pde EN into Paisley St Thru	324	292	-32	-10%	1
Railway Pde EN into Shaftesbury Rd RT	25	19	-6	-24%	3
Shaftesbury Rd NB into Railway Pde LT	21	33	12	57%	4
Shaftesbury Rd NB into Shaftesbury Rd Thru	589	554	-35	-6%	1
Paisley St WB into Shaftesbury Rd LT	20	29	9	45%	4
Paisley St WB into Railway Pde Thru	280	270	-10	-4%	0
Paisley St WB into Shaftesbury Rd RT	161	185	24	15%	1
Shaftesbury Rd SB into Paisley St LT	111	85	-26	-23%	3
Shaftesbury Rd SB into Shaftesbury Rd Thru	408	493	85	21%	2
Shaftesbury Rd SB into Railway Pde RT	168	156	-12	-7%	1
Burwood Road and Belmore Street					
Belmore St EB into Burwood St LT	67	97	30	45%	4
Belmore St EB into Belmore St Thru	101	79	-22	-22%	2
Belmore St EB into Burwood St RT	36	22	-14	-39%	5
Burwood Rd NB into Belmore St LT	35	39	4	11%	1
Burwood Rd NB into Burwood Rd Thru	583	402	-181	-31%	4
Burwood Rd NB into Belmore St RT	68	41	-27	-40%	5
Belmore St WB into Burwood Rd LT	20	19	-1	-5%	1
Belmore St WB into Belmore St Thru	120	135	15	13%	1
Belmore St WB into Burwood Rd RT	22	25	3	14%	1
Burwood Rd SB into Belmore St LT	42	24	-18	-43%	5
Burwood Rd SB into Burwood Rd Thru	311	278	-33	-11%	1
Burwood Rd SB into Belmore St RT	11	13	2	18%	2
Wynne Avenue and Belmore Street					
Belmore St EB into Wynne Ave LT	128	127	-1	-1%	0
Belmore St EB into Belmore St Thru	107	146	39	36%	3
Belmore St WB into Belmore St Thru	116	96	-20	-17%	2
Belmore St WB into Wynne Ave RT	69	121	52	75%	5
Wynne Ave SB into Belmore St LT	53	41	-12	-23%	3
Wynne Ave SB into Belmore St RT	28	12	-16	-57%	8
Conder Street and Belmore Street					
Conder St NB into Conder St Thru	328	158	-170	-52%	7
Conder St NB into Belmore St RT	156	148	-8	-5%	1
Belmore St WB into Conder St LT	78	49	-29	-37%	5
Belmore St WB into Conder St RT	64	80	16	25%	2
Conder St SB into Belmore St LT	80	26	-54	-68%	10
Conder St SB into Conder St Thru	119	143	24	20%	2
Burwood Road and Belmore Street					
Belmore St EB into Burwood St LT	67	97	30	45%	4
Belmore St EB into Belmore St Thru	101	79	-22	-22%	2
Belmore St EB into Burwood St RT	36	22	-14	-39%	5
Burwood Rd NB into Belmore St LT	35	39	4	11%	1
Burwood Rd NB into Burwood Rd Thru	583	402	-181	-31%	4
Burwood Rd NB into Belmore St RT	68	41	-27	-40%	5
Belmore St WB into Burwood Rd LT	20	19	-1	-5%	1
Belmore St WB into Belmore St Thru	120	135	15	13%	1
Belmore St WB into Burwood Rd RT	22	25	3	14%	1
Burwood Rd SB into Belmore St LT	42	24	-18	-43%	5
Burwood Rd SB into Burwood Rd Thru	311	278	-33	-11%	1

5.7 2017 AM Peak Calibration Link Synopsis

Calibration Summary for Model 17AM4Q
Network = 2017BASE Trip Table = 17AM4Q
2017 AM PEAK CALIBRATED BASE MODEL
Observed Counts versus Modelled Volumes

Location..........	Node	Node	Count	Model	Diff	Diff%	GEH
BURWOOD RD SB N WILGA	1348	10096	493	544	51	10	2
WILGA ST EB	10096	4020	365	366	1	0	0
WILGA ST WB	4020	10096	506	454	-52	-10	2
PARK AVE EB	8542	10097	449	437	-12	-3	1
PARK AVE WB	10097	8542	409	320	-89	-22	5
BURWOOD RD NB S PARK A	4800	10097	508	437	-71	-14	3
BURWOOD RD SB S PARK A	10097	4800	493	512	19	4	1
BURWOOD RD SB N GEORGE	4800	8541	420	459	39	9	2
GEORGE ST EB	8541	1356	63	95	32	51	4
GEORGE ST WB W BURWOOD	8541	8506	153	77	-76	-50	7
RAILWAY CRES WB	8544	1365	144	110	-34	-24	3
DEANE ST WB	8543	8544	133	88	-45	-34	4
BURWOOD RD NB N RAILWA	10094	8544	679	582	-97	-14	4
RAILWAY PDE EB W BURWO	8544	10094	473	409	-64	-14	3
RAILWAY PDE WB E BURWO	8522	10094	409	425	16	4	1
RAILWAY PDE EB E BURWO	10094	8522	334	342	8	2	0
BURWOOD RD NB S RAILWA	8539	10094	536	502	-34	-6	1
BURWOOD RD SB S RAILWA	10094	8539	368	290	-78	-21	4
BURWOOD CENTRAL NB	8533	848	7	11	4	57	1
BURWOOD CENTRAL SB	848	8533	9	11	2	22	1
RAILWAY PDE EB W WYNNE	8554	8533	423	368	-55	-13	3
RAILWAY PDE WB W WYNNW	8533	8554	452	513	61	13	3
RAILWAY PDE EB W CONDE	1361	8554	564	517	-47	-8	2
RAILWAY PDE WB W CONDE	8554	1361	592	518	-74	-13	3
CONDER ST NB	8557	8525	267	244	-23	-9	1
CONDER ST SB	8554	8525	218	205	-13	-6	1
BELMORE ST EB W BURWOO	8523	8539	164	193	29	18	2
BELMORE ST WB W BURWOO	8539	8523	196	215	19	10	1
BELMORE ST WB E BURWOO	8228	8539	162	172	10	6	1
BELMORE ST EB E BURWOO	8539	8228	111	125	14	13	1
WYNNE AVE NB N BELMORE	8555	8524	100	143	43	43	4
WYNNE AVE SB N BELMORE	8533	8524	184	166	-18	-10	1
CONDER ST NB S BELMORE	8559	8557	396	311	-85	-21	5
CONDER ST SB N BELMORE	8525	8557	199	169	-30	-15	2
BELMORE ST WB E CONDER	8555	8557	142	111	-31	-22	3
BELMORE ST EB E CONDER	8557	8555	236	170	-66	-28	5
WENTWORTH NB S RAILWAY	1367	4820	252	250	-2	-1	0
WENTWORTH SB S RAILWAY	4820	1367	374	358	-16	-4	1
RAILWAY WB E WENTWORTH	1361	4820	517	520	3	1	0
RAILWAY EB E WENTWORTH	4820	1361	590	526	-64	-11	3
WENTWORTH SB N RAILWAY	8536	4820	644	611	-33	-5	1
MORWICK EB W WENTWORTH	4813	4820	599	589	-10	-2	0
SHAFTESBURY NB S RAILW	8556	4803	626	532	-94	-15	4
SHAFTESBURY SB S RAILW	4803	8556	623	546	-77	-12	3
PAISLEY EB E SHAFTESBU	4803	4804	402	375	-27	-7	1
PAISLEY WB E SHAFTESBU	4804	4803	490	472	-18	-4	1
SHAFTESBURY NB N RAILW	4803	8537	786	680	-106	-13	4
SHAFTESBURY SB N RAILW	8537	4803	636	610	-26	-4	1
RAILWAY WB W SHAFTESBU	4803	8522	434	337	-97	-22	5
SHAFTESBURY SB N WILGA	10089	4798	557	592	35	6	1
WILGA EB W SHAFTESBURY	4020	4798	180	154	-26	-14	2
SHAFTESBURY NB S WILGA	10095	4798	809	776	-33	-4	1
SHAFTESBURY SB N VICTO	4798	10095	390	430	40	10	2

VICTORIA WB E SHAFTESB	8528	10095	502	563	61	12	3
SHAFTESBURY NB S VICTO	8552	10095	779	739	-40	-5	1
VICTORIA EB W SHAFTESB	4036	10095	222	199	-23	-10	2

Summary of GEH Calibration Validation

	Counts	%
GEH <= 5 Target = > 60%	55	98
GEH <= 7 Target = > 80%	56	100
GEH <= 10 Target = > 95%	56	100
GEH <= 12 Target = 100%	56	100
GEH > 12 Target = 0%	0	0
Total Counts	56	

Mean, Mean Absolute Difference (MAD) & +/- 10% MAD Analysis - Model 17AM4Q
Date = 06-14-2019. Time = 09:35:13

Note.... A Mean, a Mean Absolute Difference (MAD) & a MAD +/- 10% Count Variability Analysis is calculated and the results given below. The 10% MAD count variation endeavours to cater for the known 20% variation in daily traffic volumes, errors and discrepancies in SCATS and other count methods.

Observed Count Range	Mean %	MAD ABS %	MAD +-10% %	Counts
0001 to 0500	5.04	12.28	2.28	38
0501 to 1000	6.87	8.66	0.00	18
1001 to 1500	0.00	0.00	0.00	0
1501 to 2000	0.00	0.00	0.00	0
2001 to 2500	0.00	0.00	0.00	0
2501 to 3000	0.00	0.00	0.00	0
3001 to 3500	0.00	0.00	0.00	0
3501 to 4000	0.00	0.00	0.00	0
4001 to 5000	0.00	0.00	0.00	0
5001 to Maximum	0.00	0.00	0.00	0
Total of Counts 0001 to Maximum Range	5.97	10.44	0.44	56
Total of Counts 0501 to Maximum Range	6.87	8.66	0.00	18-------

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5.8 2017 PM Peak Calibration Link Synopsis

Calibration Summary for Model 17PM3E
Network = 2017BASE Trip Table = 17PM3E
2017 PM PEAK CALIBRATED BASE MODEL
Observed Counts versus Modelled Volumes

Location..........	Node	Node	Count	Model	Diff	Diff%	GEH
BURWOOD RD SB N WILGA	1348	10096	439	319	-120	-27	6
WILGA ST EB	10096	4020	480	453	-27	-6	1
WILGA ST WB	4020	10096	565	545	-20	-4	1
PARK AVE EB	8542	10097	499	426	-73	-15	3
PARK AVE WB	10097	8542	365	313	-52	-14	3
BURWOOD RD NB S PARK A	4800	10097	415	350	-65	-16	3
BURWOOD RD SB S PARK A	10097	4800	485	475	-10	-2	0
BURWOOD RD SB N GEORGE	4800	8541	475	380	-95	-20	5
GEORGE ST EB	8540	8552	22	22	0	0	0
GEORGE ST WB W BURWOOD	8541	8506	178	107	-71	-40	6
RAILWAY CRES WB	8544	1365	41	51	10	24	1
DEANE ST WB	8543	8544	210	203	-7	-3	0
BURWOOD RD NB N RAILWA	10094	8544	532	483	-49	-9	2
RAILWAY PDE EB W BURWO	8544	10094	474	397	-77	-16	4
RAILWAY PDE WB E BURWO	8522	10094	417	349	-68	-16	3
RAILWAY PDE EB E BURWO	10094	8522	374	371	-3	-1	0
BURWOOD RD NB S RAILWA	8539	10094	479	399	-80	-17	4
BURWOOD RD SB S RAILWA	10094	8539	325	273	-52	-16	3
BURWOOD CENTRAL NB	8533	848	16	12	-4	-25	1
BURWOOD CENTRAL SB	848	8533	18	22	4	22	1
RAILWAY PDE EB W WYNNE	8554	8533	523	451	-72	-14	3
RAILWAY PDE WB W WYNNE	8533	8554	624	565	-59	-9	2
RAILWAY PDE EB W CONDE	1361	8554	586	501	-85	-15	4
RAILWAY PDE WB W CONDE	8554	1361	607	520	-87	-14	4
CONDER ST NB	8557	8525	301	255	-46	-15	3
CONDER ST SB	8525	8557	255	209	-46	-18	3
BELMORE ST EB W BURWOO	8523	8539	327	345	18	6	1
BELMORE ST WB W BURWOO	8539	8523	178	171	-7	-4	1
BELMORE ST WB E BURWOO	8228	8539	265	217	-48	-18	3
BELMORE ST EB E BURWOO	8539	8228	210	173	-37	-18	3
WYNNE AVE NB N BELMORE	8555	8524	192	123	-69	-36	5
WYNNE AVE SB N BELMORE	8524	8555	107	90	-17	-16	2
CONDER ST NB S BELMORE	8559	8557	218	188	-30	-14	2
CONDER ST SB N BELMORE	8525	8557	255	209	-46	-18	3
BELMORE ST WB E CONDER	8555	8557	246	234	-12	-5	1
BELMORE ST EB E CONDER	8557	8555	164	135	-29	-18	2
BELMORE ST EB W WYNNE	8557	8555	156	135	-21	-13	2
WENTWORTH NB S RAILWAY	1367	4820	283	267	-16	-6	1
WENTWORTH SB S RAILWAY	4820	1367	495	416	-79	-16	4
RAILWAY WB E WENTWORTH	1361	4820	588	522	-66	-11	3
RAILWAY EB E WENTWORTH	4820	1361	617	490	-127	-21	5
WENTWORTH SB N RAILWAY	8536	4820	854	728	-126	-15	4
MORWICK EB W WENTWORTH	4813	4820	553	476	-77	-14	3
SHAFTESBURY NB S RAILW	8556	4803	594	522	-72	-12	3
SHAFTESBURY SB S RAILW	4803	8556	683	570	-113	-17	5
PAISLEY EB E SHAFTESBU	4803	4804	415	340	-75	-18	4
PAISLEY WB E SHAFTESBU	4804	4803	452	379	-73	-16	4
SHAFTESBURY NB N RAILW	4803	8537	846	720	-126	-15	5
SHAFTESBURY SB N RAILW	8537	4803	879	743	-136	-15	5
RAILWAY WB W SHAFTESBU	4803	8522	376	325	-51	-14	3
SHAFTESBURY SB N WILGA	10089	4798	999	841	-158	-16	5
WILGA EB W SHAFTESBURY	4020	4798	154	132	-22	-14	2
SHAFTESBURY NB S WILGA	10095	4798	601	516	-85	-14	4

SHAFTESBURY SB N VICTO	4798	10095	884	763	-121	-14	4
VICTORIA WB E SHAFTESB	8528	10095	304	267	-37	-12	2
SHAFTESBURY NB S VICTO	8552	10095	698	660	-38	-5	1
VICTORIA EB W SHAFTESB	4036	10095	568	494	-74	-13	3

Summary of GEH Calibration Validation

	Counts	%
GEH <= 5 Target = > 60%	55	96
GEH <= 7 Target = > 80%	57	100
GEH <= 10 Target = > 95%	57	100
GEH <= 12 Target = 100%	57	100
GEH > 12 Target = 0%	0	0
Total Counts	57	

Mean, Mean Absolute Difference (MAD) & +/- 10% MAD Analysis - Model 17PM3E
Date = 06-14-2019. Time = 09:41:16

Note.... A Mean, a Mean Absolute Difference (MAD) & a MAD +/- 10% Count Variability Analysis is calculated and the results given below. The 10% MAD count variation endeavours to cater for the known 20% variation in daily traffic volumes, errors and discrepancies in SCATS and other count methods.

Observed Count Range	Mean %	MAD ABS %	MAD +-10% %	Counts
0001 to 0500	13.85	14.43	4.43	38
0501 to 1000	13.21	13.21	3.21	19
1001 to 1500	0.00	0.00	0.00	0
1501 to 2000	0.00	0.00	0.00	0
2001 to 2500	0.00	0.00	0.00	0
2501 to 3000	0.00	0.00	0.00	0
3001 to 3500	0.00	0.00	0.00	0
3501 to 4000	0.00	0.00	0.00	0
4001 to 5000	0.00	0.00	0.00	0
5001 to Maximum	0.00	0.00	0.00	0
Total of Counts 0001 to Maximum Range	13.51	13.78	3.78	57
Total of Counts 0501 to Maximum Range	13.21	13.21	3.21	19

5.9 2017 WE Peak Calibration Link Synopsis

Calibration Summary for Model 17AMWE6
Network = 2017BASE Trip Table = 17AMWE6
2017 WEEKEND Peak CALIBRATED BASE MODEL
Observed Counts versus Modelled Volumes

Location..........	Node	Node	Count	Model	Diff	Diff%	GEH
BURWOOD RD SB N WILGA	1348	10096	397	371	-26	-7	1
WILGA ST EB	10096	4020	577	581	4	1	0
WILGA ST WB	4020	10096	601	489	-112	-19	5
PARK AVE EB	8542	10097	504	536	32	6	1
PARK AVE WB	10097	8542	339	298	-41	-12	2
BURWOOD RD NB S PARK A	4800	10097	364	423	59	16	3
BURWOOD RD SB S PARK A	10097	4800	565	496	-69	-12	3
BURWOOD RD SB N GEORGE	4800	8541	412	346	-66	-16	3
GEORGE ST EB	8541	8506	68	106	38	56	4
GEORGE ST WB W BURWOOD	8541	8506	83	106	23	28	2
RAILWAY CRES WB	8544	1365	57	73	16	28	2
DEANE ST WB	8543	8544	82	137	55	67	5
BURWOOD RD NB N RAILWA	10094	8544	534	523	-11	-2	0
RAILWAY PDE EB W BURWO	8544	10094	416	334	-82	-20	4
RAILWAY PDE WB E BURWO	8522	10094	424	448	24	6	1
RAILWAY PDE EB E BURWO	10094	8522	422	400	-22	-5	1
BURWOOD RD NB S RAILWA	8539	10094	492	484	-8	-2	0
BURWOOD RD SB S RAILWA	10094	8539	361	274	-87	-24	5
BURWOOD CENTRAL NB	8533	848	15	11	-4	-27	1
BURWOOD CENTRAL SB	848	8533	9	13	4	44	1
RAILWAY PDE EB W WYNNE	8554	8533	522	473	-49	-9	2
RAILWAY PDE WB W WYNNE	8533	8554	475	463	-12	-3	1
RAILWAY PDE EB W CONDE	1361	8554	563	573	10	2	0
RAILWAY PDE WB W CONDE	8554	1361	473	436	-37	-8	2
CONDER ST NB	8557	8525	217	202	-15	-7	1
CONDER ST SB	8554	8525	224	183	-41	-18	3
BELMORE ST EB E WYNNE	8555	8523	164	205	41	25	3
BELMORE ST WB W BURWOO	8539	8523	172	181	9	5	1
BELMORE ST WB E BURWOO	8228	8539	162	144	-18	-11	1
BELMORE ST EB E BURWOO	8539	8228	211	201	-10	-5	1
WYNNE AVE NB N BELMORE	8555	8524	132	117	-15	-11	1
WYNNE AVE SB N BELMORE	8524	8555	84	70	-14	-17	2
CONDER ST NB S BELMORE	8559	8557	220	259	39	18	3
CONDER ST SB N BELMORE	8525	8557	278	231	-47	-17	3
BELMORE ST WB E CONDER	8555	8557	168	171	3	2	0
BELMORE ST EB E CONDER	8557	8555	236	245	9	4	1
WENTWORTH NB S RAILWAY	1367	4820	252	228	-24	-10	2
WENTWORTH SB S RAILWAY	4820	1367	496	516	20	4	1
RAILWAY WB E WENTWORTH	1361	4820	343	440	97	28	5
RAILWAY EB E WENTWORTH	4820	1361	573	581	8	1	0
WENTWORTH SB N RAILWAY	8536	4820	738	851	113	15	4
MORWICK EB W WENTWORTH	4813	4820	603	640	37	6	1
SHAFTESBURY NB S RAILW	8556	4803	635	689	54	9	2
SHAFTESBURY SB S RAILW	4803	8556	664	612	-52	-8	2
PAISLEY EB E SHAFTESBU	4803	4804	416	346	-70	-17	4
PAISLEY WB E SHAFTESBU	4804	4803	445	440	-5	-1	0
SHAFTESBURY NB N RAILW	4803	8537	925	829	-96	-10	3
SHAFTESBURY SB N RAILW	8537	4803	656	641	-15	-2	1
RAILWAY WB W SHAFTESBU	4803	8522	388	313	-75	-19	4
SHAFTESBURY SB N WILGA	10089	4798	537	569	32	6	1
WILGA EB W SHAFTESBURY	4020	4798	154	119	-35	-23	3
SHAFTESBURY NB S WILGA	10095	4798	713	718	5	1	0

SHAFTESBURY SB N VICTO	4798 10095	441	536	95	22	4
VICTORIA WB E SHAFTESB	8528 10095	373	324	-49	-13	3
SHAFTESBURY NB S VICTO	8552 10095	730	757	27	4	1
VICTORIA EB W SHAFTESB	4036 10095	434	528	94	22	4

Summary of GEH Calibration Validation

	Counts	%
GEH <= 5 Target = > 60%	56	100
GEH <= 7 Target = > 80%	56	100
GEH <= 10 Target = > 95%	56	100
GEH <= 12 Target = 100%	56	100
GEH > 12 Target = 0%	0	0
Total Counts	56	

Mean, Mean Absolute Difference (MAD) & +/- 10% MAD Analysis - Model 17AMWE6

Note.... A Mean, a Mean Absolute Difference (MAD) & a MAD +/- 10% Count Variability Analysis is calculated and the results given below. The 10% MAD count variation endeavours to cater for the known 20% variation in daily traffic volumes, errors and discrepancies in SCATS and other count methods.

Observed Count Range	Mean %	MAD ABS %	MAD +-10% %	Counts
0001 to 0500	1.62	13.11	3.11	39
0501 to 1000	0.77	6.82	0.00	17
1001 to 1500	0.00	0.00	0.00	0
1501 to 2000	0.00	0.00	0.00	0
2001 to 2500	0.00	0.00	0.00	0
2501 to 3000	0.00	0.00	0.00	0
3001 to 3500	0.00	0.00	0.00	0
3501 to 4000	0.00	0.00	0.00	0
4001 to 5000	0.00	0.00	0.00	0
5001 to Maximum	0.00	0.00	0.00	0
Total of Counts 0001 to Maximum Range	1.20	10.01	0.01	56
Total of Counts 0501 to Maximum Range	0.77	6.82	0.00	17

5.10 Travel Times

As previously discussed, travel time surveys were undertaken on Burwood Road to assist in validating and calibrating the base model.

Results indicate a maximum difference of -7.41% difference between the collated field data and modelled travel times. RMS guidelines require average modelled travel times to have a differential not greater than 15% or one (1) minute from the observed travel times for the entire route collected.

The calibrated travel times are considered acceptable within the parameters of current modelling practices and the *RMS* guidelines.

Figure 27 2017 AM Calibrated Base Model

Source Road Delay Solutions, 2019

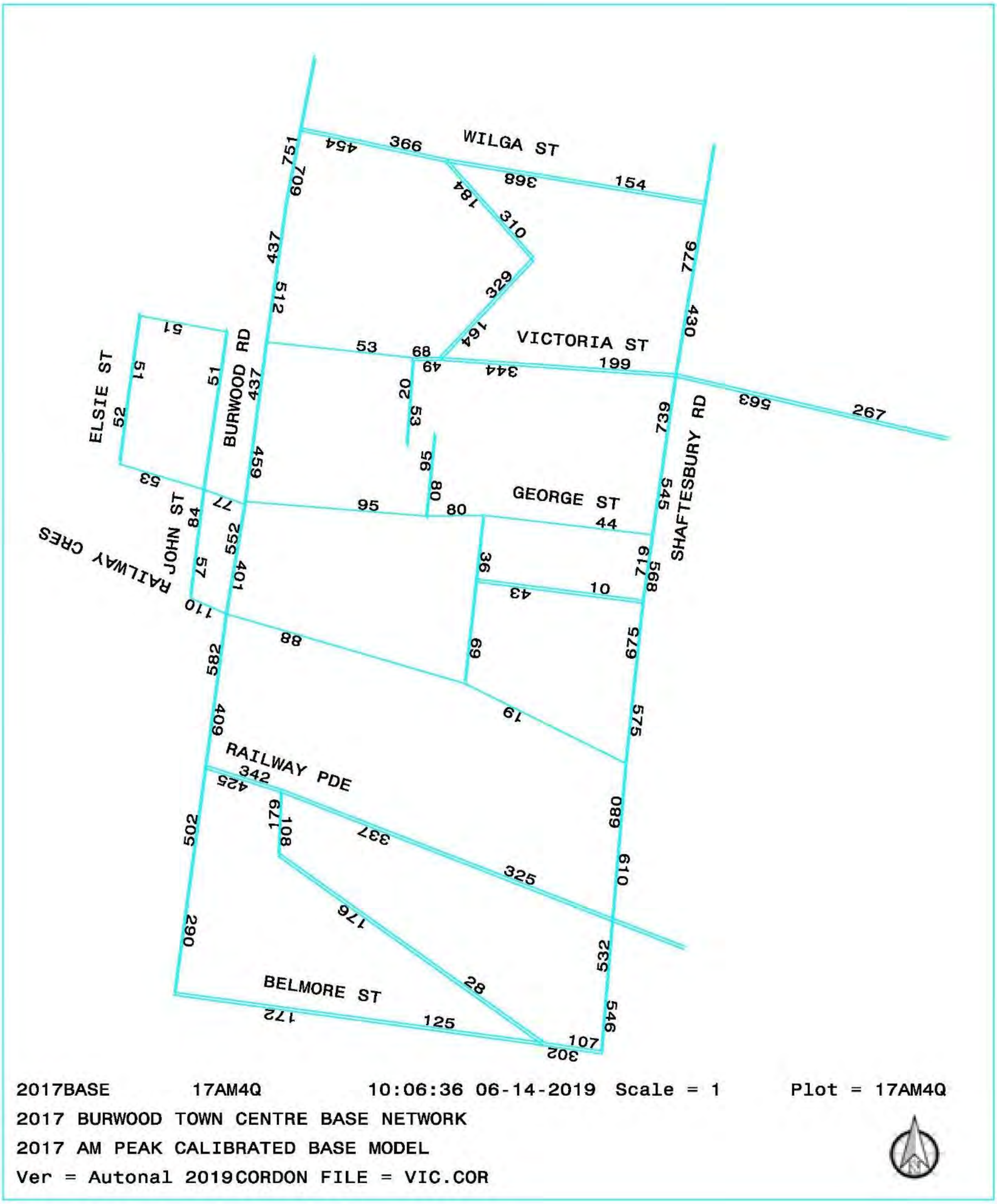


Figure 28 2017 PM Calibrated Base Model

Source Road Delay Solutions, 2019

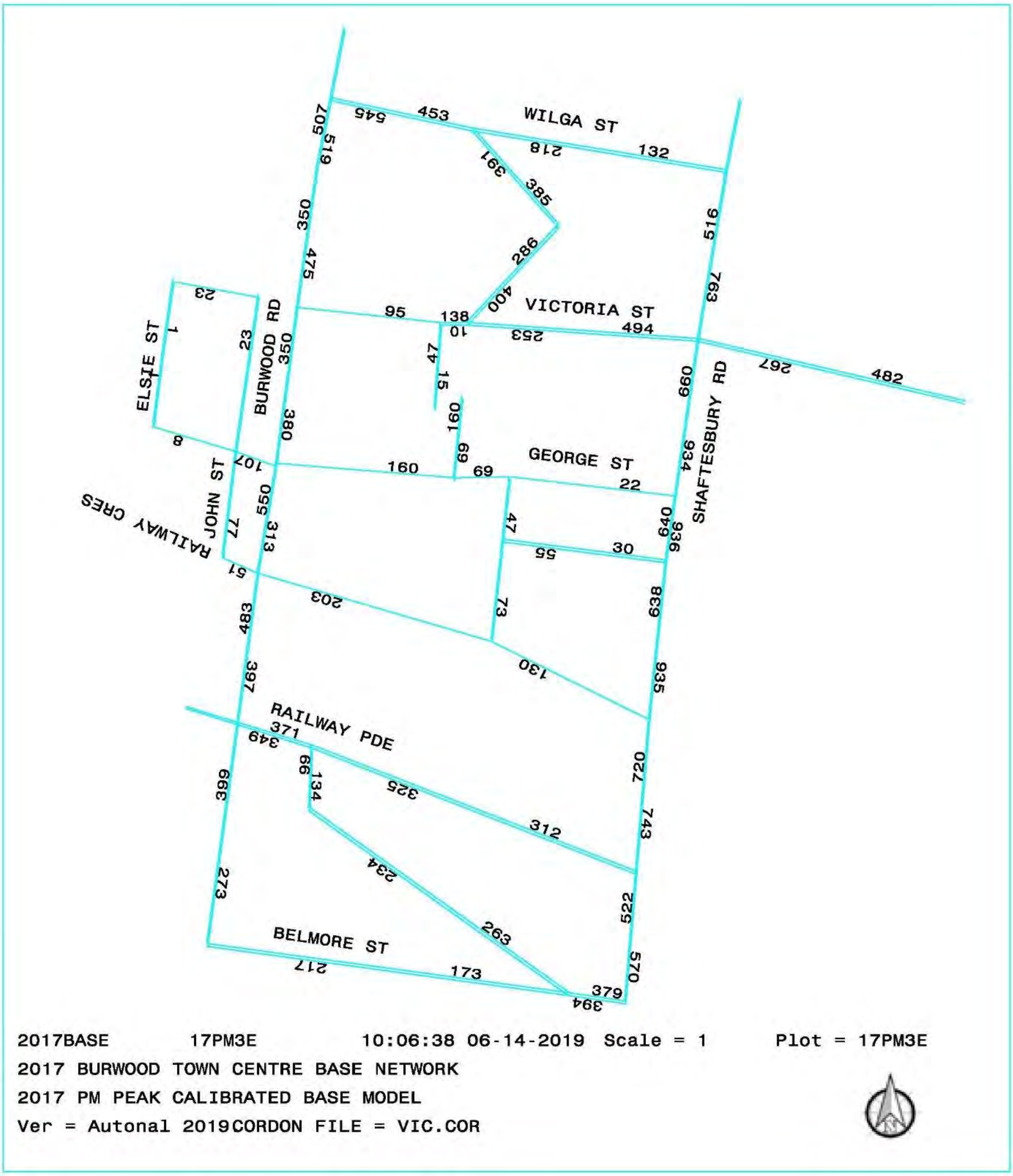
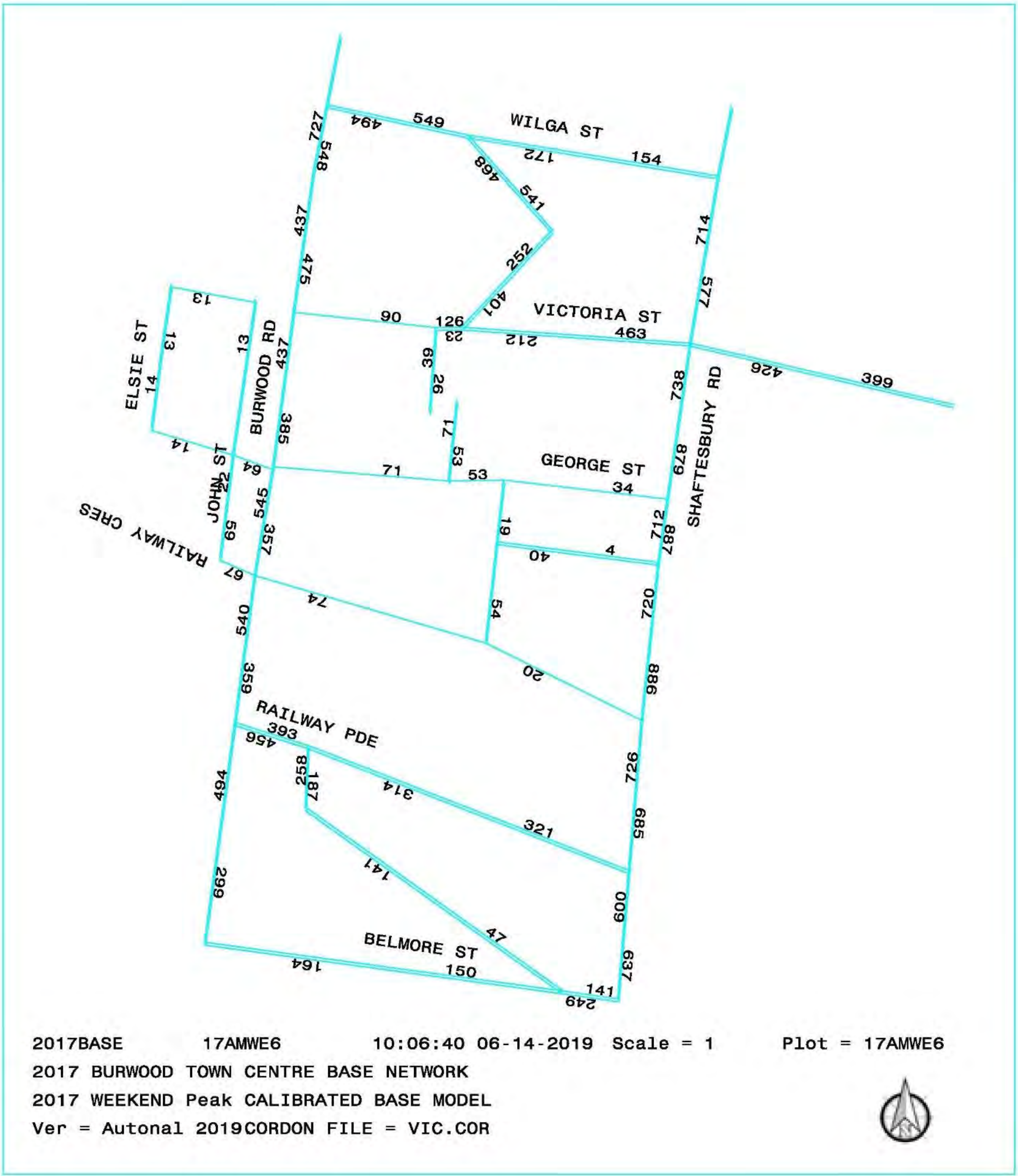


Figure 29 2017 WE Calibrated Base Model

Source Road Delay Solutions, 2019



5.11 Operational Performances

The operational performance of each intersection, individually, along Burwood Road indicates a satisfactory Level of Service (LoS) during both the AM and PM comuter peak periods, between George Street and Belmore Street.

Occassional residual queues are reported from several sites through preceding intersections, impeding the coordinated traffic signal operations and the through movements.

The pedestrian phases along Burwood Road are demanded each cycle and necessitate significant time to clear before allowing left and right turn vehicle movements to be performed.

This is particularly evident, southbound, at the Burwood Road intersection with Railway Parade. With a trailing and repeat right turn from the central shared through and right turn lane, in conjunction with the inherent delay imposed by pedestrians on the left turn movement, ‘A’ phase can ‘*trap*’ southbound motorists if the right and left turn movements are held, concurrently.

Site observations also indicated, that particularly during the morning peak and to a lesser degree during the evening peak, drop offs and pick ups at the Burwood railway station, made from the southbound kerb side lane preceding and following the pedestrian fence at Deane Street and Railway Parade, respectively, caused some minor delays when coinciding with the ‘A’ phase display at the Railway Parade intersection.

Sidra coordinated network modelling has also been undertaken, adopting a 100 second cycle length (AM peak) and 110 second cycle length (PM peak) and program generated offsets to better determine the operational performance of Burwood Road during the morning and evening peak periods under the current traffic demands.

The route along Burwood Road, between George Street to the north and Clarence Street to the south, reports to operate at an unsatisfactory LoS ‘E’ in both directions during the AM and PM peak periods with an average travel speed generally less than 25km/h covering the 850m route distance.

The incidence of residual queueing along the route can be attributed to the generally single lane capacity and there is no immediate opportunity, within the current road reserve, to widen or improve the route capacity and performance.

The weekend peak traffic volumes within the network, for a typical Saturday, are marginally less than those exhibited during the week day commuter peak periods.

Pedestrian activity is reduced with the reduction in Journey to Work and commercial trips and can primarily be attributed to retail activity through the centre.

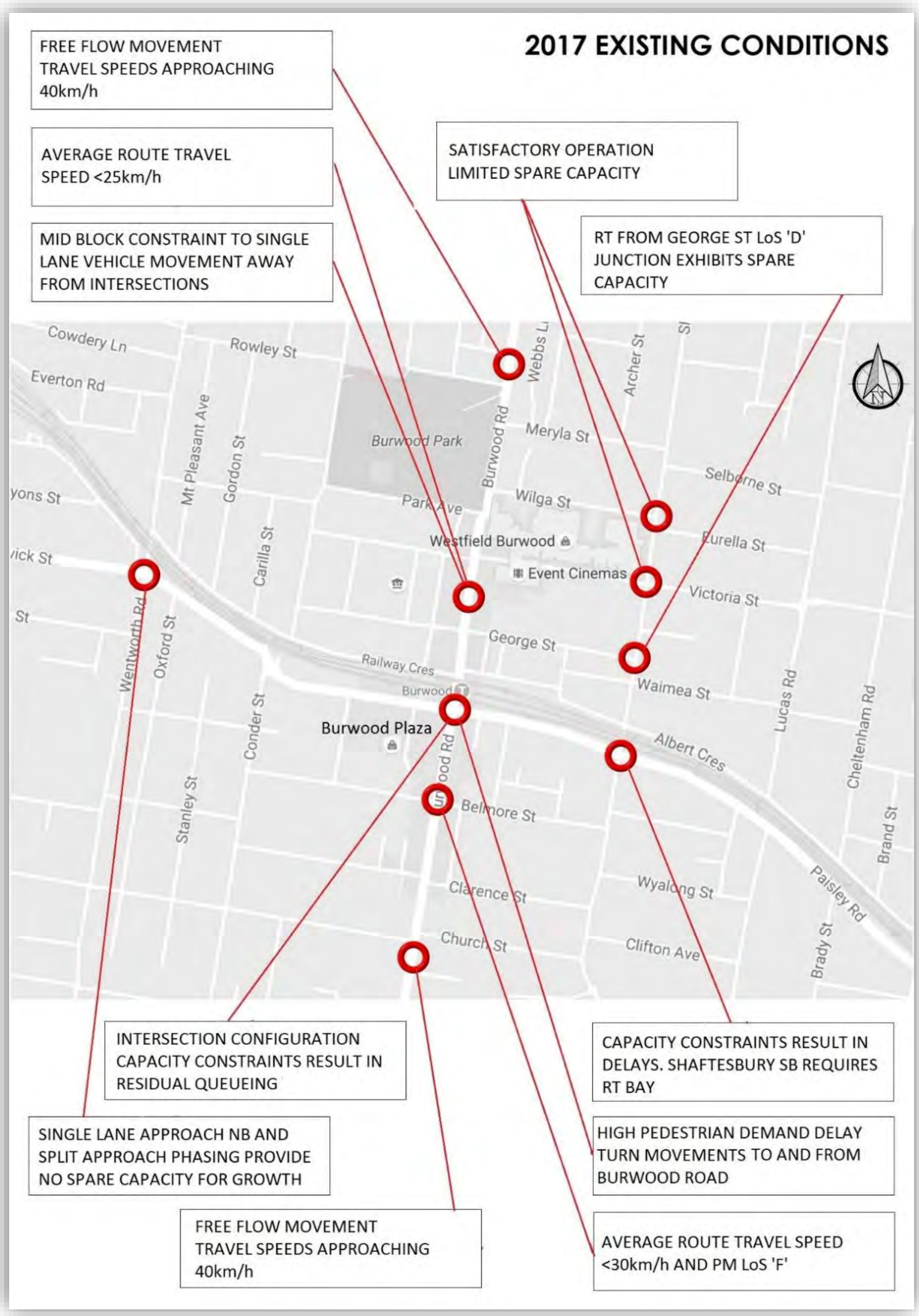
Reporting an unsatisfactory LoS 'E' for the Burwood Road route during the weekend peak between George Street and Clarence Street, the road network constraints on a weekend remain the same as during the commuter peak periods.

On street parking, mid block and intersection capacity constraints and high pedestrian activity are the primary factors contributing to lower vehicle speeds and residual queueing or '*spillback*'.

Shaftesbury Road reports satisfactory LoS at those intersections, operating independently, between Railway Pararde and Wilga Street. However, capacity constraints lead to queueing between and beyond preceeding intersections is reported. The spillback reported in the models, results in poor route performance during the weekday commuter peak periods. Shaftesbury Road operates as a viable collector road on the periphery of the Burwood Town Centre and an alternate north south corridor to Burwood Road.

Figure 30 2017 Existing Conditions

Source Road Delay Solutions, 2017



6 FUTURE CONDITIONS

6.1 Planning Policies and Guidelines

This section contains a review of the strategic and statutory planning documents that will shape the Victoria Street East development. These include the Sydney Metropolitan Strategy and subregional planning documents, as well as the current local planning strategies, environmental planning instruments and guidelines, the *Local Environmental Plan* and relevant development control plans.

The focus here will be on the policies, strategic directions and development provisions that have direct implications in the development assessment and which influence the integration of land use, transport services and facilities in the future.

6.2 Policy Context

There are a number of strategic state policies which are relevant to future development in the Sydney metropolitan area. The policies include NSW 2021, A Plan for Growing Sydney and The NSW Long Term Transport Master Plan.

6.3 NSW 2021

NSW 2021 'Plan to Make NSW Number One' sets targets to increase the number of commuter trips made by public transport within various regions through the Metropolitan area, including…

- → *80% in the Sydney CBD,*
- → *50% in the Parramatta CBD,*
- → *20% in the Liverpool CBD, and*
- → *25% in the Penrith CBD.*

The plan targets are…

- → *To improve road safety, reduce fatalities to 4.3 per 100,000 population by 2016,*
- → *Double the mode share of bicycle trips made in the metropolitan area by 2016, and*
- → *Increase the proportion of the population living within 30 minutes by public transport of a city or major centre in the metropolitan area.*

6.4 A Plan for Growing Sydney

A Plan for Growing Sydney provides a strategic plan to accommodate an additional 1.6 million people, 664,000 houses and 689,000 jobs.

The plan includes the following goals and actions...

Goal 1: A competitive economy with world class services and transport

Actions

- *grow a more internationally competitive Sydney CBD,*
- *grow Greater Parramatta – Sydney's second CBD,*
- *establish a new priority growth area – Greater Parramatta to the Olympic Peninsula,*
- *transform the productivity of western Sydney through growth and investment,*
- *enhance capacity at Sydney's gateways and freight networks,*
- *expand the Global Economic Corridor,*
- *grow strategic centres – providing more jobs closer to home,*
- *enhance linkages to regional NSW,*
- *support priority economic sectors,*
- *plan for education and health services to meet Sydney's growing needs, and*
- *deliver infrastructure.*

Goal 2: A city of housing choice, with homes that meet our needs and lifestyles

Actions

- *accelerate housing supply across Sydney,*
- *accelerate urban renewal across Sydney – providing homes closer to employment opportunities,*
- *improve housing choice to suit different needs and lifestyles, and*
- *deliver timely and well planned greenfield precincts and housing.*

Goal 3: A great place to live with communities that are strong, healthy and well balanced

Actions

- *revitalize existing suburbs,*
- *create a network of interlinked, multipurpose open and green spaces across Sydney,*
- *create built environments; and*
- *promote Sydney's heritage, arts and culture.*

Goal 4: A sustainable and resilient city that protects the natural environment and has a balanced approach to the use of land and resources

Actions

- *protect our natural environment and biodiversity,*
- *build Sydney's resilience to natural hazards, and*
- *manage the impacts of development on the environment.*

The Plan for Growing Sydney defines Burwood as a 'Strategic Centre', in the 'central subregion', highlighting its importance in the metropolitan area in terms of employment and future development.

The plan provides a number of priorities specifically relating to Burwood as follows…

- *work with council to provide capacity for additional mixed use development including offices, retail, services and housing, and*
- *investigate a potential light rail corridor from Parramatta to Strathfield/Burwood via Sydney Olympic Park.*

6.5 NSW Long Term Transport Master Plan

The NSW Long Term Transport Master Plan has been developed, in association with A Plan for Growing Sydney and State Infrastructure Strategy, to support NSW 2021. The key measures identified are as follows…

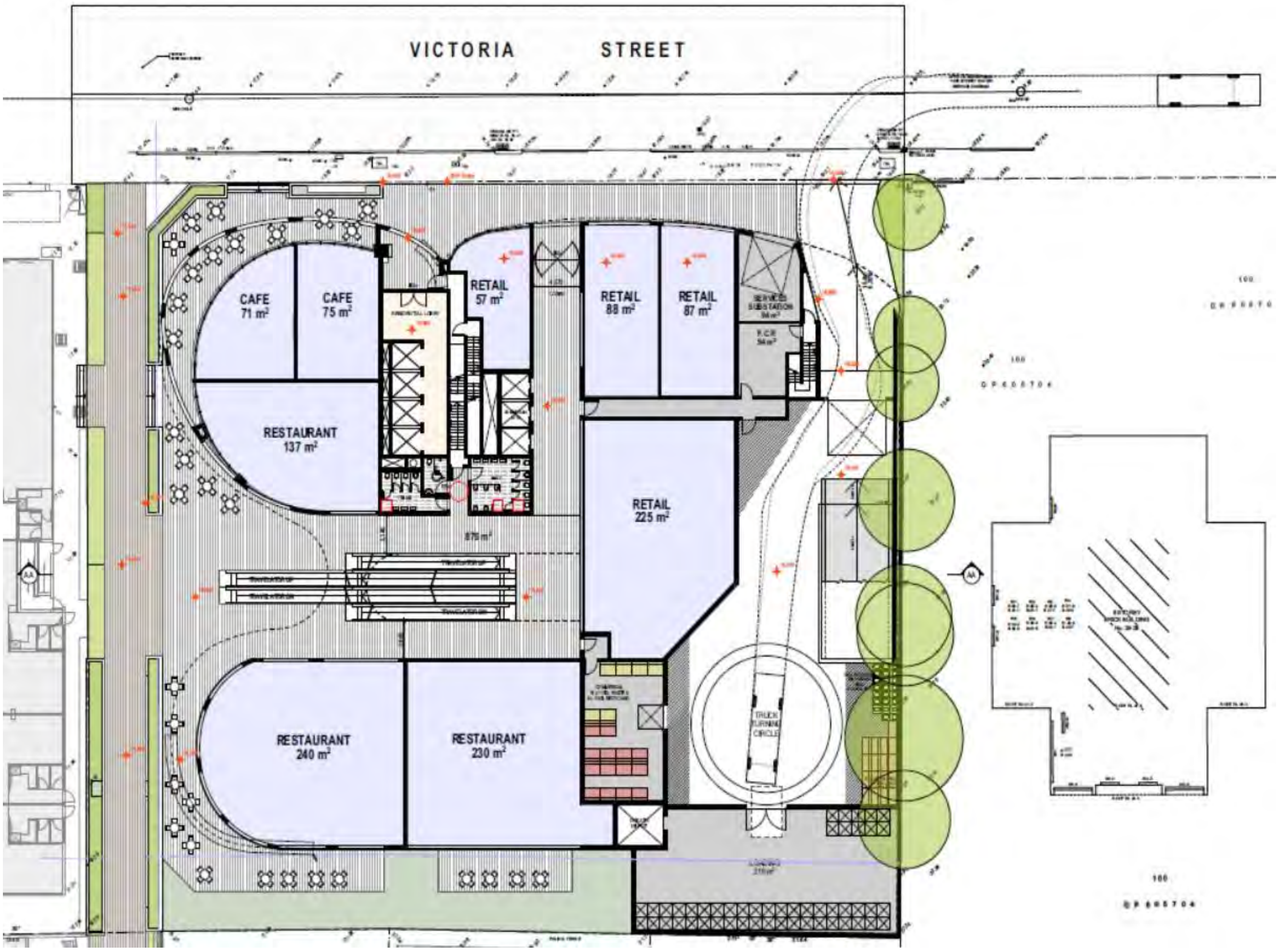
- *providing a fully integrated transport system,*
- *providing a modern railway system and increase capacity by 60 per cent,*
- *providing a modern light rail system in the CBD,*
- *providing a modern bus system to complement the rail networks,*
- *connect the motorway network, including WestConnex, F3/M2 link and F6,*
- *reduce congestion in the CBD, including removing the monorail, increasing light rail, improving pedestrian links, increasing ferry use, providing increased capacity on the rail system and improved walking and cycling infrastructure,*
- *support the growth of new economic centres including the north west and*
- *south west rail links, new roads in growth areas and new bus infrastructure;*
- *connect regional communities through major highway upgrades, and*
- *improved rail, bus and air services,*
- *improve freight efficiency and productivity,*
- *improve access to Sydney Airport and Port Botany,*
- *boost walking, cycling and its integration with public transport; and*
- *preserve future transport corridors.*

6.6 The Development Footprint

The Development Application (DA) proposes the demolition of the existing structure(s) and construction of a mixed use development at 28-34 Victoria Street East, Burwood. The development is to include…

- *179 residential apartments,*
- *2,070m² GFA - 1,749m² GLFA of restaurants/cafes floor space,*
- *457m² GFA - 400m² GLFA of specialty reatail floor space,*
- *1,981m² GFA – 1,283m² GLFA of supermarket floor space, and*
- *1,788m² GFA – 2,525m² GLFA of commercial floor space.*

Figure 31 *Development Footprint*
Source *Urban Link, 2019*



6.7 Development Access

Access to the development and the residential, retail and commercial activities is proposed from the Victoria Street East frontage, at the north eastern corner of the site.

Under the Australian Standards for off-street parking AS2890.1 (2004), the development is required to…

- → *Provide a Category 1 Driveway, defined as a minimum width of 5.5m, for a scenario involving residential, commercial and retail activities (69 Class 1A parking spaces).*

The passenger vehicle access point to the car park will be provided in accordance with the Australian Standard for Parking Facilities Part 1 Off-Street, AS 2890.1:2004.

The loading dock provisions will comply with *AS 2890.2 – 2002 Parking Facilities Part 2 Off-Street Commercial Vehicles*.

6.8 Parking Requirements

The development will accord with Burwood City Council's DCP which includes the following parking requirements for developments in centres…

Offices	*One (1) parking space per 400m^2 (for the first 400m^2 plus one space per 120m^2 thereafter,*
Retail	*One (1) space per 33m^2,*
Residential	*0.5 spaces per studio/bed sitter,*
	One (1) space per one/two bedroom apartment,
	1.5 spaces per three bedroom apartment; and
Visitors	*One (1) space per five dwellings for visitor parking.*

By comparison, the *RMS guide* suggests the following parking requirements for high density residential in sub-regional centres and CBDs…

Sub-regional centres

0.6 spaces per one bedroom apartment,

0.9 spaces per two bedroom apartment,

1.4 spaces per three bedroom apartment, and

One (1) space per five apartments for visitors.

CBDs

0.4 spaces per one bedroom apartment,

0.7 spaces per two bedroom apartment,

1.2 spaces per three bedroom apartment, and

One (1) space per seven apartments for visitors.

Based upon Council's DCP, the development is to be serviced by a total of 318 off-street parking spaces, provided as follows...

- → *229 residential spaces,*
- → *36 visitor spaces,*
- → *35 supermarket/retail/retail spaces,*
- → *35 Restauarant/Café spaces,*
- → *19 commercial spaces,*
- → *60 residential bicycle space provisions, and*
- → *4 residential motorbike spaces.*

NB The Rresidential and Commercial allocations are inclusive of 18 and 3 disabled spaces, respectively.

The above allocations is considered satisfactory.

6.9 Car Share

The DCP does not provide car share parking requirements for developments within the Burwood Town Centre. In view of this and having concern for security, no car share spaces are proposed.

6.10 Bicylcle Parking

The bicycle parking is in accordance with Autsroads Guidelines and provides for 60 residential bicycle provisions, based primarily on 1 bicycle provision per 3 units.

6.11 Motorcycles Parking

The development proposes 4 residential motorcycle spaces to be provided, even though Burwood Council's DCP does not prescribe a motorcycle parking rate.

Figure 32 *Development Parking Requirements*

Source *Road Delay Solutions, 2019*

DEVELOPMENT SITE PARKING TABLE					
Development Component	Area (Units &/or GLFA m^2)	Area *(Units &/or GFA m^2)*	DCP		
			Units	*Rate*	*Provided*
Residential Apartments	179				
Residential Disabled (*forms part of residential parking*)	179		per 10 units unless demand requested	1	18
1 Bed Apartments	47		per unit	1	47
2 Bed Apartments	105		per unit	1	105
3 Bed Apartments	27		per unit	1.5	41
Visitor Parking	179		per 5 units	1	36
RESIDENTIAL VEHICLES					**229**
Supermarket and Retail Specialty Shops	1,759	2,438	1 space first 400m² then add 1 space per 40 m2 above first 400m² GLFA	1	35
Restaurants/Cafes #	1,749	2,070	1 space first 400m² then add 1 space per 40 m2 above first 400m2 GLFA	1	35
Takeaway#	0	0	per 3 seats	1	0
Commercial	2,525	1,788	1 space first 400 m² then add 1 space per 120 m² GFA		19
Commercial - Disabled **(Part of Commercial parking)**					3
RETAIL/COMMERCIAL MOTOR VEHICLES					89
BICYCLES - Residential	179		1 per 3 units	1	60
MOTORCYCLES - Residential	179		1 space per 50 units	1	4
MOTOR CYCLES AND BICYCLES SPACES					64

6.12 Internal Circulation

Vehicular access to the off-street basement car park is proposed via the single, 5.5m wide, driveway located at the north eastern corner of the site.

The development is to be serviced by three (3) basement levels for passenger vehicle parking. The levels are to be split into two primary sections…

- *Publicaly accessible retail/commercial parking on B1 and B2 via number plate recognition, and*
- *Private residential apartment parking on B3 with access being granted via use of a tag.*

Retail/commercial customer vehicles have access to parking on both the B1 and B2 levels via use of a ramp running along the eastern boundary of the site. Upon reaching Basement Level 1, patrons will be directed to dedicated retail parking spaces and the retail lift access. They may also proceed down to Basement Level 2 via a two way down ramp running along the eastern boundary of the site.

Residential parking is to be provided on the Basement Level 3. Access is granted via tag recognition and through a security roller shutter upon leaving Basement Level 2.

Lifts access is provided for residents to the apartments and/or retail activities, from each level of basement parking.

6.13 Passenger Vehicle Parking Design

All internal parking areas are proposed to comprise a series of standard 90 degree angled parking rows being serviced adjoining the circulatory parking aisles.

An audit of compliance with AS2890.1:2004 has been undertaken with a schedule of compliance presented in the following table.

Passenger vehicle swept path plans are presented in *Appendix D.*

Further to the audit, the design criterion provided, with respect to disabled parking spaces is in accordance with AS2890.6-2009…

- *Visitor and residential disabled space width = 2.4m (plus adjoining 2.4m wide shared area which marked when provided outside of circulation aisle)*
- *Visitor and residential disabled parking space length = 5.4m; and*
- *Clearance above disabled spaces = 2.5m.*

Figure 33 Parking Compliance Table

Source Road Delay Solutions, 2019

ASSESSMENT OF COMPLIANCE OF ON-SITE PARKING - AUSTRALIAN STANDARD (AS 2890.1-2004)			
Section	Requirement	Provided	Compliance
2.3.3	Max 100m parking module length	Maximum 45m	Yes
2.4.1	Standard retail customer 90 degree space dimensions = 2.6m x 5.4m	Minimum space dimensions = 2.6m x 5.4m	Yes
2.4.1	Standard commercial 90 degree space dimensions = 2.4m x 5.4m	Minimum space dimensions = 2.4m x 5.4m	Yes
2.4.1	Small car 90 degree space dimensions = 2.3m x 5.0m	Minimum small space dimensions = 2.3m x 5.0m	Yes
2.4.1	300mm additional width against obstruction	Minimum additional width = 300mm	Yes
2.4.2 (a)	Parking aisle adjacent to retail customer 90 degree spaces = 6.6m	Minimum parking aisle = 6.6m	Yes
2.4.2 (a)	Parking aisle adjacent to staff and residential 90 degree spaces = 5.8m	Minimum parking isle = 5.8m	Yes
2.4.2 (c)	Blind aisles to be extended a minimum of 1m beyond last space	Blind aisles extended at least 1m in all cases	Yes
2.4.6	Maximum gradients, 1:20 parallel to angle of parking and 1:16 @ 90 degrees to angle of parking	Parking modules are close to level	Yes
2.4.7	Motorcycle parking dimensions = 1.2m x 2.5m	Minimum = 1.2m x 2.5m	Yes
2.5.2 (a) (i)	One-way straight roadway / ramp, at least 3.0m wide	Minimum = 3.0m wide	Yes
2.5.2 (a) (ii)	Two-way straight roadway / ramp, at least 5.5m wide	Minimum = 5.5m	Yes
2.5.2 (a) (iii)	One-way roadways separated by minimum median width pf 0.6m	Minimum = 0.6m	Yes
2.5.2 (b)	One-way curved road or ramp width = 3.4m	Minimum = 3.4m	Yes
2.5.2 (b)	Two-way curved road or ramp width = 6.7m	Minimum = 6.7m	Yes
2.5.3 (a)	Maximum grade on ramp = 1 in 4	Maximum grade = 1 in 5	Yes
2.5.3 (d)	Maximum change in grade = 1 in 8	Maximum change in grade = 1 in 10	Yes
3.2.4	Sight distance at driveway minimum 45m	>45m	Yes
3.4.2	Sight distance triangle 2.5m x 2m at corner of driveway must be clear of obstructions	Sight distance triangle provided at Parsonage Street	Yes
3.3 (a)	Maximum grade over property line / building alignment / pedestrian path and within 6m of property boundary = 1 in 20	1 in 20	Yes
5.2	Columns to be located between 750- 1750mm back from opening of space or last 1750mm of the space	Columns located outside of nominated design envelope	Yes
5.3	Minimum headroom = 2.2m	Minimum headroom = 2.2m	Yes

6.14 Site Servicing

The subject development is proposed to provide a formalised heavy vehicle servicing dock, within the vehicle circulation area, located on the ground floor. This dock is proposed to service vehicles up to and including 8.8m long SRV vehicles associated with deliveries servicing the retail floor space, residential removalist and refuse/waste collection.

Service vehicles are proposed to access the dock in a forward direction via the access proposed on Victoria Street East. From the westbound carriageway, service vehicle will proceed along the ground floor hardstand to a turntable, located at the south eastern corner. Vehicles are able to be rotated and loading/unloading activities are performed from either side of the vehicle. Following the completion of loading/unloading activities, the service vehicles are capable of exiting the site in a forward direction, back onto Victoria Street East and preceed eastbound to Shaftesbury Avenue.

Sight distance, in excess of 45m, and a pedestrian sight triangle of 2.5m x 2m is satisfied at the access.

The access roadway and the dock hardstand area are proposed to provide the following critical design criteria in accordance with the relevant requirements under AS2890.2-2002…

- → *Turnaround provision via employment of a turntable,*
- → *Maximum grade = 1:20,*
- → *Maximum change in grade = 1:20,*
- → *Loading bay dimensions = 3.5m x 12.5m, and*
- → *Minimum clearance = 4.5m.*

In order to demonstrate the capability of vehicles up to and including 8.8m long rigid SRV vehicles entering the site, *Road Delay Solutions* has prepared swept path plans which are included as *Appendix D*. The turning paths provided have been generated using Autodesk Vehicle Tracking software and derived for Austroads 8.8m long rigid vehicle specifications. The plans indicate that service vehicles are suitably capable of entering and leaving the site in a forward direction. The proposed internal servicing arrangements of the subject development are therefore considered to be satisfactory.

6.15 Growth Forecasts

Investigations into the traffic impacts associated with the Victoria Street East development have been assessed in unison with the planned growth within the Burwood town centre.

The *Department of Planning* have set the areas defining the Burwood Town Centre as Travel Zones TZ 910, 913 and 915.

The future Year trip matrices, originally produced by the *BTS* in October 2014 and revised in October 2016, have been developed from a 4 step travel model established on forecast population and employment projections throughout the Metropolitan Area and assigned to a computer based transport network.

These trip tables form the basis for the *Netanal* future year trip demands and have been applied from the 2011 *BTS* travel zone (TZ) system, through the employment of an equivalency table, prepared and provided by the *BTS*.

Generally, the *Netanal* vehicle trip distribution for the future year trip tables of the Sydney Statistical Division have been retained from the *BTS* trip matrices. However, known irregularities between the land use assumptions within the *BTS* matrices and available growth data, in particular *BTS* TZs 910, 913 and 915, make it necessary to disaggregate the zone structure to better reflect the furture year demand generations associated with the Victoria Street East development.

The following figure presents the interpreted population data employed in the modelled trip matrices for TZs 910, 913 and 915…

- → *A residential population of 8,374 persons in year 2016 is anticipated to reach 11,714 by year 2026, being an increase of 3,340 persons,*
- → *Dwellings (homes and/or apartments) are set to reach 6,069 by 2026, an increase of 1,730 with an adopted occupancy rate of 1.93 persons, and*
- → *The current workforce of 4,353 is expected to reach 6,051 by year 2026.*

The *BTS* data has been compared with Council's approved and known developments which lie within the *BTS* Zones 910, 913 and 915. It has been considered that while still to be determined, the addition of growth associated with the Parramatta Road Urban Renewal Project on the southern side of Parramatta Road either side of Burwood Road is captured by the *BTS* projections. However the specific extent of the proposed Urban Renewal project and its associated traffic generation is yet to be determined.

After careful consideration and assessment it is considered that the *BTS* projections adequately encompass the approved and known development within the town centre, at this time.

The analysis also determined that the *BTS* forecast dwellings of 6,069 is in fact marginally higher than Council's current anticipated growth level achieving only 5,565 dwellings by year 2026. The *BTS* and Council growth levels are presented in the following figures.

Figure 34 Burwood Town centre Adopted Growth Projections

Source BTS Zone Explorer, 2017

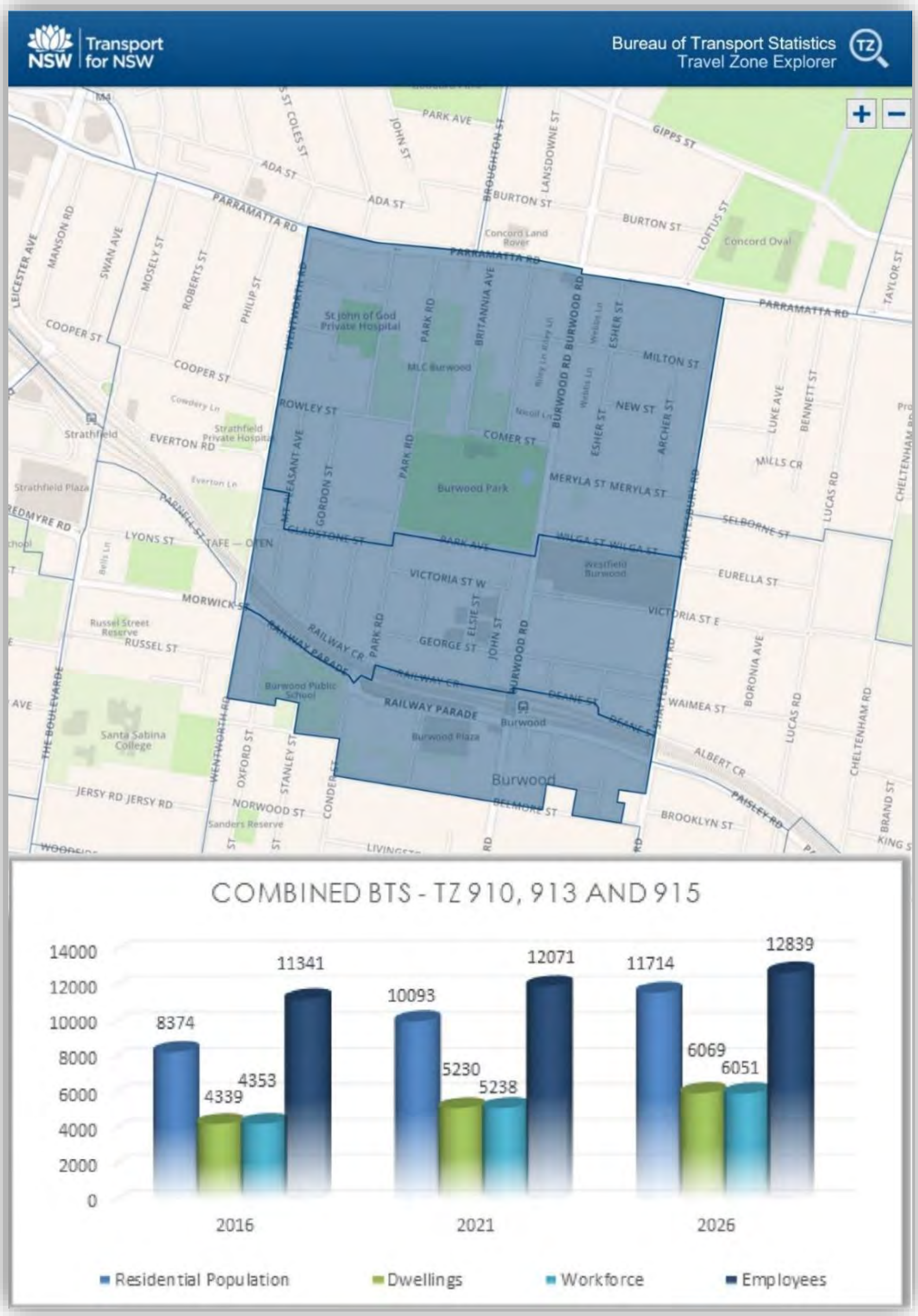


Figure 35 *Burwood Council Approved and Planned Developments*

Source *Cardno, 2016*

SIGNIFICANT CALCULATED GROWTH WITHIN BTS TZ 910, 913 and 915												
			Component				Generation Rate				Vehicle Generation	
Identifier BTS Zone	Address	Proposed Development	Residential Units	Retail GLFA *(70% of Site Area)*	Serviced Apartments	Commercial GLFA *(70% of Site Area)*	Residential	Retail	Serviced Apartments	Commercial	AM	PM
1 915	6 Railway Parade BURWOOD	Constructed 17 storey mixed residential flat building containing 47 residential units, 3 levels of commercial units, over 3 level of basement parking for 48 vehicles	BURWOOD CENTRAL EXISTING TRAFFIC GENERATION 2017									
2 910	48 Burwood Road BURWOOD	Construction of a 7 storey development comprising one ground floor commercial suite and twenty residential apartments over two levels of basement parking for 17 car parking spaces	20			252	0.19	0.125	0.4	0.016	7.832	7.832
3 910	11 - 13 Burwood Road BURWOOD	Construction of an 8 storey mixed use development containing commercial space, 37 residential apartments over 3 levels of basement parking for 53 vehicles	37			504	0.19	0.125	0.4	0.016	15.094	15.094
4 913	46 Park Road BURWOOD	Construction of a 5 storey residential flat building containing 14 units above basement parking	14				0.19	0.125	0.4	0.016	2.66	2.66
5 915	7 – 15 Conder Street, 2 – 10 Hornsey Street and 2 – 4 Stanley Street BURWOOD	Demolition and construction of Part 4 and 5 storey residential flat above basement parking	14				0.19	0.125	0.4	0.016	2.66	2.66
6 910	56 – 60 Burwood Road BURWOOD	Construction of 9 storey mixed use development containing 46 residential units and 1 ground floor retail suite above the basement parking	46	882			0.19	0.125	0.4	0.016	118.99	118.99
7 913	1 – 3 Gloucester Avenue and 42 – 44 Park Road BURWOOD	Construction of a 4 storey residential flat building comprising of 129 units with 2 levels of basement parking	129				0.19	0.125	0.4	0.016	24.51	24.51
8 910	35 Burwood Road BURWOOD	Construction of a 9 storey mixed use development containing ground floor commercial suites and 22 residential units above basement parking	22			420	0.19	0.125	0.4	0.016	10.9	10.9
9 913	28-34 Victoria St BURWOOD	Construction of a 33 storey mixed use building comprising 436 residential units, 3,200 retail and 4,200 commercial	178	2893		1659	0.19	0.059	0.059	0.016	231.051	231.051
10 910	32 Burwood Road BURWOOD	Construction of a 6 storey mixed use development containing ground floor commercial suites and 22 residential units above basement parking	22			252	0.19	0.125	0.4	0.016	8.212	8.212
11 913	7 Gloucester Avenue and 48 – 50 Park Road BURWOOD	Construction of a 5 storey residential flat building containing 42 units above basement parking	42			420	0.19	0.125	0.4	0.016	14.7	14.7
12 915	BURWOOD HOTEL 121 – 133 Burwood Road and 38 – 40 Railway Parade BURWOOD	Construction of a 20 storey mixed - use development consisting of 3 levels of retail suites, 1 level of restaurant, 7 levels containing 56 serviced apartments, 9 levels containing 68 residential apartments above basement parking	68	4200	56		0.19	0.125	0.4	0.016	560	560
13 910	18 – 20 Meryla Street BURWOOD	Construction of a 5 storey multi residential flat building containing 27 residential units, 3 commercial units and over 2 levels of basement parking for 33 vehicles	27			630	0.19	0.125	0.4	0.016	15.21	15.21
14 910	2A – 8 Burwood Road BURWOOD	Construction of a 9 storey residential flat building containing 50 residential units, over 2 level of basement parking for 67 vehicles	50				0.19	0.125	0.4	0.016	9.5	9.5
15 910	27 – 29 Burwood Road BURWOOD	Construction of a 9 storey mixed use development consisting of 46 residential units, 4 commercial premise units and 2 levels of basement car parking	46			525	0.19	0.125	0.4	0.016	17.14	17.14
16 913	2 -14 Elsie Street BURWOOD	Retention of 7 storeys commercial building and construction of 8 storey mixed use development containg 64 units and 2 reatil units above basement parking	64	945			0.19	0.125	0.4	0.016	130	130
17 915	BURWOOD PLACE	Construction of 3 towers of residential units, retail and commercial floor space above basement car parking	900	7,400	100	5,400	0.19	0.125	0.4	0.016	1222	1222

18 913	9 - 15 Deane Street and 18 - 20 George Street BURWOOD	Construction of 3 storey residential flat building above basement parking	12				0.19	0.125	0.4	0.016	2.28	2.28
19 915	1 – 3 Belmore Street and 67 – 73 Shaftesbury Road BURWOOD	Construction of 9 storey Development comprising of 103 apartments and 3 commercial suites and 2 levels of basement parking	103			700	0.19	0.125	0.4	0.016	31	31
20 913	44 Belmore Street BURWOOD	Construction of a 6 storey mixed use development with commercial/office at ground level and 36 residential units	36			600	0.19	0.125	0.4	0.016	16	16
21 915	77 Shaftesbury Road and 1 Clarence Street BURWOOD	Construction of a part 4 and part 10 storey building containing 42 Senior Living Housing	42				0.19	0.125	0.4	0.016	8	8
22 Out of Zone	60 Belmore Street BURWOOD	Construction of a 5 storey residential flat building fourteen (14) two bedroom apartments and one (1) studio apartment over a basement parking area of sixteen spaces	15				0.19	0.125	0.4	0.016	3	3
23 915	B2 SQUARE 27 – 31 Belmore Street BURWOOD	Construction of a 7 storey mixed use development being a 3 storey podium, 3 residential towers containing 210 units, 8,616m^2 of commercial retail space with 6 levels of basement parking for 580 cars	210	4,000		2,616	0.19	0.125	0.4	0.016	582	582
24 913	9 – 15 Deanne Street and 18 – 20 George Street BURWOOD	Construction of a 22 storey building above ground level of a mixed use development	195				0.19	0.125	0.4	0.016	37	37
25 913	36 – 38 Victoria Street BURWOOD	Construction of a mixed use development containing commercial floor space of 5546 sqm, 40 serviced apartments and 77 residential units	77		40	4,546	0.19	0.125	0.4	0.016	103	103
26 910	5 – 9 Wilga Street BURWOOD	Construction of an 8 storey Mixed Use Development	170	3,000		3,000	0.19	0.125	0.4	0.016	455	455
27 910	3 Wilga Street and 41A – 41B Shaftesbury Road BURWOOD	Construction of a Mixed Use Development consisting of 34 residential units and 1 commercial unit	EXISTING TRAFFIC GENERATION 2017									
28 913	29 George Street BURWOOD	Construction of a 19 storey mixed use development comprising 3 basement parking levels, a church hall, 43 units and commercial floor space	EXISTING TRAFFIC GENERATION 2017									
29 915	BURWOOD GRAND 39 - 47 Belmore Street, 6 – 14 Conder Street and 11 – 19 Wynne Avenue BURWOOD	Construction of a two storey retail/commercial podium, ten – storey building with 90 serviced apartments, two – eighteen storey buildings with a total of 332 residential apartments and 3 basement levels of parking	332				0.19	0.125	0.4	0.016	63	63
30 913	1 – 3 Marmaduke Street and 7 Deane Street BURWOOD	Erection of a new 22 storey mixed use development comprising of 3 retail units at ground floor, 62 serviced apartments, 36 residential apartments over four levels of basement car parking	38	2,000	82		0.19	0.125	0.4	0.016	290	290
31 915	1 – 3 Elizabeth Street BURWOOD	*Mixed Use Development of 15/16 levels (Please refer to map)	205				0.19	0.125	0.4	0.016	39	39
32 Out of Zone	17 – 19 Conder Street BURWOOD	Part 3 and Part 5 storey Residential Flat Building with 20 units over 2 levels of basement car parking	20				0.19	0.125	0.4	0.016	4	4
33 Out of Zone	21 Conder Street BURWOOD	Alterations and Additions to the existing commercial building and conversion to a Boarding House			20		0.19	0.125	0.4	0.016	8	8

6.16 Traffic Generation

All projected traffic generation rates applied to the developments within the town centre were based on the industry standard *RMS Guide to Traffic Generating Developments*.

Based on the RMS's *Technical Direction TDT 2013/04a* entitled *'Guide to Traffic Generating Developments Updated Traffic Surveys'*, the Victoria Street East development will generate 9,912 vehicle trips daily, with 3,200 vehicle trips, including heavy vehicles, occurring during the morning and evening commuter peak periods, combined.

The *RMS Technical Direction* outlines the generation rate for the high density residential form, per apartment, commercial and retail activities. The following presents the applied generation rates adopted for the assessment of the road network.

While the average annual growth in vehicular traffic throughout the Metropolitan area is in the order of 1.5%-1.7% the current average annual growth on Burwood Road is reported as -0.9% across the combined AM and PM peak commuter periods. The AM peak reports an average growth of 0.3% per annum while the PM peak is reported as -1.8%.

While the applied annual growth rate in traffic of 1.5% to 1.7% throughout the Metropolitan area within the models is higher than that currently reported on Burwood Road, examination of the competing parallel route of Shaftesbury Road, suggest a significant volume of through traffic and vehicles accessing the town centre utilise this corridor.

The applied annual growth rate is considered to be a conservatively high estimation within the study area given that the town centre is already well established, with Burwood Road operating near or at capacity during the commuter peak periods. Expectations are that with no change to the road network the reported growth on Burwood Road from the year 2026 '*Do Nothing*' model vehicular growth within the study area will be low.

Table 7 *Proposed Vehicle Generation*

Source *Road Delay Solutions, 2019*

VICTORIA STREET VEHICLE GENERATION TABLE															
Development Component	Area *(Units &/or GLFA m^2)*	Area *(Units &/or GFA m^2)*	Daily *RMS Trip Rate*	AM Peak Hour *GLFA RMS Trip Rate/m^2*	PM Peak Hour *GLFA RMS Trip Rate/m^2*	WE Peak Hour *GLFA RMS Trip Rate/m^2*	AM Peak Hour Generation *(vph)*	PM Peak Hour Generation *(vph)*	WE Peak Hour Generation *(vph)*	AM Outbound Trips *(vph)*	AM Inbound Trips *(vph)*	PM Outbound Trips (vph)	PM Inbound Trips (vph)	WE Outbound Trips (vph)	WE Inbound Trips (vph)
Residential Apartments	179		1.52	0.19	0.15	0.1	34	27	18	27	7	5	21	10	8
1 Bed Apartments	47														
2 Bed Apartments	105														
3 Bed Apartments	27														
Restaurants/Cafes	1,356	1,981	0.3	0.05	0.05	0.05	68	68	34	54	14	14	54	27	7
Retail Specialty Shops*	400	457	0.3403	0.059	0.059	0.075	24	24	30	11	13	13	11	17	14
Supermarket*	1,359	1,981	0.3403	0.059	0.059	0.075	80	80	102	36	44	44	36	56	46
Commercial	2,525	1,788	0.11	0.016	0.012	0.001	40	30	3	6	34	26	5	2	1
TOTAL			1,555				246	229	186	134	112	102	127	111	75

**The Supermarket and Specialty Shops generation rate is based on RMS Technical Direction TDT 2013/04a - 5.9vph/100m2 of GLFA given the proximity to Westfield and the higher demand by live in residents*

The retail GLFA excludes common areas such as walkways, garbage storage, unoccupied lobby areas and the shared stock storage provisions.

6.17 Traffic Distribution

The traffic distribution through the town centre has been drawn from numerous sources.

Residential and commercial land use distribution has been based on the applied year 2026 *BTS* trip matrices, published in 2014 and revised in October 2016.

The retail distribution has been determined by a catchment analysis of simillar operations.

To determine and apply the distribution of traffic generated by the proposed retail operations, within the model, former analysies of retail operations for the Gladesville Shopping Village and Warriewood Square were undertaken by *Road Delay Solutions* in the first and third quarters of 2016, respectively

The retail distribution pattern was determined by a simple survey of 126 patrons at each surveyed complex, entering by vehicle into the carparks, and observed heading to the respective supermarkets. These patrons were asked to roughly estimated the distance they had travelled or their origin postcode. The survey did not include pedestrian foot traffic.

These investigations revealed that patrons to both centres were generally attracted from a radial catchment not exceeding 5 kilometres.

It was found that the retail operations generally attracted some 72% of patrons from within a 1.5 kilometre radius of the site, a further 19% within 2kms and with the majority of the remaining 8%, some 3.5 - 4kms.

This particular distribution pattern has been applied within the trip matrices applied to the future year 2026 model. The distribution of traffic was proportionately applied to the percentage of residential lots within adjoining catchments.

It was found that the current 2016 matrices reflected a similar trip distribution pattern with the exception of some 10% arriving from an origin some 5.5km away.

6.18 Future Models

The future 2017 and 2026 models were run against three differing infrastructure scenarios to understand and compare the impacts associated with the Victoria Street East development site and Council's proposed Section 94 infrastructure…

- *2017 Development Model – 2017 Network and trip matrices run with the Victoria Street East traffic generation,*
- *2026 'Do Nothing' - The future 2026 growth run on the current 2017 road network, and*
- *2026 Development Model – The 2026 Section 94 road network including proposed supplemental infrastructure and traffic generation from the Victoria Street East development.*

Three (3) levels of road network and intersection performance have been undertaken for this project…

- *Network,*
- *Route, and*
- *Intersection.*

Network performance assesses the operation of all modelled intersections and their interaction.

Route performance which focuses on Shaftesbury Road and Burwood Road, both northbound and southbound.

Intersection performance is reported from the *SIDRA* network models and reports the operation of each individual intersection.

6.19 2017 Development Model

The proposed mixed use development is located on Victoria Street East with access primarily from Shaftesbury Avenue and secondary from Burwood Road. Vehicle generate has been calculated at 253vph during the morning peak hour period, 239vph during the PM and 193vph during the week end peak.

Vehicles will arrive and depart the site via the following volumes…

AM Peak Arrivals

- *11 vph from Burwood Road, and*
- *91 vph from Shaftesbury Road*

AM Peak Departures

- *151 vph to Shaftesbury Road*

PM Peak Arrivals

- *29 vph from Burwood Road*
- *115 vph from Shaftesbury Road*

PM Peak Departures

- *95 vph to Shaftesbury Road*

WE Paeak Arrivals

- *3 vph from Burwood Road*
- *72 vph from Shaftesbury Road*

WE Peak Departures

- *118 vph to Shaftesbury Road.*

The traffic generation, associated with the development, primarily impacts Shaftesbury Road at the intersection with Victoria Road East. The operation of the traffic signal controlled intersections along Shaftesbury Road report a satisfactory Los with the proposed traffic generation.

Figure 36 *2017 AM with Development Model*

Source *Road Delay Solutions, 2019*

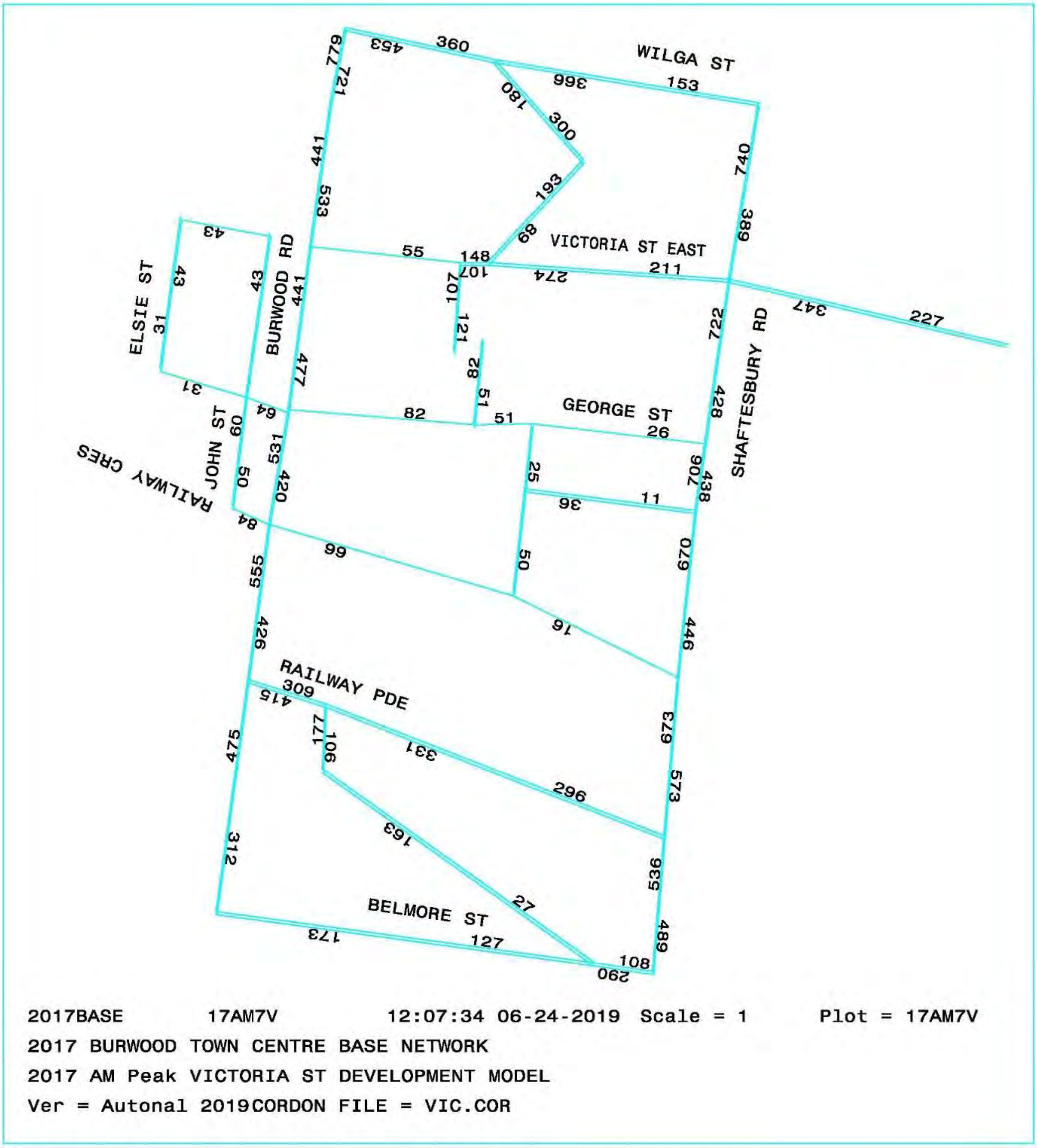


Figure 37 2017 PM with Development Model

Source Road Delay Solutions, 2019

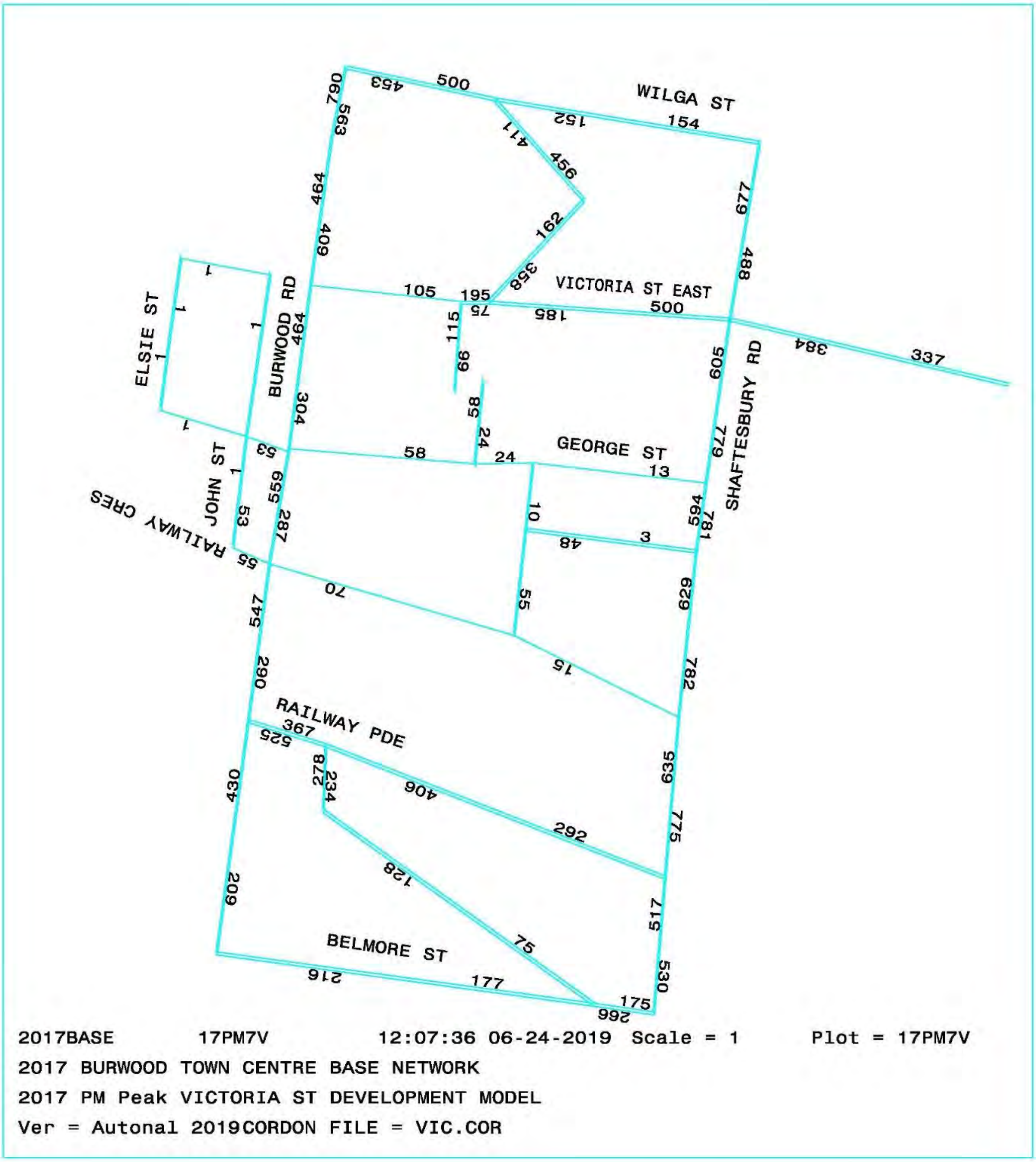
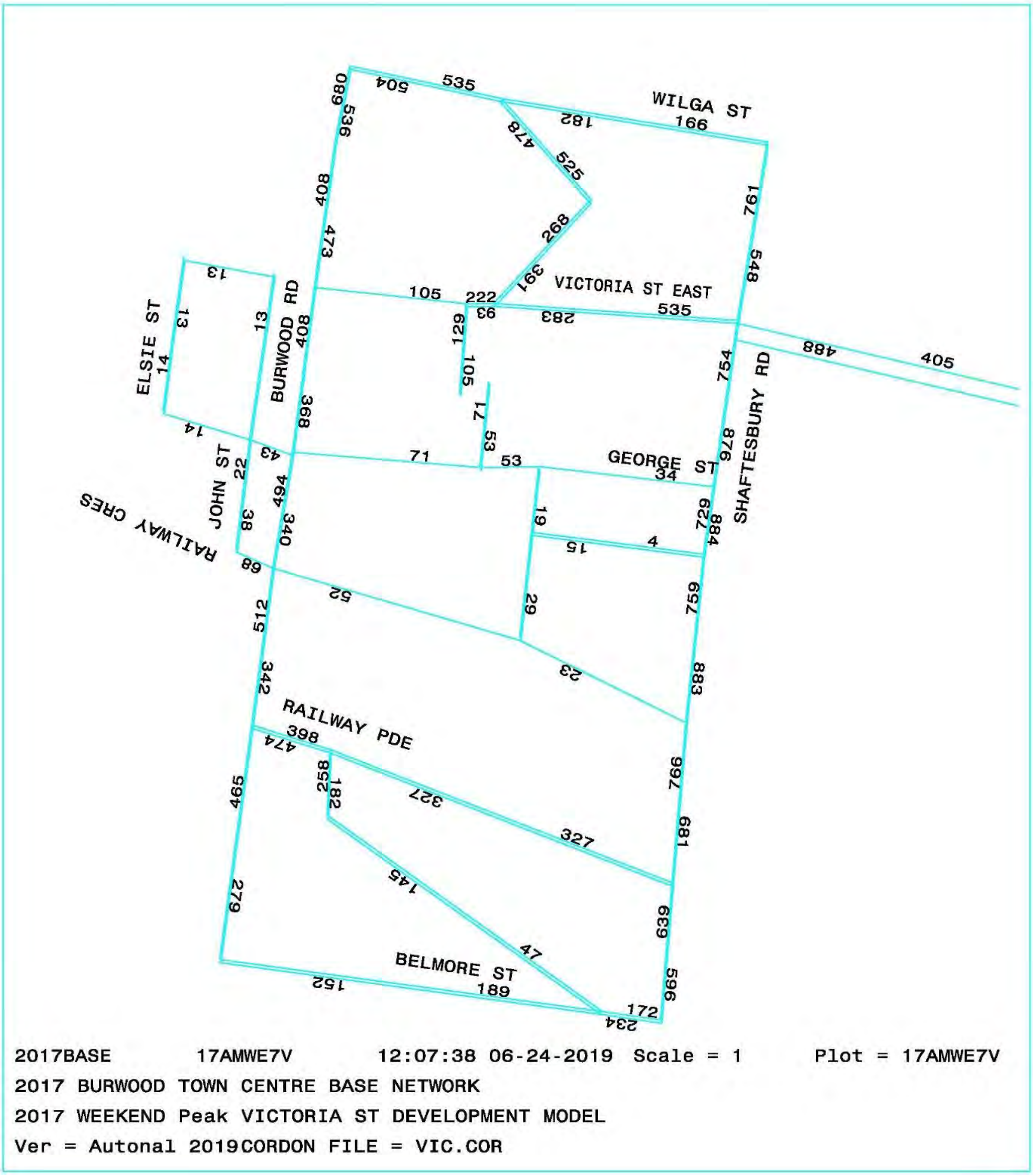


Figure 38 *2017 WE with Development Model*

Source *Road Delay Solutions, 2019*



6.20 2026 Base Year Model

Year 2026 was nominated as the future assessment year which is conventional practice for this form of mixed use development. The year represents a practical timeframe within which some confidence in the understanding of likely development levels and prevailing traffic patterns can be made.

The future year 2026 model was developed to understand the likely traffic impacts the general metropolitan growth, and any other potential Burwood town centre developments, would have on the traffic network.

Year 2026 is a typical planning horizon based upon 15 years since the observed census data in 2011.

The base case or hereafter termed the '*Do Nothing*' traffic model was developed with the 2026 trip matrices assigned to the 2016 road network with no infrastructure improvements or mitigation measures employed.

With the *BTS* housing and employement growth rates applied to the modelled 2026 trip matrices, the reported vehicle growth projections, within the town centre, are presented in the following table. By comparison, the Metropolitan arterial road network screen lines, including Parramatta Road and the Hume Highway, report an average growth of some 13.8% to year 2026.

Table 8 Projected 10 Year Vehicle Growth

Source Road Delay Solutions, 2019

AVERAGE PROJECTED VEHICLE GROWTH TO YEAR 2026			
Road	AM PEAK	PM PEAK	WEEKEND PEAK
Burwood Road	3.4%	8.5%	6.8%
Shaftesbury Avenue	4.8%	9.1%	6.2%

The road network operation and Burwood Road route operation are both reported as LoS'E' The reported growth on Shaftesbury Road is slightly greater than that on Burwood Road and suggesting that the congested state of Burwood Road will be unattractive to motorists until such time as capacity constraints can be reduced or eliminated.

Shaftesbury Road reports a route LoS 'E' which is caused by queued vehicles trailing back into preceding intersections due to capacity issues such as…

- *Shared lanes and the split approach phasing at the Railway Parade/Paisley Street intersection, and*
- *The single through lanes in Shaftesbury Road, at the signalised intersection of Wilga Street, which restricts the vehicle capacity entering and exiting the study area to the north.*

It is apparent that with the anticipated metropolitan growth, Burwood Road and Shaftesbury Road will continue to operate, at their respective levels of service, until such time as the capacity constraints along each route can be addressed.

Anecdotally, it can be supposed that Burwood Road is operating at or near its theoretical capacity and will allow for no further growth in vehichular traffic while the competing parallel route of Shaftesbury Road remains a viable option.

It is considered that the level of congestion reported on Burwood Road is acceptable as it reduces the speed of vehicles within a highly pedestrianised town centre while diminishing the attractiveness of the route to through traffic. Invariably, reducing congestion on Burwood Road would likely increase vehicle speeds and may give rise to any potential incident severity. Furthermore, all evidence would suggest that any treatment to reduce traffic on Burwood Road would see a proportionate and corresponding rise in traffic on Shaftesbury Road.

The modelling suggests that with the anticipated growth to year 2026, Shaftesbury Road will also operate close to its theoretical capacity limits but with generally, acceptable average vehicle delays along the corridor.

Figure 39 ***2026 AM Base 'Do Nothing' Model***

Source *Road Delay Solutions, 2019*

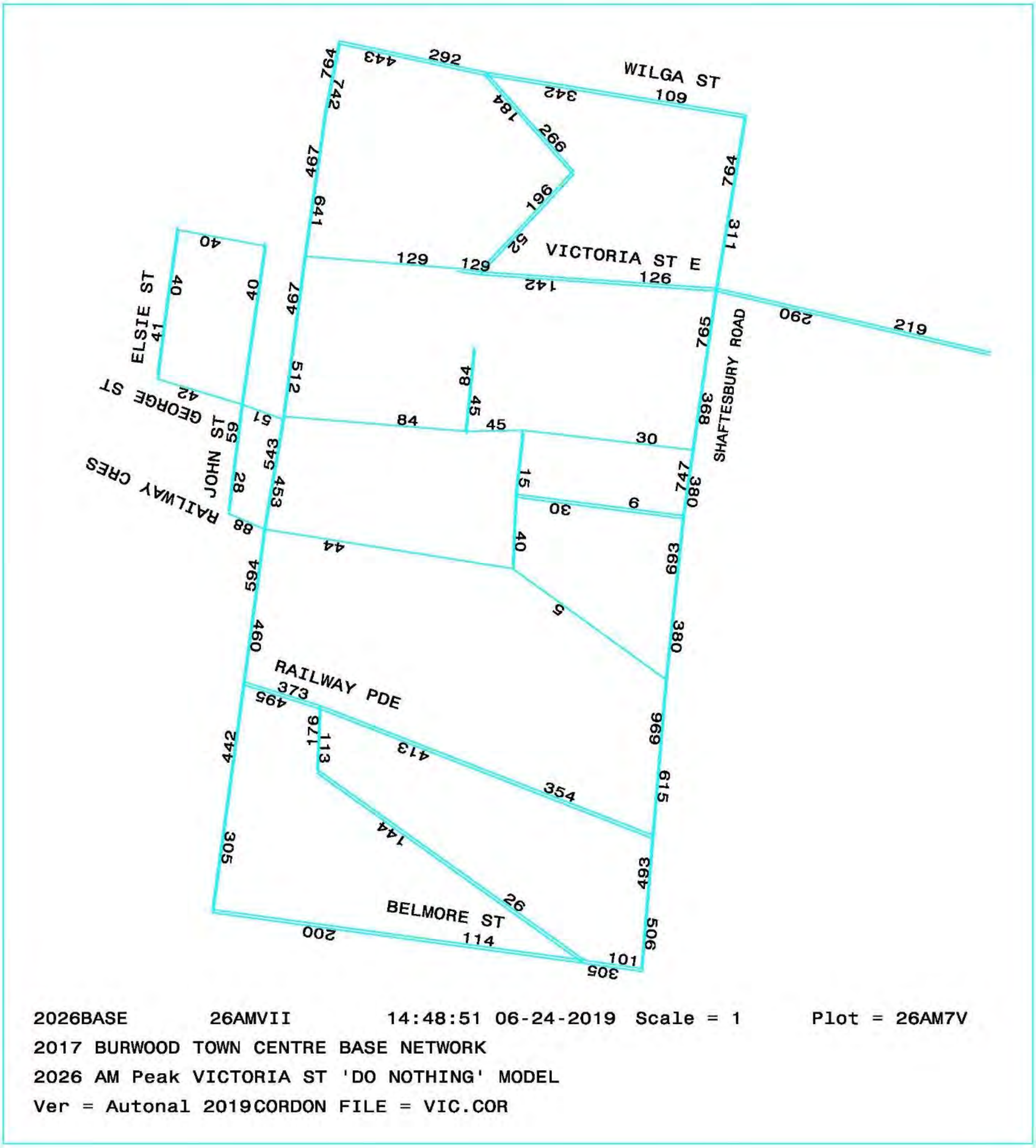


Figure 40 ***2026 PM Base 'Do Nothing' Model***

Source *Road Delay Solutions, 2019*

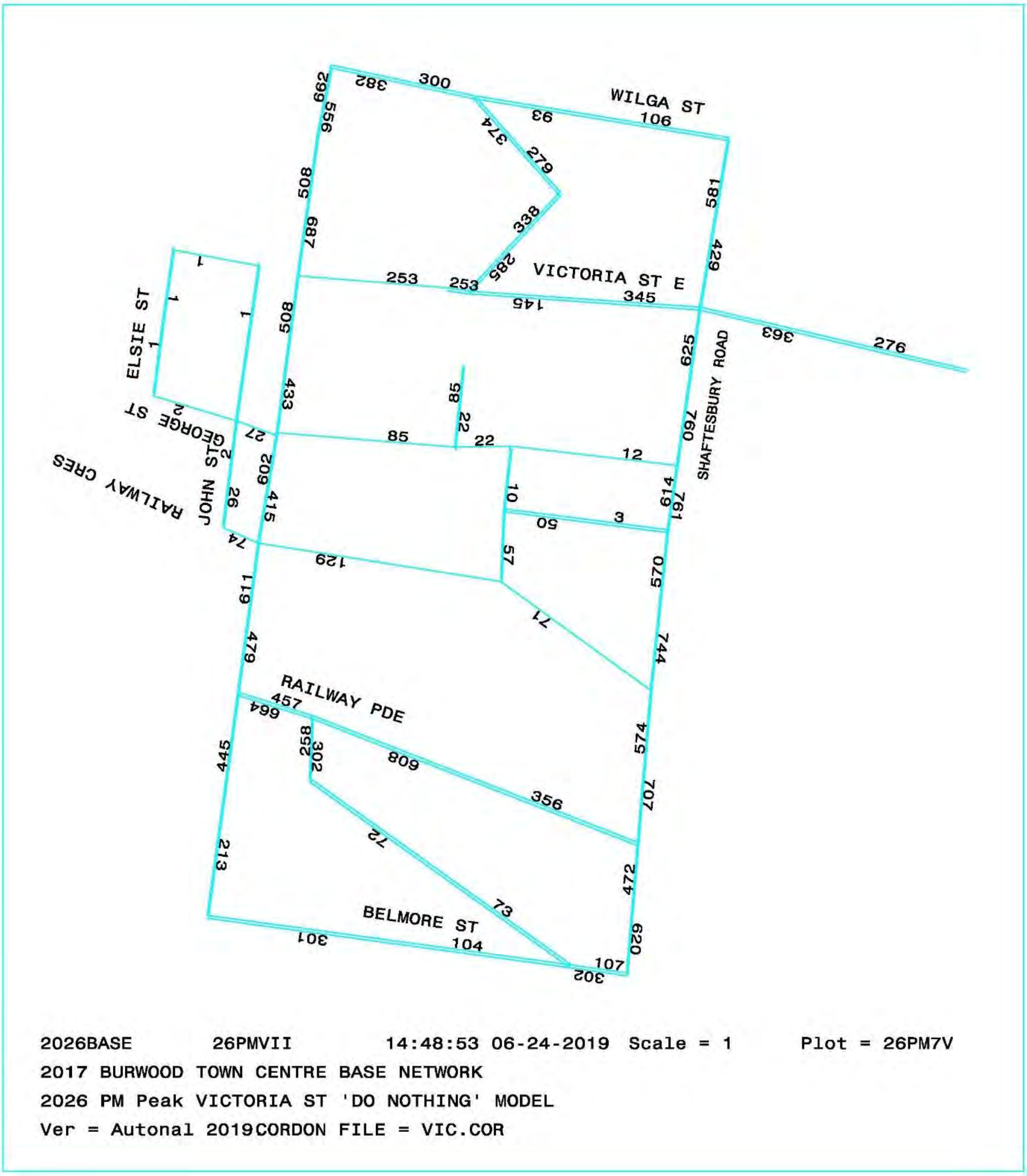
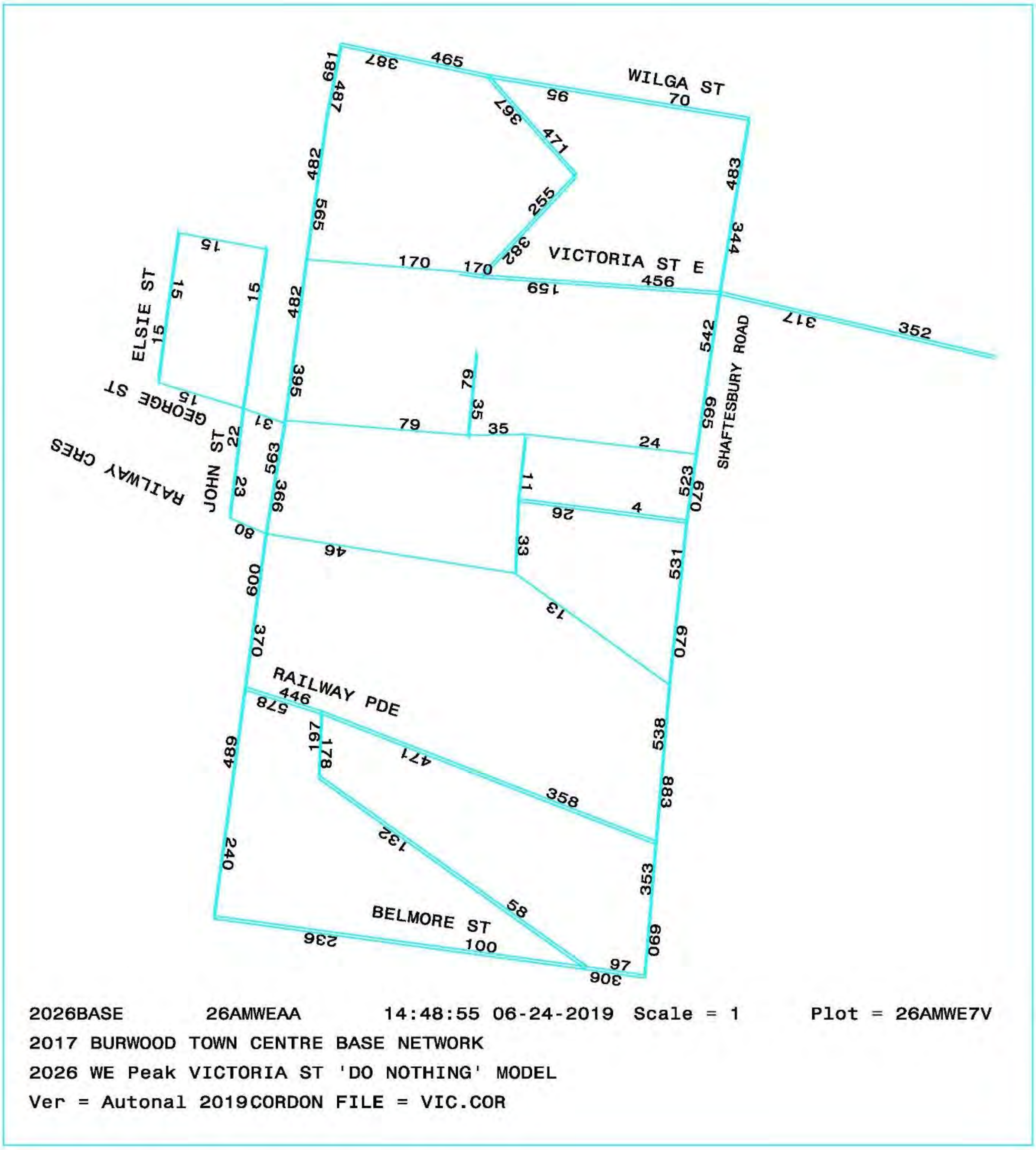


Figure 41 *2026* ***WE Base 'Do Nothing' Model***

Source *Road Delay Solutions, 2019*



6.21 2026 Development with Section 94 Infrastructure Model

The final scenario modelled is for the Year 2026, inclusive of…

- → *The BTS 2026 growth rates,*
- → *Stage 1 of the West Connex project (M4 East – Homebush Bay Drive to Pomeroy Street/Tunnelled Pomeroy Street to City West Link Road), which is scheduled for opening in 2019,*
- → *Burwood Council's Section 94 Infrastructure Plan, and*
- → *The Victoria Street East traffic generation.*

Figure 42 Westconnex Stage 1 M4 East – M4 to City West Link Road

Source http://www.westconnex.com.au, 2016

The Section 94 infrastructure plan and anticipated implementation dates include…

- → *Future signalised right turn movement from Burwood Road, southbound, into Belmore Street, westbound, (2016-2018),*
- → *Upgrade to the signalised intersection at Burwood Road and Railway Parade, (2016-2018),*
- → *New traffic signals at the intersection of Railway Parade and Conder Street, (2016-2018),*
- → *Widening of Railway Parade east of Burwood Road (2024-2027),*
- → *New mid-block traffic signals in Wynne Avenue (2012-2015),*
- → *New traffic signals at Belmore Street and Wynne Avenue (2012-2015),*
- → *New traffic signals at Belmore Street and Conder Street (2012-2015),*
- → *Widening of Railway Parade adjacent to Victoria Street (after 2035),*
- → *Streetscape upgrades in Belmore Street, Conder Street, Wynne Avenue (2012 - after 2020), and*
- → *Shared zones in Conder Street and Clarendon Place (2016-2018).*

Figure 43 *Section 94 Infrastructure Plan*

Source *Burwood Council, 2016*

Figure 12 2026 Supplemental Road Network Treatment

Source Road Delay Solutions, 2019

Identifier	Proposed Road Network Component	Priority in Relation to Development	Reasoning	Preliminary Budget Estimates
1	Widening of pedestrian crossings to 5m at select locations.	Nil	To increase the pedestrian capacity and attempt to reduce the incidence of demand for the pedestrian 'WALK' during each cycle.	$ 100,000.00
2	Retention of right turn for all vehicles, SB on Burwood Road at Railway Parade.	Nil	Afford buses access to the stops in Railway Parade on the northern side of Burwood Plaza.	$ -
3	Introduction of a pedestrian 'scramble' phase.	Nil	A pedestrian 'scramble' phase will reduce the impacts of pedestrian movements on the SB left turn movement in Burwood Road.	$ 350,000.00
4	Signalisation of Burwood Road intersection at Victoria Street East. Buses Only RT movement from Burwood Road NB (Interim measure).	Low	Would benefit the development after 2026 in formalising both bus and pedestrian movements. Intended to reduce the incidence of 'J' walking across Burwood Road and improve safety for pedestrians with the left turn entry to Victoria Street East.	$ 850,000.00

All preliminary budget estimates include... Design, Provision for Traffic, Project Management, stormwater, indicative cost for utility and services adjustment.
All preliminary budget estimates exclude... Legal fees pertaining to WAD(s), performance bonds, maintenance charges and temporary utility and service connections.

The 2026 Section 94 model does not assess each measure proposed under the Council plan individually, but adopts the proposed improvements and includes the traffic generation associated with the Victoria Street East development.

It has been reported from the modelling that with the S94 improvements, the operational performance of Burwood Road and Shaftesbury Road, both northbound and southbound will operate at a LoS 'E', further consolidating the view that Burwood Road is operating at capacity and the competing parallel route of Shaftesbury Road will remain a viable alternative path into and out of the town centre, with motorists utilising side street entry to the centre and access to the available parking provisions.

The S94 Infrastructure Plan outlines provision for modification to the Burwood Road intersection with Railway Parade. After dicussions with Council it is intended to retain the current movement conditions including the right turn from Burwood Road, southbound, into Railway Parade under the plan.

There is some discrepancy over the intersection of Burwood Road and Belmore Street. An *RMS* traffic signal design layout depicts a future dedicated, right turn movement, southbound, in Burwood Road, replacing the current filterd right turn movement for all vehicles, Modelling supports Council's view that the Burwood Road intersection with Railway Parade and also with Belmore Street, should be retained in its current form as no significant improvement is reported with the relocation of the right turn movement, southbound, in Burwood Road from Railway Parade to Belmore Street, as reported in the body of this document.

With the proposed mixed use development, the subsequent, calculated, vehicle generation is 246vph during the AM peak, 229vph during the PM and 186vph during the weekend peak.

The development vehicle generation has been applied to the year 2026 trip matrices and the operational modelling generally reports a network LoS 'E' for the morning, evening and weekend peak periods on Shaftesbury Road.

Detailed assessment of each key intersection within the town centre has been undertaken to determine the impact on average vehicle delay, level of service and the resultant queue lengths.

The mesoscopic modelling indicates that with the addition of the Victoria Street East traffic generation, Burwood Road traffic volumes do not rise significantly. However, traffic vehicle volumes do increase on Shaftesbury Road, as Victoria Road East is the primary ingress and egress corridor to and from the development.

With the included Victoria Street East traffic generation, the intersection of Victoria Street east and Shaftesbury Road reports a LoS 'C' for the AM, PM and Weekend peak periods.

The modelling has further found that the proposed Victoria Street East traffic generation fails to trigger any infrastructure improvements, particularly on Shaftesbury Road and Victoria Street East.

Figure 44 *2026 AM Development S94 Model*

Source *Road Delay Solutions, 2019*

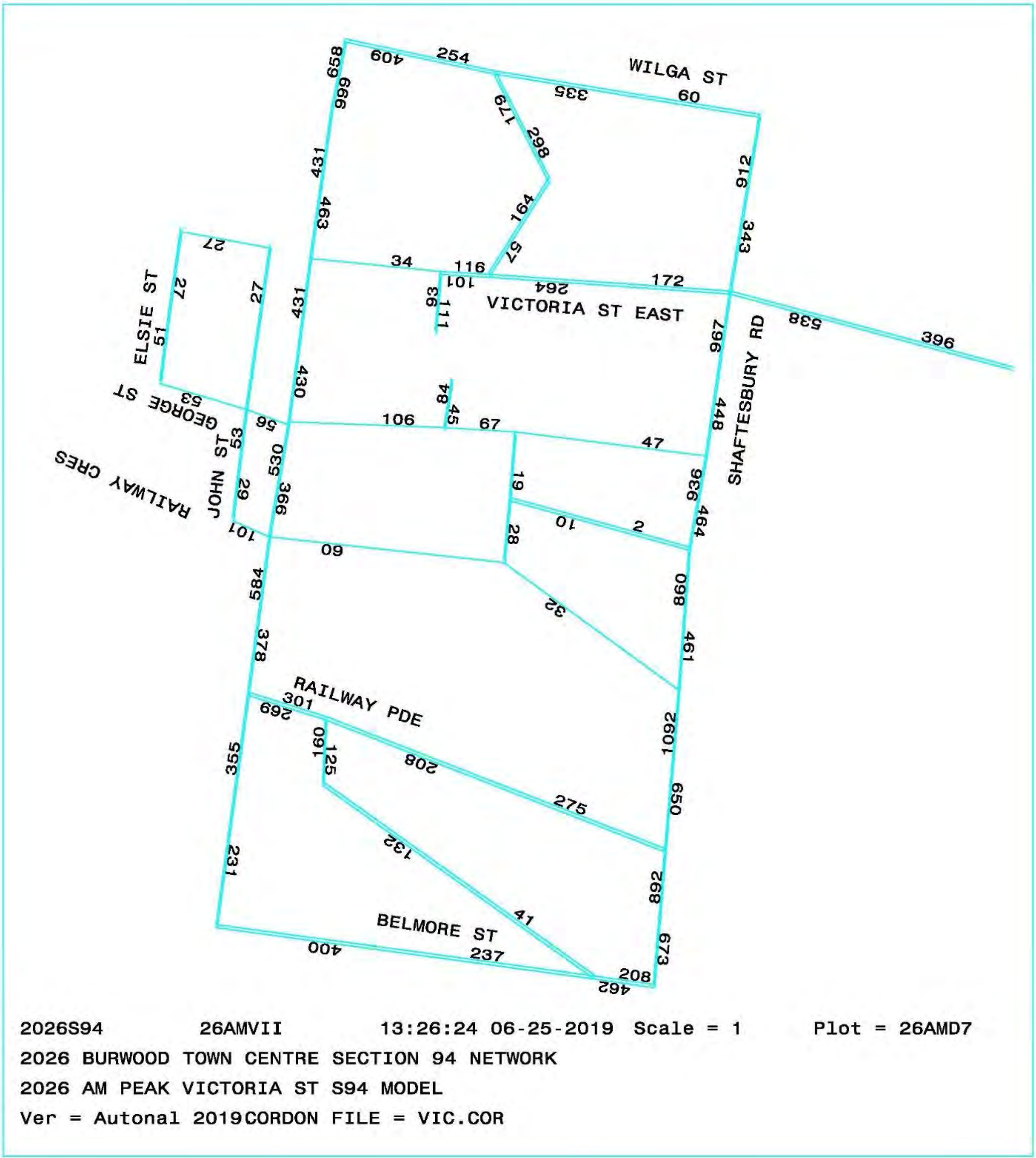


Figure 45 *2026 PM Development S94 Model*

Source *Road Delay Solutions, 2019*

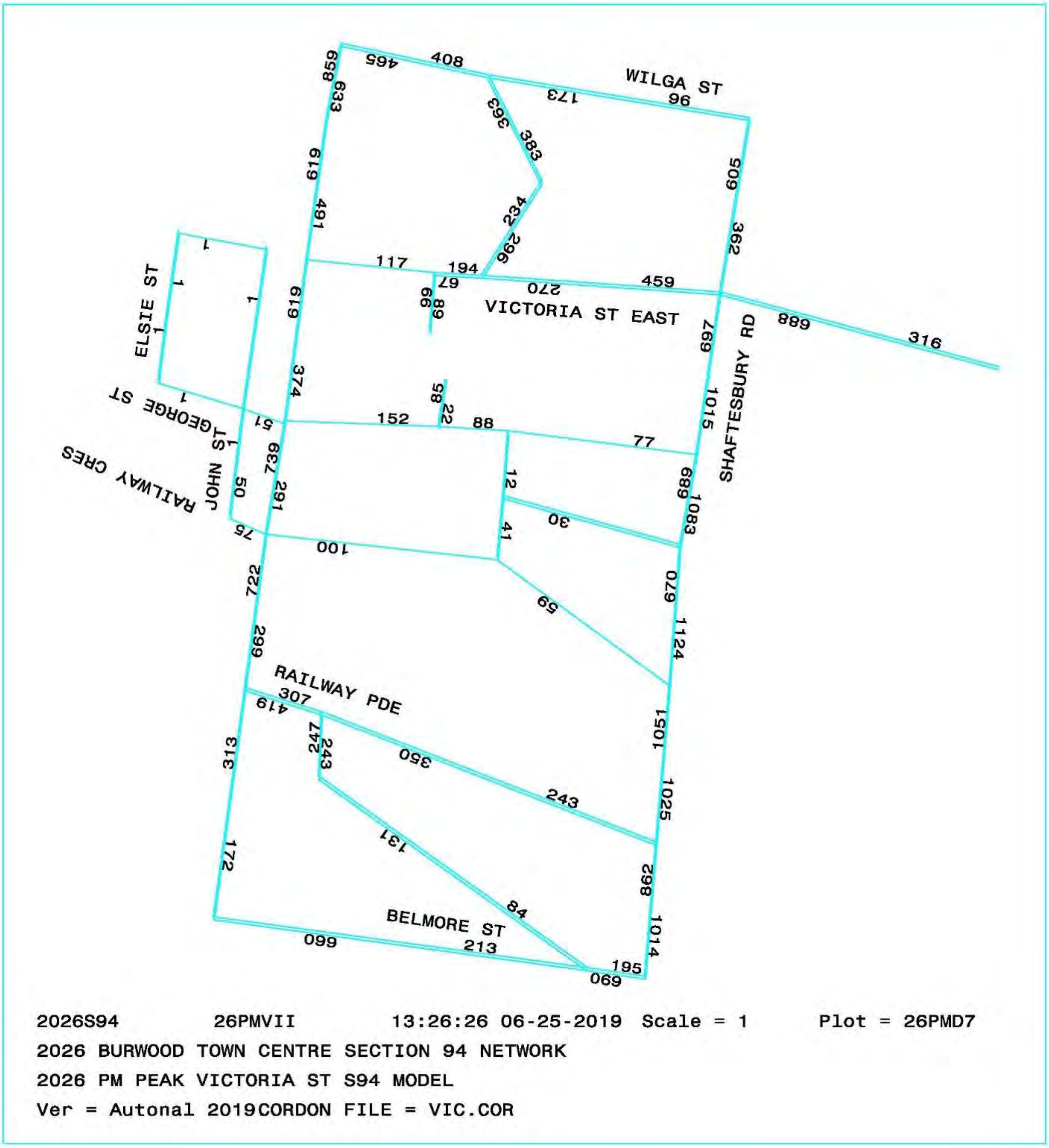


Figure 46 *2026 WE Development S94 Model*

Source *Road Delay Solutions, 2019*

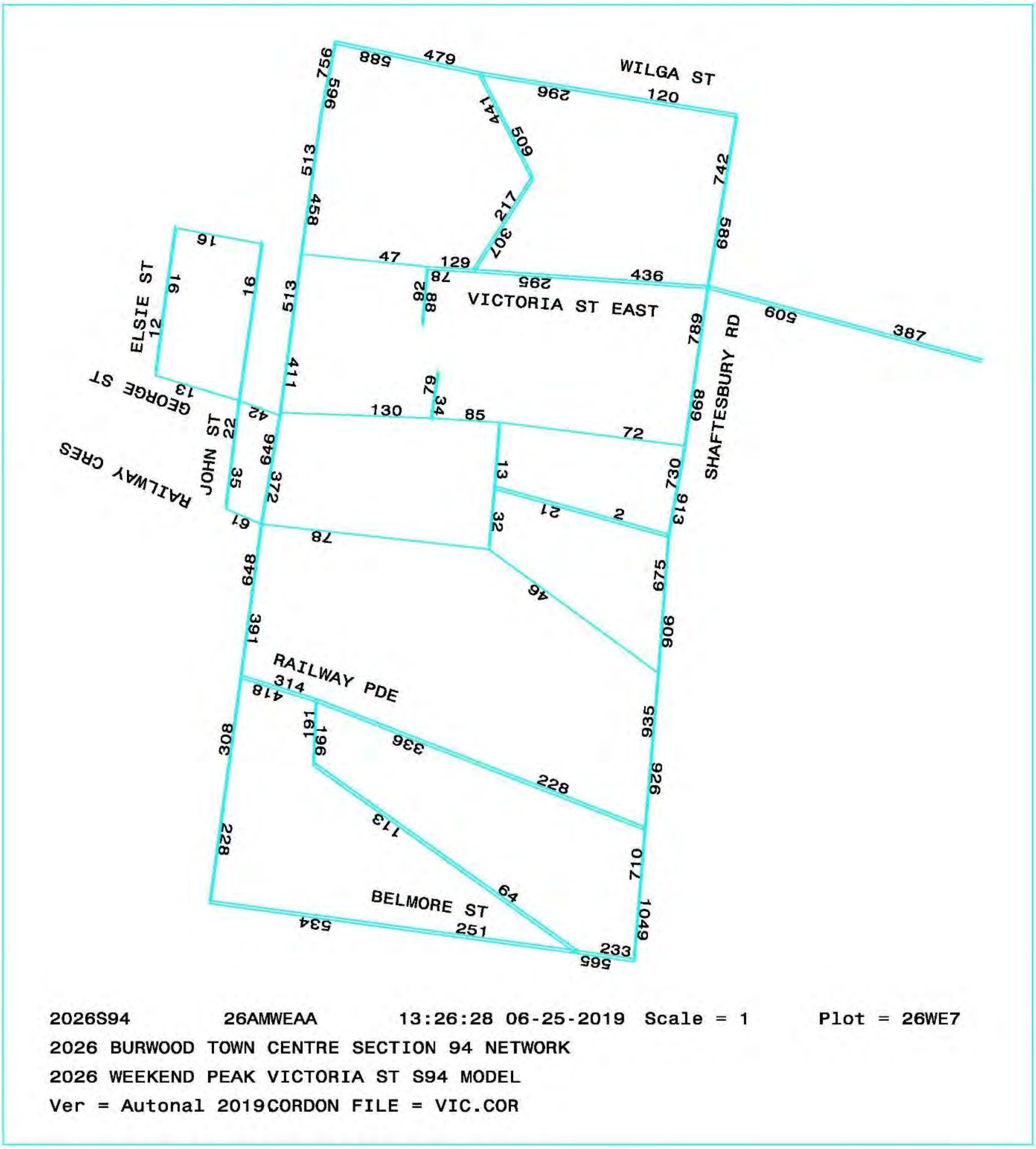


Table 9 *Burwood Town Centre Intersection Operational Performance*

Source *Road Delay Solutions, 2019*

VICTORIA STREET EAST SIDRA INTERSECTION PERFORMANCES												
Model	17AM4Q	17PM3E	17AMWE6	17AM7V	17PM7V	17AMWE7V	26AM7V	26PM7V	26AMWE7V	26AMD7	26PMD7	26WE7
	2017 Existing			2017 'with Development'			2026 'Do Nothing' Base			2026 'With Section 94 Road Network and Victoria Street Development'		
	AM	PM	WE	AM	PM	WE	AM	PM	WE	AM	PM	WE
Burwood Road and Victoria Street East												
DS	0.154	0.167	0.154	0.167	0.148	0.163	0.224	0.425	0.264	0.143	0.162	0.157
AVD *(sec)*	0.8	1.2	1.1	0.8	1	1.1	1.7	2.9	1.9	1.1	1.1	1.2
LOS	A	A	A	A	A	A	A	A	A	A	A	A
Burwood Road, Deane Street and Railway Crescent												
DS	0.827	0.668	0.679	0.642	0.669	0.847	0.49	0.531	0.72	0.455	0.536	0.799
AVD *(sec)*	16.3	13.3	13.1	13.1	13.3	17.3	14	15.5	13.4	19.6	15.9	15.7
LOS	B	A	A	A	A	B	A	B	A	B	B	B
Burwood Road and Railway Parade												
DS	0.823	0.836	0.791	0.843	0.834	0.875	0.817	0.934	0.83	0.808	0.922	0.92
AVD *(sec)*	31.3	21.9	21	27.7	21.6	23.5	35	46.6	28.9	35.4	44.3	44.2
LOS	C	B	B	B	B	B	C	D	C	C	D	D
Burwood Road and Belmore Street												
DS	0.87	0.656	0.877	0.791	0.743	0.663	0.796	0.92	0.75	0.65	0.943	0.875
AVD *(sec)*	22.1	16.5	20.4	19.1	19.6	29.1	30.8	44.6	21.7	29.5	42.5	36.1
LOS	B	B	B	B	B	C	C	D	B	C	D	C
Shaftesbury Road and Wilga Avenue												
DS	0.867	0.867	0.789	0.959	0.807	0.897	0.996	0.872	0.8	0.908	0.814	0.796
AVD *(sec)*	17.6	21.2	19.6	45.9	22.2	30.7	55.5	22.1	32.6	31.6	24.4	26.6
LOS	B	B	B	D	B	C	D	B	C	C	B	B
Shaftesbury Road and Victoria Street												
DS	0.892	0.826	0.791	0.691	0.71	0.87	0.653	0.544	0.864	0.753	0.741	0.873
AVD *(sec)*	25.5	23.2	22.6	36.5	25.5	38.8	32.2	30.2	26.4	35.4	34.3	33.9
LOS	B	B	B	C	B	C	C	C	B	C	C	C
Shaftesbury Road and George Street												
DS	0.175	0.188	0.197	0.203	0.209	0.235	0.229	0.288	0.248	0.48	0.684	0.697
AVD *(sec)*	0.6	0.6	0.7	0.2	0.3	0.4	0.6	1.1	1.5	2.3	3	3.5
LOS	A	A	A	A	A	A	A	A	A	A	A	A
Shaftesbury Road, Railway Parade and Paisley Street												
DS	0.861	0.836	0.836	0.836	0.749	0.738	0.957	0.746	0.871	0.78	0.823	0.813
AVD *(sec)*	38.5	41.6	37.5	29.8	28.7	30.9	51.4	38	43.7	36.7	40.4	28.7
LOS	C	C	C	C	C	C	D	C	D	C	C	C
Burwood Road and George Street												
DS	0.195	0.162	0.167	0.175	0.168	0.151	0.169	0.19	0.19	0.155	0.199	0.193
AVD *(sec)*	0.7	0.6	0.9	0.8	0.7	0.8	0.9	0.7	0.9	1.3	1.1	1.1
LOS	A	A	A	A	A	A	A	A	A	A	A	A

Table 10 Modelled Vehicle Projections

Source Road Delay Solutions, 2019

MESOSCOPIC MODEL HOURLY TRAFFIC VOLUME PROJECTIONS												
Model	1	2	3	4	5	6	7	8	9	10	11	12
ROAD LINK	17AM4Q	17AM7V	26AM7V	26AMD7	17PM3E	17PM7V	26PM7V	26PMD7	17AMWE6	17AMWE7V	26AMWEB	26WE7
BURWOOD RD SB N WILGA ST	544	544	554	462	319	334	373	300	360	357	350	240
WILGA ST EB	366	360	292	285	453	500	482	446	549	535	465	417
WILGA ST WB	454	453	443	355	545	453	447	419	494	504	387	452
PARK AVE EB	437	458	501	346	426	546	578	404	513	508	500	497
PARK AVE WB	320	309	305	312	313	375	319	295	296	299	222	253
BURWOOD RD NB S PARK AVE	437	441	467	387	350	464	508	529	437	408	482	504
BURWOOD RD SB S PARK AVE	512	533	641	412	475	409	687	338	475	473	565	364
BURWOOD RD SB N GEORGE ST	459	477	512	384	380	304	433	256	385	368	395	302
GEORGE ST EB	95	82	126	162	160	58	345	477	71	71	456	442
GEORGE ST WB W BURWOOD RD	77	64	51	33	107	53	27	8	64	43	31	13
RAILWAY CRES WB	110	84	88	63	51	55	74	32	67	68	80	40
DEANE ST WB	88	66	44	34	203	70	129	68	74	52	46	38
BURWOOD RD NB N RAILWAY PDE	582	555	594	481	483	547	611	591	540	512	600	616
RAILWAY PDE EB W BURWOOD RD	409	426	460	317	397	290	479	260	359	342	370	270
RAILWAY PDE WB E BURWOOD RD	425	415	495	347	349	525	664	493	456	474	578	484
RAILWAY PDE EB E BURWOOD RD	342	309	373	227	371	367	457	342	393	398	446	348
BURWOOD RD NB S RAILWAY PDE	502	475	442	403	399	430	445	315	494	465	489	288
BURWOOD RD SB S RAILWAY PDE	290	312	305	199	273	209	213	162	299	279	240	180
BURWOOD CENTRAL NB	11	11	8	11	12	12	11	12	11	11	10	11
BURWOOD CENTRAL SB	11	11	12	12	22	22	23	23	13	13	14	14
RAILWAY PDE EB W WYNNE AVE	368	335	423	415	451	407	446	617	458	460	496	707
RAILWAY PDE WB W WYNNE AVE	513	508	557	632	565	711	904	816	471	485	462	666
RAILWAY PDE EB W CONDER ST	517	484	693	725	501	447	971	622	563	565	1007	958
RAILWAY PDE WB W CONDER ST	518	502	1074	714	520	711	979	845	454	470	690	656
BELMORE ST EB W BURWOOD RD	193	205	168	226	345	331	343	317	368	357	390	308
BELMORE ST WB W BURWOOD RD	215	215	290	476	171	228	353	494	204	189	325	597
BELMORE ST WB E BURWOOD RD	172	173	200	373	217	216	301	428	164	152	236	481
BELMORE ST EB E BURWOOD RD	125	127	114	183	173	177	104	151	150	189	100	140
WYNNE AVE NB N BELMORE RD	143	150	399	458	123	148	562	598	130	127	398	476
WYNNE AVE SB N BELMORE RD	166	155	393	302	347	149	424	383	136	139	586	415
CONDER ST NB S BELMORE ST	311	315	314	361	188	192	259	196	265	246	346	250
CONDER ST SB N BELMORE ST	169	166	210	326	209	196	229	143	237	238	234	342
BELMORE ST WB E CONDER ST	111	109	106	82	234	241	234	252	184	174	161	153
BELMORE ST EB E CONDER ST	170	183	150	149	135	141	173	100	214	206	263	148
WENTWORTH NB S RAILWAY	250	317	215	174	267	464	287	224	249	249	208	238
WENTWORTH SB S RAILWAY	358	340	315	281	416	637	484	578	523	521	429	439
RAILWAY WB E WENTWORTH	520	505	1077	714	522	726	993	845	459	474	693	656
RAILWAY EB E WENTWORTH	526	494	703	725	490	448	971	622	571	574	1014	958
WENTWORTH SB N RAILWAY	611	581	723	795	728	962	1257	1024	818	823	1025	985
MORWICK EB W WENTWORTH	589	530	534	279	476	444	481	301	641	636	689	535
SHAFTESBURY NB S RAILWAY	532	536	493	614	522	517	472	564	600	639	353	515
SHAFTESBURY SB S RAILWAY	546	489	506	588	570	530	620	772	637	596	690	848
PAISLEY EB E SHAFTESBURY	375	334	297	155	340	376	283	39	370	362	260	88
PAISLEY WB E SHAFTESBURY	472	423	450	351	379	363	550	305	440	403	365	334
SHAFTESBURY NB N RAILWAY	680	673	696	779	720	635	574	731	726	766	538	717
SHAFTESBURY SB N RAILWAY	610	573	615	634	743	775	707	841	685	681	883	941
RAILWAY WB W SHAFTESBURY	337	331	413	270	325	406	608	387	314	327	471	362
SHAFTESBURY SB N WILGA	592	572	536	696	841	529	480	615	640	610	402	708
WILGA EB W SHAFTESBURY	154	153	109	65	132	154	106	46	154	166	70	73
SHAFTESBURY NB S WILGA	776	740	764	975	516	677	581	711	714	761	483	663
SHAFTESBURY SB N VICTORIA	430	389	311	491	763	488	429	550	577	548	344	558
VICTORIA WB E SHAFTESBURY	563	347	290	472	267	384	363	452	426	488	317	413
SHAFTESBURY NB S VICTORIA	739	722	765	773	660	605	625	625	738	754	542	635
VICTORIA EB W SHAFTESBURY	199	211	126	162	494	500	345	477	463	535	456	442

MODEL IDETIFIERS AND DESCRIPTION		
1	17AM4Q	2017 AM PEAK CALIBRATED BASE MODEL
2	17AM7V	2017 AM PEAK VICTORIA ST DEVELOPMENT MODEL
3	26AM7V	2026 AM PEAK VICTORIA ST 'DO NOTHING' MODEL
4	26AMD7	2026 AM PEAK VICTORIA ST SECTION 94 MODEL
5	17PM3E	2017 PM PEAK CALIBRATED BASE MODEL
6	17PM7V	2017 PM PEAK VICTORIA ST DEVELOPMENT MODEL
7	26PM7V	2026 PM PEAK VICTORIA ST 'DO NOTHING' MODEL
8	26PMD7	2026 PM PEAK VICTORIA ST SECTION 94 MODEL
9	l7AMWE6	2017 WEEKEND PEAK CALIBRATED BASE MODEL
10	'AMWE7V	2017 WEEKEND PEAK VICTORIA ST DEVELOPMENT MODEL
11	AMWE7V	2026 WE PEAK VICTORIA ST 'DO NOTHING' MODEL
12	26WE7	2026 WEEKEND PEAK VICTORIA ST SECTION 94 MODEL

7 LOADING DOCK MANAGEMENT PLAN

Managing loading dock operations is critical in ensuring the workplace is without risks to health and safety. Vehicles including powered mobile plant, moving in and around the hardstand area, reversing, loading and unloading can cause serious injury.

This Loading Dock Management Plan (LDMP) has been prepared by *Road Delay Solutions* as a guide outlining the procedures and conditions to be considered within the loading dock hardstand area associated with the Victoria Street East development, Burwood.

The operational procedures are a critical component of the LDMP. The procedural requirements commence with the driver's approach to the site and continue until such time as they leave.

An efficient operation, of which the LDMP is a part, permits companies to avoid delays, minimise accidents, prevent product damage, meet timeframes and ultimately, satisfy customer demands and expectations.

Optimum operational procedures can only exist if the loading dock is properly designed, operated and maintained. With effective loading dock processes, companies can realise significant gains in productivity, energy efficiency, and safety, while cutting costs.

Information contained in this document is relevant to all individuals accessing the loading dock.

As the Victoria Street East development loading dock will serve numerous operators from the supermarket to the specialty shops, Café to the residential waste management, each operator, hereby named the '*Tenant*' will be responsible to ensure that the policies and procedures, as outlined, are observed and performed by all people within their respective organisations. This includes principal contractors, drivers, service personnel and other agents involved in the daily operation of the facility.

The retail and waste management operations are currently speculative but each *Tenant* must adhere to following guidelines.

Legal Obligations

Generally, it can be stated that everyone actively employed within the boundaries of the loading dock has a work health and safety duty.

The following outline these obligations and duties under law as they pertain to the *Tenant* and senior or delegated staff members.

The Tenant

The Tenant will be directly responsible for all the traffic management and material handling operations associated with the site.

Specifically, ensuring that the traffic management is executed in a way that will accommodate the differing vehicle classes and their movement to and from the Nu-Pure Warehouse.

The Tenant must ensure, so far as is reasonably practicable, that workers and other person are not exposed to health and safety risks arising from the daily operation of the business or undertaking.

The Tenant must further ensure, so far as is reasonably practicable, adequate provision has been made to permit staff, contractors, service personnel and the public the ability to enter and exit the site without risk to health and safety.

These considerations include, but are not limited to…

- → *Movements within the dock and access driveways,*
- → *Pedestrian site access,*
- → *During loading dock operations – peak traffic scheduling versus non-peak times,*
- → *Emergency vehicle access and egress, including fire service, ambulance, and police,*
- → *Any appropriate pavement marking(s) for loading area adherence and layover provision,*
- → *Emergency evacuation procedures,*
- → *Communication, and*
- → *Waste management.*

Senior Staff Members

Directors and managers have a duty to exercise due diligence to ensure the business or undertaking complies with the Work Health and Safety (WHS) Act and Regulations.

This includes taking reasonable steps to ensure the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks from traffic at the workplace.

Communication

A clear line of communication is to be maintained between each *Tenant* and/or designated staff, contractors and service personnel utilising the loading dock.

It is beneficial that the *Tenants* set in place a regular line of communication to manage delivery scheduling and general loading dock operations and activities to avoid conflicts which might arise from competing arrival times.

Access Conditions

The loading dock entry is to be from a driveway layback located on Victoria Street East.

The dock area will remain open at all times. However, the store rooms surrounding the hardstand area must be locked and maintained by the respective authorities. These areas include the…

- → *Supermarket loading area,*
- → *Residential waste and recycling store, and*
- → *Commercial/retail waste and recycling store.*

To enable service vehicles to enter and leave the site in a forward direction, a turntable is provided within the hardstand area.

All drivers must be aware of their vehicle class, height and wieght when utilising the local roads through the precinct with respect to their legal obligations under the Motor Traffic Act. The dock allows entry to all vehicles up to and including 8.8m rigid vehicles.

Loading Dock Management

Each *Tenant* may delegate the safe operation of the loading dock to a suitably qualified and/or experienced staff member, hereby referred to as the Dock Traffic Manager (DTM).

Each *Tenant* and nominated DTM is responsible for…

- → *The effective management of service vehicle delivery and operational outcomes within the site, pertaining to the loading dock, stock rooms and waste retention areas,*
- → *The efficient unloading of all deliveries, waste and recycling pickups,*

- → *The coordination and clear understanding of delivery schedules from direct suppliers and distribution centres,*
- → *Effective coordination/communication with each of the other Tenants to ensure coincidental arrivals do not occur,*
- → *The education of drivers and/or suppliers as to appropriate delivery routes to and from the dock, with particular attention to the legal obligations by vehicle class,*
- → *The assurance that all deliveries, in particular the supermarket, are rostered in two hour intervals to allow for unloading and egress,*
- → *No queueing of delivery vehicles entering the loading dock will be permitted. The Tenant must ensure any vehicle approaching the loading dock is directed to delay entry until such time as the dock entry is clear to access, and*
- → *All entries and exits will be performed in a forward direction only.*

Any transgression or violation contravening the above conditions may be logged by any *Tenant* and relayed to both the building supervisor, in a timely fashion.

Loading Dock Operating Hours

At this time, the operating hours are estimated to be 6am till 11pm, Monday to Sunday, given the retail operations for Victoria Street East are speculative, at this time.

Any change to these hours must be immediately relayed to *Road Delay Solutions* for correction to the LDMP. Highly visible signs will be erected within and outside the loading dock advising the dock operating times.

Waste and recycling collections for each Tenant must be actioned within the operating hours. Doors to the supermarket loading area, residential waste and recycling and commercial/retail will be closed outside of these hours.

Vehicle Movements

The respective *Tenants* are responsible for their specific loading dock operations.

All vehicle drivers entering the loading dock must…

- → *Enter the loading dock in a forward direction only from the layback on Victoria Srtreet East,*
- → *Exit the loading dock in a forward direction only onto Victoria Street East,*
- → *Enter the loading dock at an appropriate speed (10kmh) commensurate with the surrounding environment,*
- → *Entry to the loading dock area is clear and free of obstruction,*
- → *There is sufficient space to completely traverse the footway area on Victoria Street East,*
- → *Not queue in the driveway before entering the loading dock,*

- *Ensure all loading and unloading procedures occur soley within the designated loading dock area,*
- *Ensure no goods are loaded or unloaded from Victoria Street East,*
- *Leave the loading dock immediately after all goods have been delivered or dispatched,*
- *Not park or leave delivery vehicles within the loading dock area outside of the prescribed operating hours, and*
- *Adhere to all directions made by the respective Tenant and/or designated DTM.*

Each driver and/or delivery provider will be issued with a Driver Direction Sheet outlining…

1. *Each driver must arrive within their allotted delivery time window. Be punctual or advise the respective tenant and/or DTM of any change.*
2. *Enter and exit the dock in a forward direction.*
3. *The maximum vehicle length permitted within the loading dock is 8.8m.*
4. *Do not attempt arrival before 6am on any day.*
5. *Do not wait, queue or park on Victoria Street East.*
6. *Do not attempt unloading and delivery of manifest from the surrounding local streets. Your actions will be actionable by your supervisors and further deliveries by your company may be jeopardised.*
7. *Deactivate any radio and/or music media systems when entering the dock.*
8. *Do not leave your vehicle unattended while in the loading dock.*
9. *Adhere to all directions made by the Tennant and/or DTM.*
10. *All vehicles must be offsite by 11pm daily.*
11. *Any breaches of these conditions may result in a site ban.*

The supermarket operations may have up to 10 trucks (Class 4 – 8.8m rigid trucks) and up to 20 direct suppliers/vendors arrivals per day during periods of high turn over, such as at Christmas and Easter.

Typically, arrivals will be fewer, each day, outside of the busy trading peaks. One (1) supermarket delivery by 8.8m rigid truck and one (1) smaller vehicle by direct supplier, may occur during the peak AM and PM commuter traffic periods. The remaining retail outlets and Café are anticipated generate, at most, three (3) arivals (estimated maximum vehicle size Class 3 - 4 tonne pantechs) during the commuter peak periods.

A maximum of five (5) arrivals in an hour are anticipated at the loading dock during the morning and evenng peak traffic periods.

No queueing of vehicles in the loading dock driveway, prior to entering the loading dock, will be permitted.

Delivery scheduling is the sole responsibility of each *Tenant* and it must be maintained that schedules for competing usage of the dock area must allow sufficient time to deliver and clear the dock.

The 8.8m rigid trucks are to unload from the rear, after proceeding onto the turntable, located at the southern end of the loading dock area.

Smaller vehicles have a designated loading/unloading area within the loading dock. This area is defined by pavement marking. These smaller delivery or service vehicles must park within the designated area and leave the loading dock, via Victoria Street East, upon completion.

A designated emergency vehicle space has been be clearly defined, within the loading dock area, by pavement marking, sign and/or symbol. This space must remain free of obstruction and be available at all times, with the exception of emergency use.

Lighting

The loading dock, arrival and departure areas must be well lit during the hours of operation. The maintenance of all lighting will be the responsibility of the building supervisor.

It is the responsibility of each *Tenant* or delegated staff member to notify the building services manager of any failure in the lighting system.

Security

The loading dock will be open to the public at all times. The supermarket holding and the entry on Victoria Street East, outside of the stated operating hours.

Access to the loading dock outside the normal operating hours will be logged electronically by the entry system and will be made available to each *Tenant* to undertake the appropriate action, as deemed necessary.

Should access be required outside the normal operating hours, each *Tenant* must be notified in writing and permission sought for any such action.

If entry is granted outside of the normal operating hours, all responsibility will be on the *Tenant* or delegated staff to ensure no unauthorised entry. Upon leaving, the roller shutters are to be closed.

Cleaning and Maintenance

It is the responsibility of each *Tenant*, upon finalising delivery, to ensure the loading dock area is clean and free of obstruction.

Any maintenance issues must be logged and reported to the building supervisor for rectification.

High Visibility Clothing

All persons moving or working within the loading dock are required at all times to wear a high-visibility jacket in order to minimise risks associated with plant and/or vehicle movements.

This clothing can be in the form of high-visibility vests and must meet the requirements of AS/NZS 4602.1. Specifically, it is the *Tenant's* responsibility to ensure that high-visibility clothing is worn at all times within the loading dock.

With one exception, the above requirements must be observed by the *Tenant's* staff, contractors and service personnel. Entries by the general public, whether by vehicle or foot are exempt.

Six (6) high visibility jackets, conforming to Australian and New Zealand Standards, must be situated in a convenient location within the loading dock storage areas for use by any *Tenant* or delegated staff.

Smoking Zones

Smoking is only to be permitted within any designated smoking areas and not within 4m of the loading zone or any materials being handled.

Work place safety is not only crutial ensuring the health of persons utilising the warehouse facility but equally important to the economic viability of operations.

For further information and guidelines regarding Risk Management and Codes of Practice please reference the following…

safe work australia

Safe Work Australia Contact Information
Phone 1300 551 832 | **Email** info@swa.gov.au | **Web** www.swa.gov.au

NSW GOVERNMENT | WorkCover   WORKCOVER NSW   www.workcover.nsw.gov.au

8 SUSTAINABLE TRAVEL PLAN

This report outlines the initiatives to be purported and implemented for the Victoria Street East development. A number of regulatory requirements apply to the project, which is proposed to comprise a mixture of high density residential, retail / commercial pockets and leisure space.

The project team seeks to exceed these requirements and provide best practice sustainability outcomes in not only community patterns but also design, construction and operation.

This residential travel plan identifies and outlines the initiatives to be undertaken for the Victoria Street East development.

The Victoria Street East site is subject to regulatory requirements for sustainability, which include *BASIX* and the *National Construction Code* (NCC) Section J for Energy Efficiency, which has a slight significance in the design of the residential infrastructure impacting on the accessibility of features within the travel plan.

Beyond these regulatory demands, the proponent seeks to exceed the minimum requirements, with respect to community parking and bicycle provisions to deliver best practice sustainable outcomes to effectively reduce greenhouse gas emissions through diminished dependence upon private vehicle usage.

The Victoria Street East development is rich in alternative travel modes from public transport to walking and cycling. Both commuter and recreational trips can be adequately accommodated within the current local transport network while proposed provisions for car share will allow an opportunity to reduce the dependence on the private vehicle.

Objectives

The following travel plan objectives form the basis of evaluation and decision making by The proponent…

- → *Reduction of greenhouse gas emissions through the diminished dependence on private vehicle usage,*
- → *Clear definition of alternative travel possibilities and opportunities incorporated within the development's design,*
- → *Reduced dependence on private vehicle usage by facilitating residents with alternative travel mode choices, such as, public transport, cycling, walking and commercial car sharing practice,*
- → *Preparation and production of a Residential Guide outlining all aspects of the precinct travel plan for distribution to visitors, staff and residents, and*
- → *Dynamic monitoring, updating and advertising of travel opportunities outlined in the Residential Guide.*

Evaluation

The sustainable travel initiatives, outlined in this plan have been evaluated in accordance with the following principles…

- → *Future-proofing and adaptability – Ensure the design principles incorporate the flexibility to enable adaption to future technology as they pertain to travel opportunities,*
- → *Operational Certainty – Ensure the operational performance of travel modes are sustainable over the long-term,*
- → *Design Quality – Optimisation of residential and community movements to ensure accessibility to travel modes during all circumstances, including emergency procedures,*
- → *Visible/communicable Access Points - Provide iconic and visual, electronic and access aids, within the development design, that engage and direct visitors, staff and residents to all transport opportunities,*
- → *Cost-benefit – Emphasise a 'value for money' approach to recommending and implementing accessibility and travel initiatives, and*
- → *Contribution – proposed initiatives will be considered and investigated in the context of engaging visitors, staff and residents as to their specific needs and requirements.*

Minimum Requirements

While the following regulations do not implicitly apply to the implementation of a Travel Plan for the residential development, a number of aspects do impact on accessibility and the movement of visitors, staff and residents within the development complex.

Specifically, the building access conditions to car parking and bicycle provisions and pedestrian open space corridors must satisfy the minimum ESD requirements as they apply to the site…

- → *Building and Sustainability Index (BASIX), and*
- → *Building Construction Code Section J for Energy Efficiency.*

Residential developments in NSW must now reduce their energy and water use, according to BASIX requirements developed by the Department of Planning. The objectives of the BASIX scheme are relative to the scope and size of developments in NSW…

- → *40% reduction in water consumption, and*
- → *20% reduction in greenhouse gas emissions for 5 stories and over.*

A dedicated car washing bay is proposed within the confines of the underground car park, on site. The initiative proposed would see the recycling of waste grey water for storage and reuse in the car washing bay within the basement car park.

The use of CO^2 monitors, within the underground car parks, should not only provide visual and audible warning of harmful emission levels but also provide a means by which to monitor and report the effectiveness of travel mode initiatives pertaining to any significant reduction in the dependence of private vehicle usage.

Access to the underground car parking and bicycle provisions is of concern during times of power failure. Access must be maintained to the car parks during these periods by means of a fail safe operation which will default to a '*rest open*' of select the main gates should power be cut off to the controller.

Targets

The proposed targets of the travel plan are considered achievable, measurable and ongoing to allow a marked reduction on the dependence on private vehicle usage and a reduction in greenhouse gas emissions.

The private motor vehicle remains the dominant mode of transport embraced by the wider Sydney community. However, the *BTS* reports the town centre exhibits a significant public transport share, with a higher than metropolitan average of 56% of JTW trips attributed to the available train and bus modes.

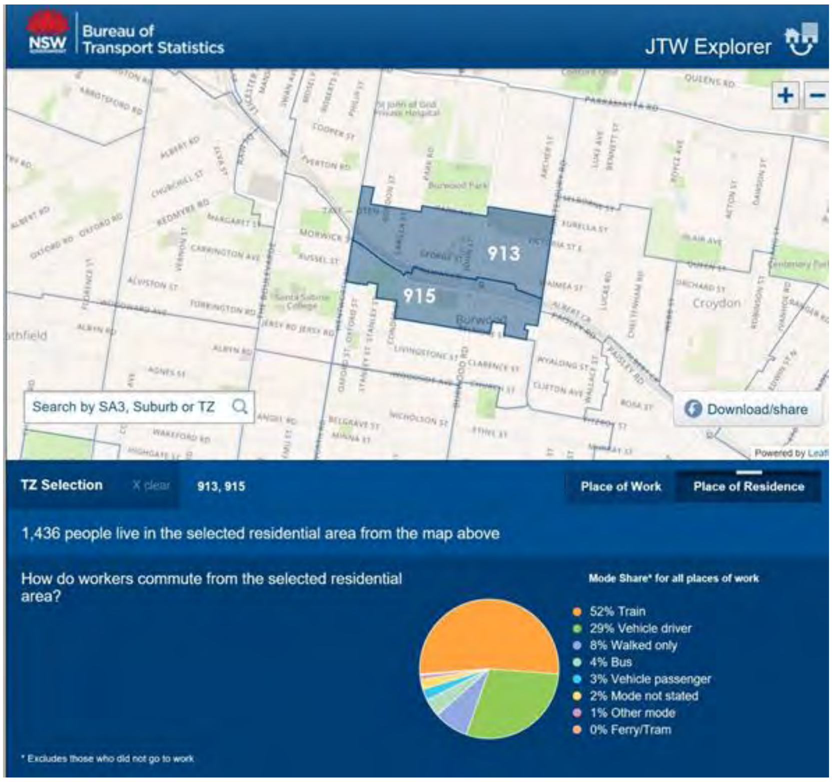


Figure 47 Burwood Town Centre JTW Mode Share

Source BTS, 2017

It is anticipated that, through the employment of the travel plan, the following targets will be achievable by 2026.

Actions

Time Period to 2019 - 2021	Reduction	**Actions…**
Commuter Peaks	7%	→ *Provision of a modestly charged Opal Card per residence* → *Education of trip planning via Transportnsw.info* → *Effective communication of alternative public transport modes to prominent work place destinations.* → *Reinforcement of transport alternatives by the Corporate Executive* → *Reinforcement of Car Pooling opportunities by the Corporate Executive.* → *Self promotion by Car Share groups/Corporate Executive.*
Recreational Peaks	2%	→ *Effective communication of alternative public transport modes to identified local recreational destinations.* → *Reinforcement of transport alternatives through residential advertising by the Corporate Executive.* → *Self promotion by Car Share groups/Corporate Executive.*
Time Period to 2021 - 2026	Reduction	**Actions…**
Commuter Peaks	3%	→ *Reinforcement of transport alternatives through residential advertising by the Corporate Executive* → *Not specific to the plan, public transport improvements, increased rolling stock and service frequency*
Recreational Peaks	3%	→ *Promotion of transport alternatives* → *Changes to recreational activities within the region* → *While not specific to the plan, public transport improvements, increased rolling stock and service frequency will assist in attaining the specified target*

Table 11 Travel Plan Targets to 2026

Source Road Delay Solutions, 2019

Private Motor Vehicle and Infrastructure

The private motor vehicle is still the dominant mode of transport embraced by the wider Sydney community. The ever increasing use of the private motor vehicle for both journey to work trips and recreational activities, places significant pressure on the road network infrastructure, the environment, health and local amenity, with road authorities compelled to sustain a perceived and expected satisfactory level of service.

The need for improved infrastructure has been assessed in this report and it is believed that the proposed development level does not warrant any works at this time.

Parking

A detailed parking study has been undertaken for the development site and details the allocation of 317 secure parking spaces.

Credit Card

The credit card provides an easy, convenient and fast way of travelling on the Sydney public transport network, the Blue Mountains, Central Coast, Hunter, Illawarra and Southern Highlands.

The act of swiping a credit card, in lieu of using an Opal card, will enable patrons to pay for their travel on ferries, trains, buses and light rail prior to undertaking their journey.

Simply tap a credit card onto a card reader at the start of their trip and tap off at the end. The electronic ticketing system will automatically calculate the fare and deduct it from the value stored on the creditl card.

No more queuing for tickets and only pay for the distance travelled.

Train

Train services are available from the Burwood Railway Station to the City at some 10 minute intervals during the commuter peaks and 20 minutes during the off peak with an average trip time to Central Station taking only 12 minutes.

Burwood Railway Station is located on Burwood Road, near the intersection with Railway Parade, and provides significant facilities for patrons.

Residents will receive a one (1) page information leaflet within their '*Welcome Pack*' detailing the web site www.Transportnsw.info to assist in planning their journey information, be it for work or recreation.

Getting around the station		Accessibility	
Stairs	✓	Hearing loop	✓
Escalator	✗	Platform tactile tiles	✓
Lift	✓	Portable boarding ramp	✓
Ramp (1:8 gradient)	✓	Wheelchair accessible toilet	✓
Level crossing	✗	Wheelchair accessible payphone	✓
		Wheelchair accessible carspace/s	✗

General facilities		Transport interchanges	
Ticket vending machine	✓	Bus stop close by	✓
Eftpos	✓	Ferry wharf close by	✓
Toilet	✓	Taxi rank close by	✓
Payphone	✓	Bike racks or bike lockers	✓
Passenger display screens	✓	Kiss and ride	✓
Help point	✓	Car park close by	✓

Table 12 Burwood Railway Station Facilities

Source www.Transportnsw.info, 2018

Figure 48 *Sydney Train Network*

Source *www.Transportnsw.info, 2018*

Bus

Sydney Buses and Westbus provide frequent services through and surrounding the Meadowbank Precinct.

It has been observed that bus services on Victoria Street East have spare capacity,

Walking

Walking is considered a valid transport mode, particularly in consideration of multi modal JTW trips. The development's close proximity to public transport provisions and pedestrian corridors juxtaposed with the medium to high density residential land use. The primary impact on road based transport movements from such pedestrian activity is generally concentrated at crossing points.

Bicycle

Results from the Sydney Cycling Survey, undertaken in November 2013, show that the cycling mode share for trips, up to ten kilometres, is currently 2%. The BTS conducts this survey annually to track performance against the NSW target which aims for a doubling of the cycling share by 2016.

Bicycle parking facilities will be provided at the rate of one (1) bicycle space per three (3) residential apartments.

Clearly signposted, secure bicycle facilities with good access and path networks will encourage residents and visitors to cycle, improving health and reducing inherent greenhouse gas emissions from private and public transport usage.

The proponent will suggest, to the body corporate, to conduct periodic resident bike riding functions on a weekend culminating in a picnic or barbeque at the local park and/or foreshore to encourage people who might be reluctant to ride.

Such activities may encourage the use of bicycles, as a mode of transport, with familiarity of the provisions and corridors within the precinct.

Carpooling

Carpooling is when two or more people make arrangements to travel together in a single motor vehicle. Carpooling is a practical way to reduce the burden of transport costs, reduce traffic congestion and reduce the impact of vehicle emissions.

Residents may register with an accredited carpooling business or simply ask, through the body corporate, if there is any like minded residents who wish to reduce transport costs and would like 'company' on a work or recreational trip.

Future Proofing

Technologically, future proofing is generally thought of as committing to open and flexible technologies which may come and go. How can we be sure a commitment to one technology will not be by-passed for another? The answer is simple. We cannot. Awareness is the single most beneficial trigger in the acceptance of future technologies.

One such example of burgeoning technology in transport is fuel source. Electrical energy is an abundant power resource, providing the potential to return zero emissions from motor vehicle activity. Total or even partial dedication to the use of electrical charging systems should be considered during the design and construction stages of the Victoria Street East Development. Solar panels on the upper roof areas connected via cables to a battery room and outlet points within the basement car parks is one consideration.

This measure is considered pro active and specifics need not be detailed as no actual demand exists at this time.

However, the use of garbage rooms along with the location of proposed conduits and cabling ducts provides a base from which a level of future proofing may be achieved.

Actions and Monitoring by the Body Corporate or Executive

It will fall upon the Body Corporate or Corporate Executive to assist in the periodic promotion and monitoring of specific aspects relating to the travel plan for the Victoria Street east development.

These activities will be undertaken as needs arise and during the Annual General Meeting(s) (AGM), to persuade mode choice preference and deter perceived or identified deficiencies in driver behaviour at the site. The activities will take the form of providing…

- *Reference to the Travel Leaflet within the 'Welcome Pack' and inclusion of the leaflet within the minutes of the meeting,*
- *Details of the available public transport choices and their location,*
- *A brief outline of the benefits derived from mode choice,*
- *The potential benefits of Car Pooling for both JTW and recreational activites, such as football, netball, etc…,*
- *Car sharing, reference to know Car Share organisations and the provisions made on site for the use of Car Share, and*
- *The reporting of any deficiencies in the use of the car parking provisions and/or driver behaviour in and around the site.*

It will be set into the Corporate By laws that, bi annually for a period of 6 years, a traffic engineering consultancy be engaged to review and quantify, through surveys, the mode choices being mode by residents and the effectiveness of the travel plan. A report is to be presented to the body corporate and to Council, for consideration and determination, detailing the effectiveness of the set targets and actions within the travel plan and the need for any further revision. The report is to broadly outline…

- *If the current targets are being met,*
- *If the current targets are realistic and practical,*
- *If further time is required to reach the set targets, such as derived from a shortfall in occupancy?,*
- *If the mode choice opportunity has been jeopardised by reductions in public transport service, and*
- *What changes, if any, need to be made to the travel plan.*

The body corporate will be encouraged to raise, at each Annual General Meeting (AGM), the significant opportunity afforded residents to reduce travel costs, improve air quality, reduce stress levels, reduce the incidence of motor vehicle accidents, lower noise levels and inherent safety advantages through the use of the abundant public transport opportunities within the precinct.

The By Laws will entrust the Body Corporate or Executive with the responsibility of monitoring the use of disabled parking, residential parking, visitor parking, the use of Car Share pods, on street parking while informing residents of any contrary use. The obligations of residents will be outlined within the minutes of regular meetings and any affirmative action(s) be taken, as deemed necessary.

9. CONCLUSION

Road Delay Solutions has been engaged by *VSD Developments Pty Ltd* to undertake the preparation of a Traffic Impact Assessment (TIA) in support of the Development Application (DA) for a mixed use development at 28-34 Victoria Street East, Burwood.

Burwood is a dynamic LGA with the town centre constantly growing with planned residential, retail and commercial developments, some well into their construction phases. The Victoria Street East development is one of these.

Mesoscopic and operational modelling has reported that vehicular growth, particularly along Burwood Road is relatively static and any fur ther growth within the Town Centre is shared with the competing parallel routes of Shaftesbury Road and Wentworth Road.

Shaftesbury Road in particular, provides a viable through traffic alternative between the Hume Highway to the south and Great Western Highway to the north, which removes pressure from Burwood Road.

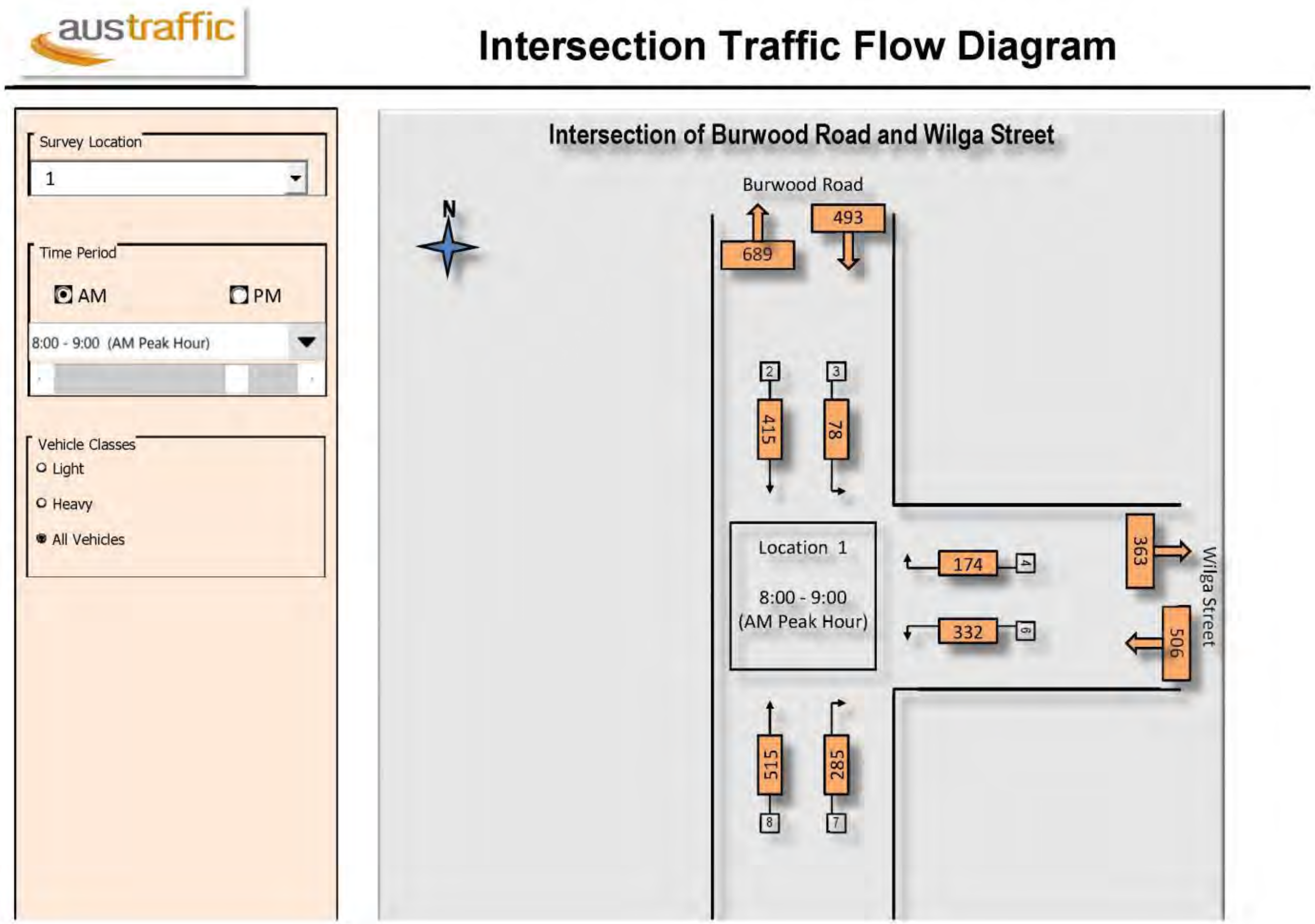
Shaftesbury Road provides the primary access to and from the development and the intersection with Victoria Street East reports a satisfactory Level of Service when modelled in isolation, under the demands of the traffic generation growth.

Shaftesbury Road, when modelled under traffic signal coordination and the S94 infrastructure treatments, reports a retained LoS ‘E’ which corresponds with the current performance level.

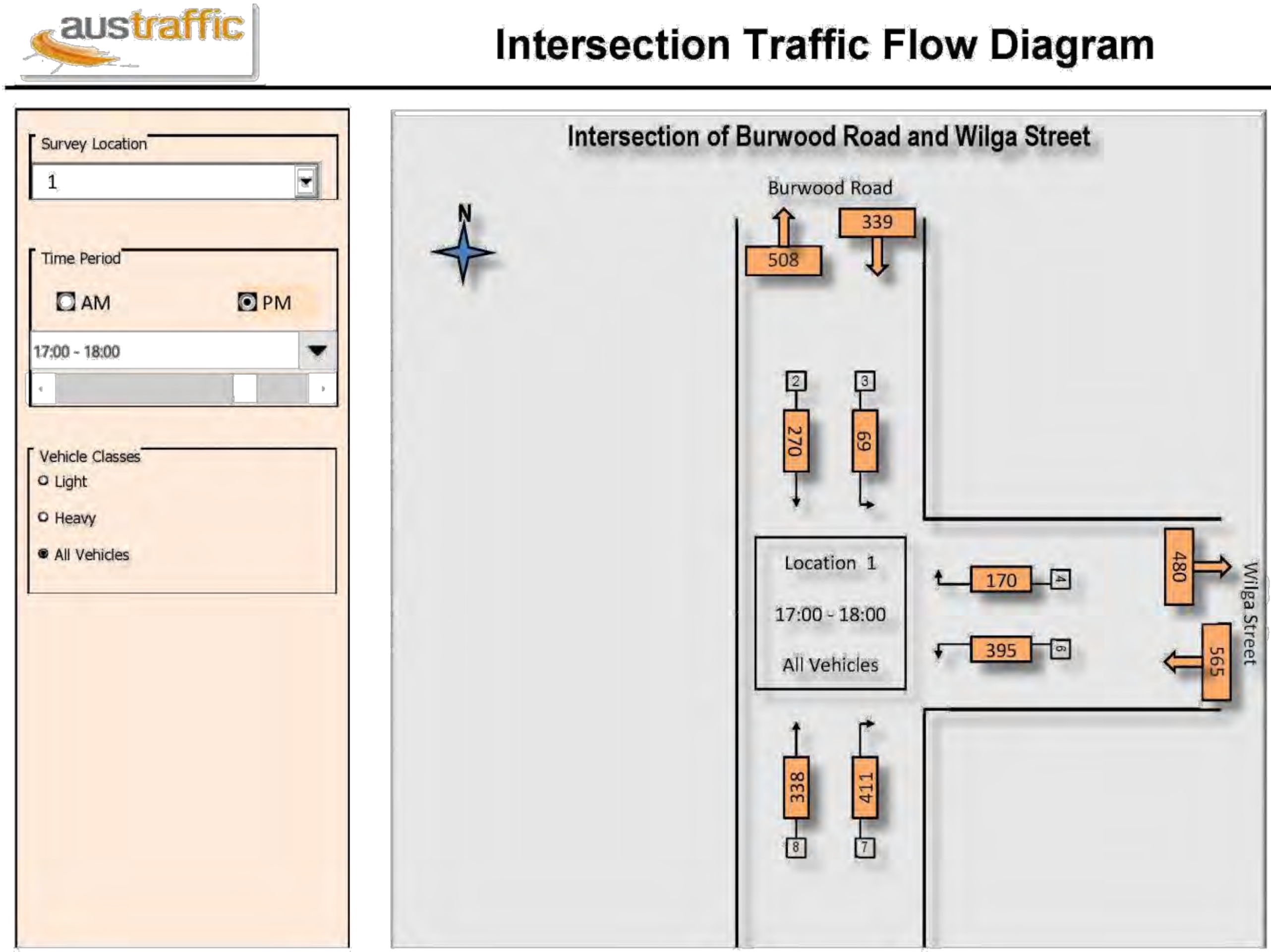
This assessment has concluded that the proposed Victoria Street East development does not instigate the need for any future infrastructure treatments.

APPENDIX A – TRAFFIC COUNT FIELD DATA

(A full copy of the traffic data is available on USB Flash Drive from Road Delay Solutions)


austraffic
Intersection Traffic Flow Diagram
Survey Location
1
Time Period
AM
PM
8:00 - 9:00 (AM Peak Hour)
Vehicle Classes
Light
Heavy
All Vehicles
Intersection of Burwood Road and Wilga Street
Burwood Road
N
689
493
2
3
415
78
Location 1
8:00 - 9:00
(AM Peak Hour)
174
4
332
6
363
506
Wilga Street
515
285
8
7

Intersection Traffic Flow Diagram



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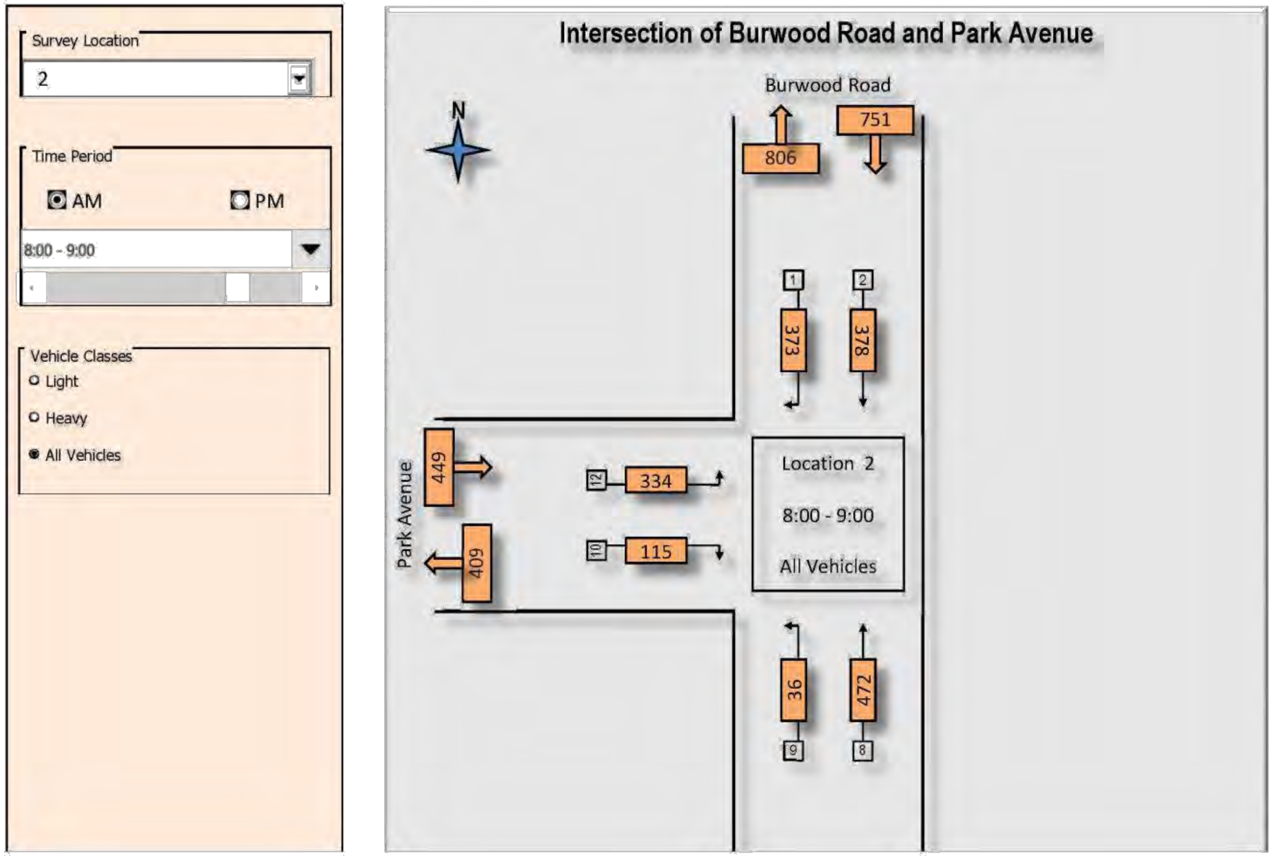

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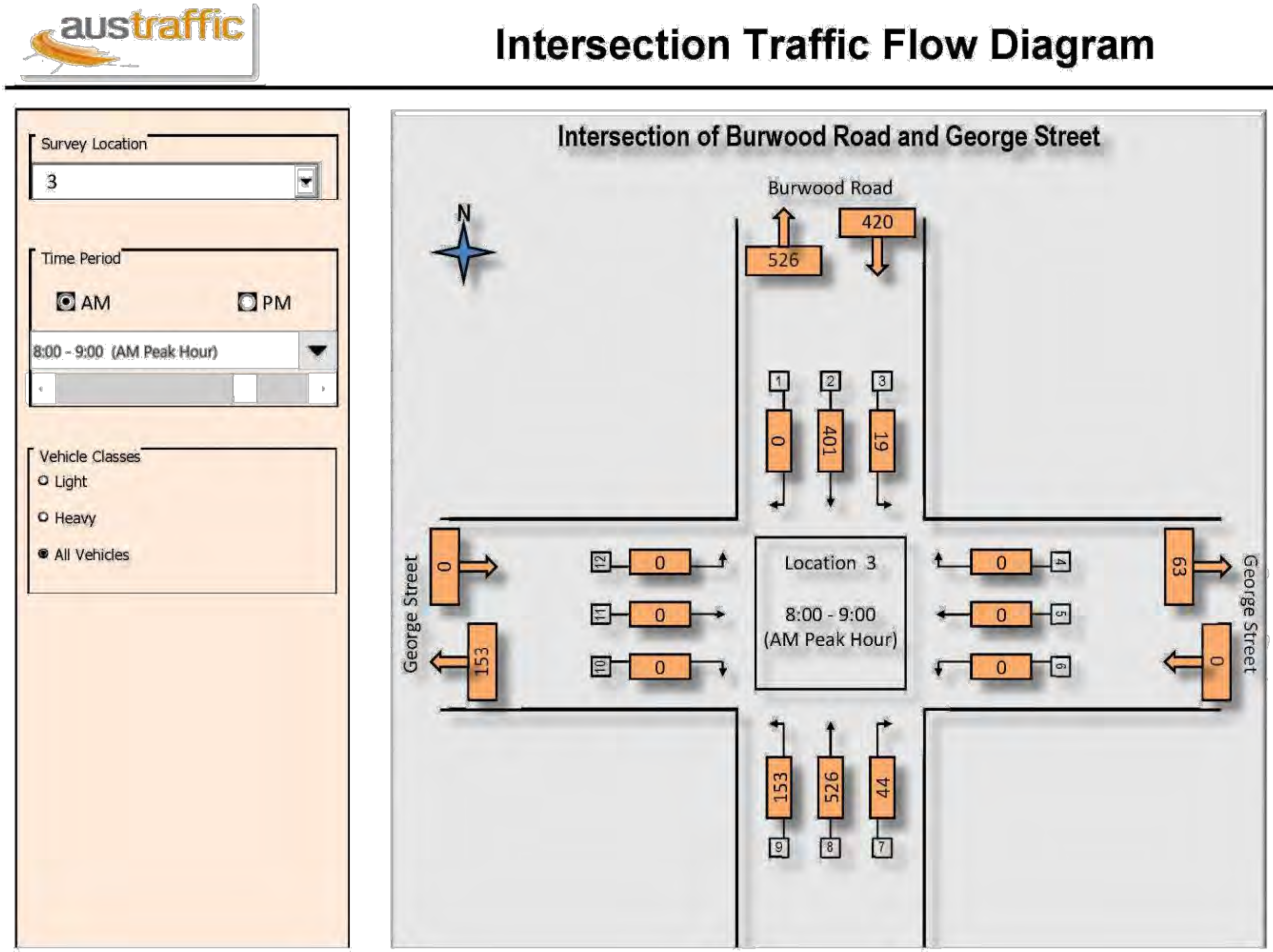

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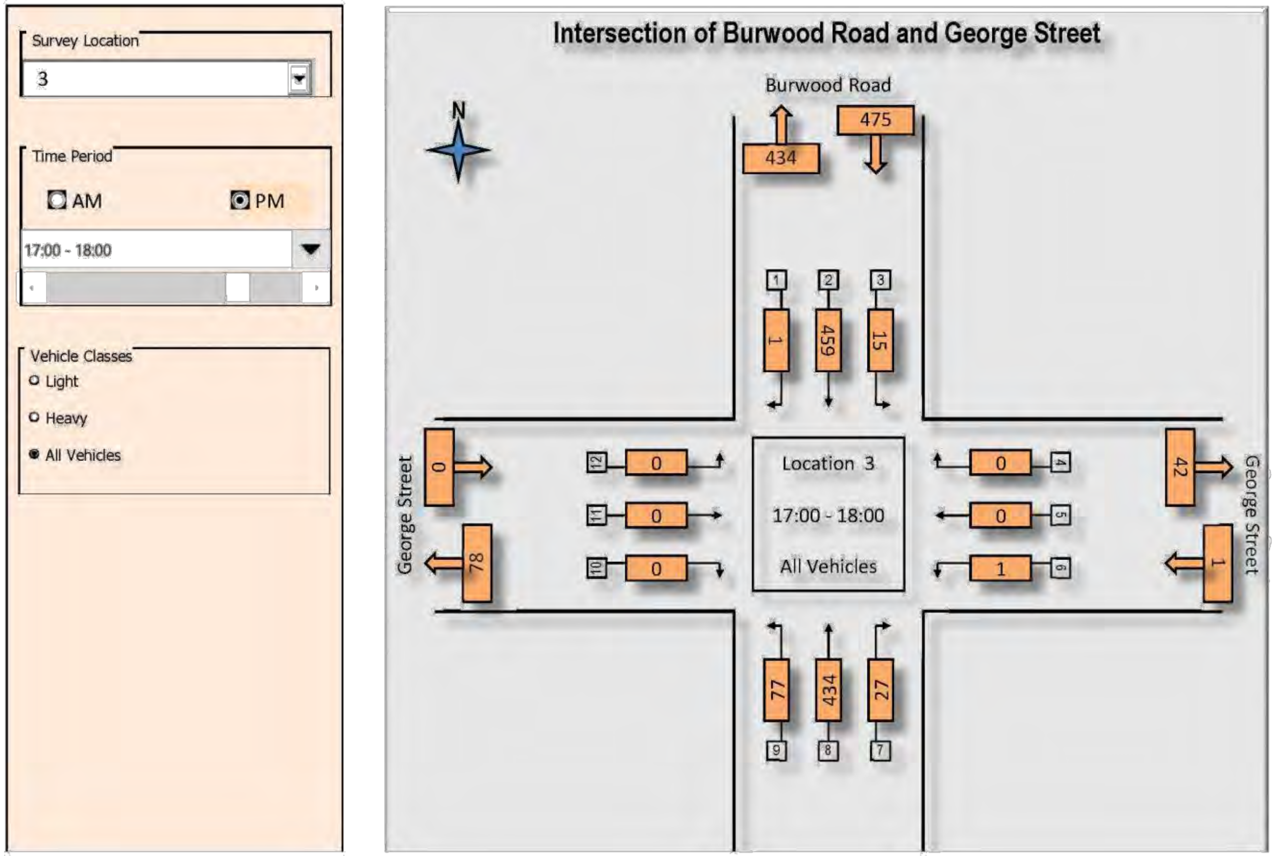

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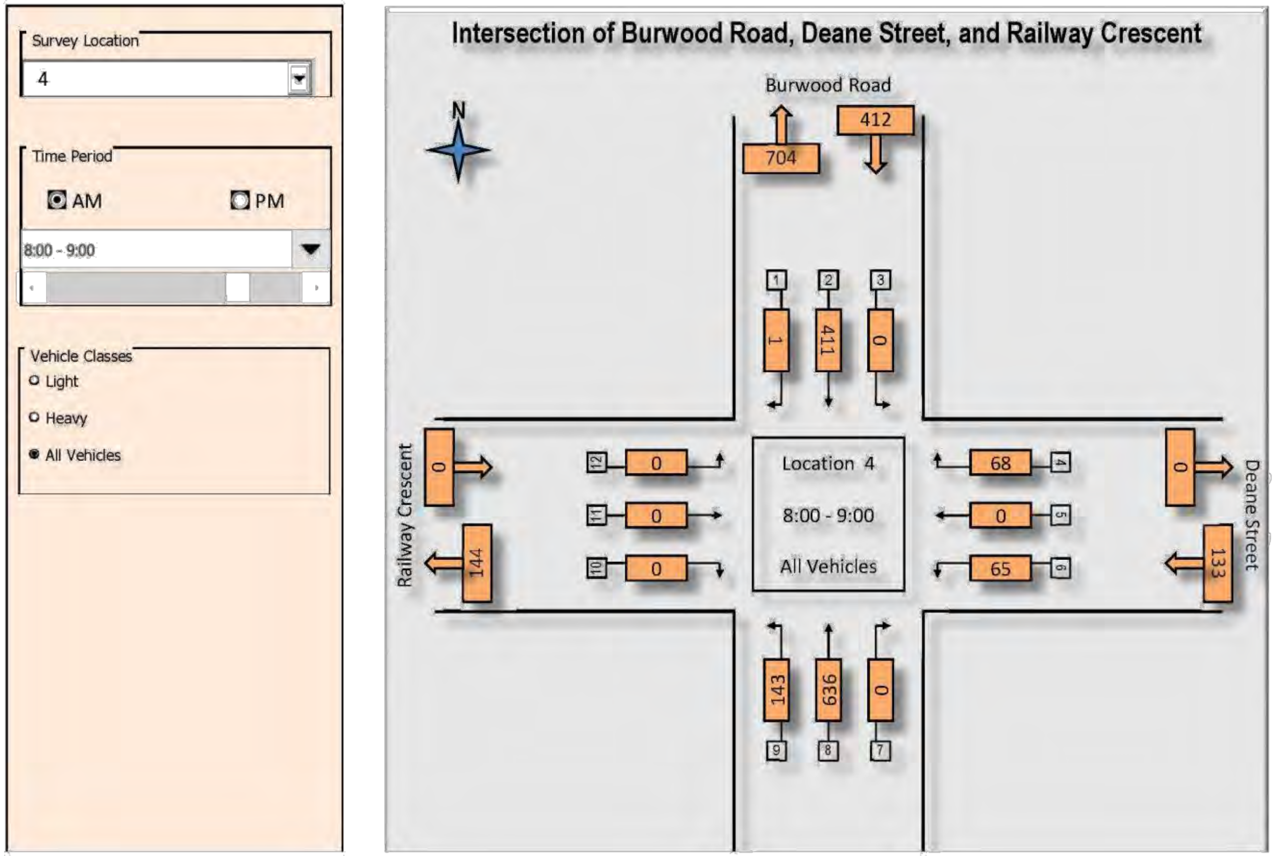

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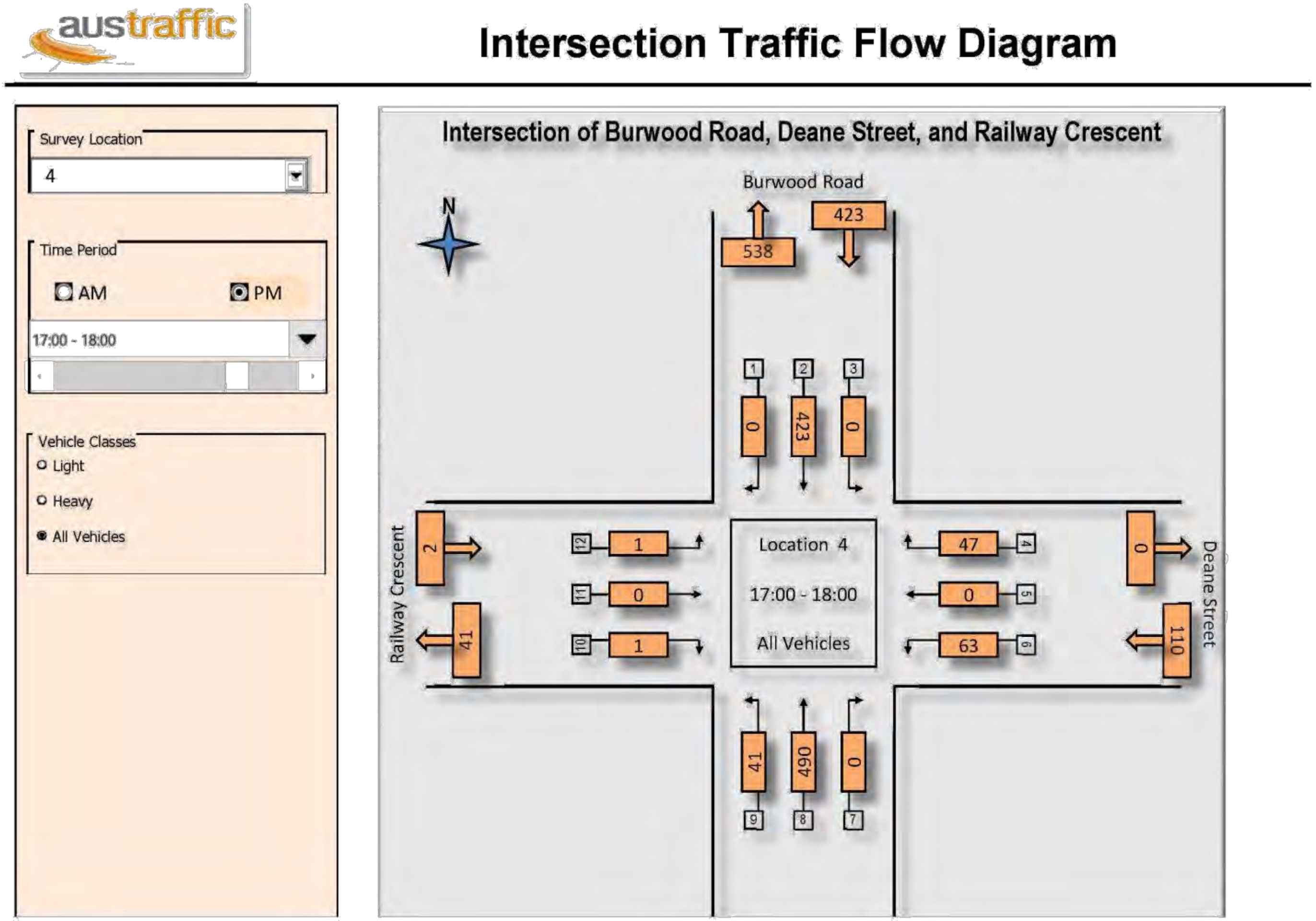
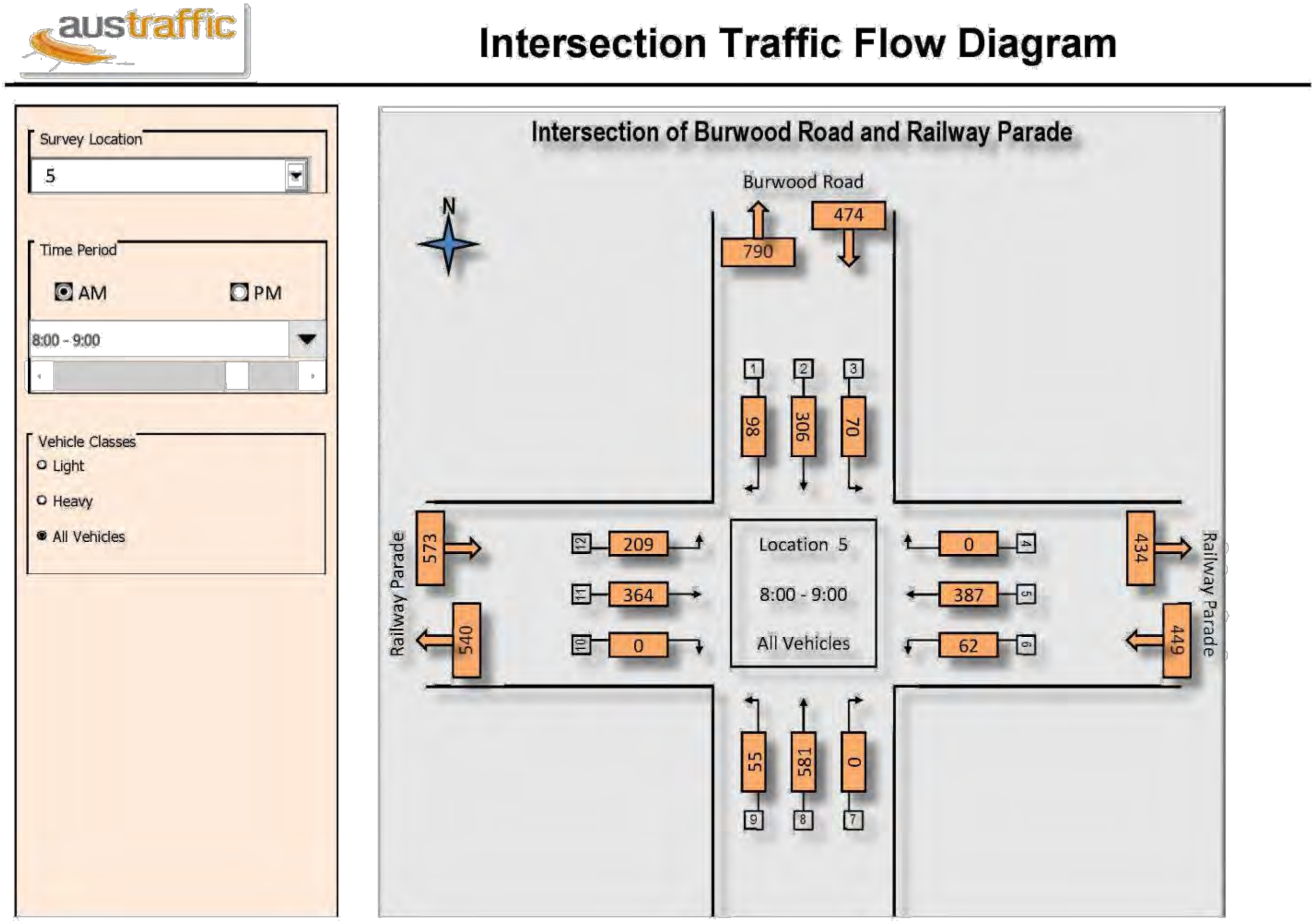
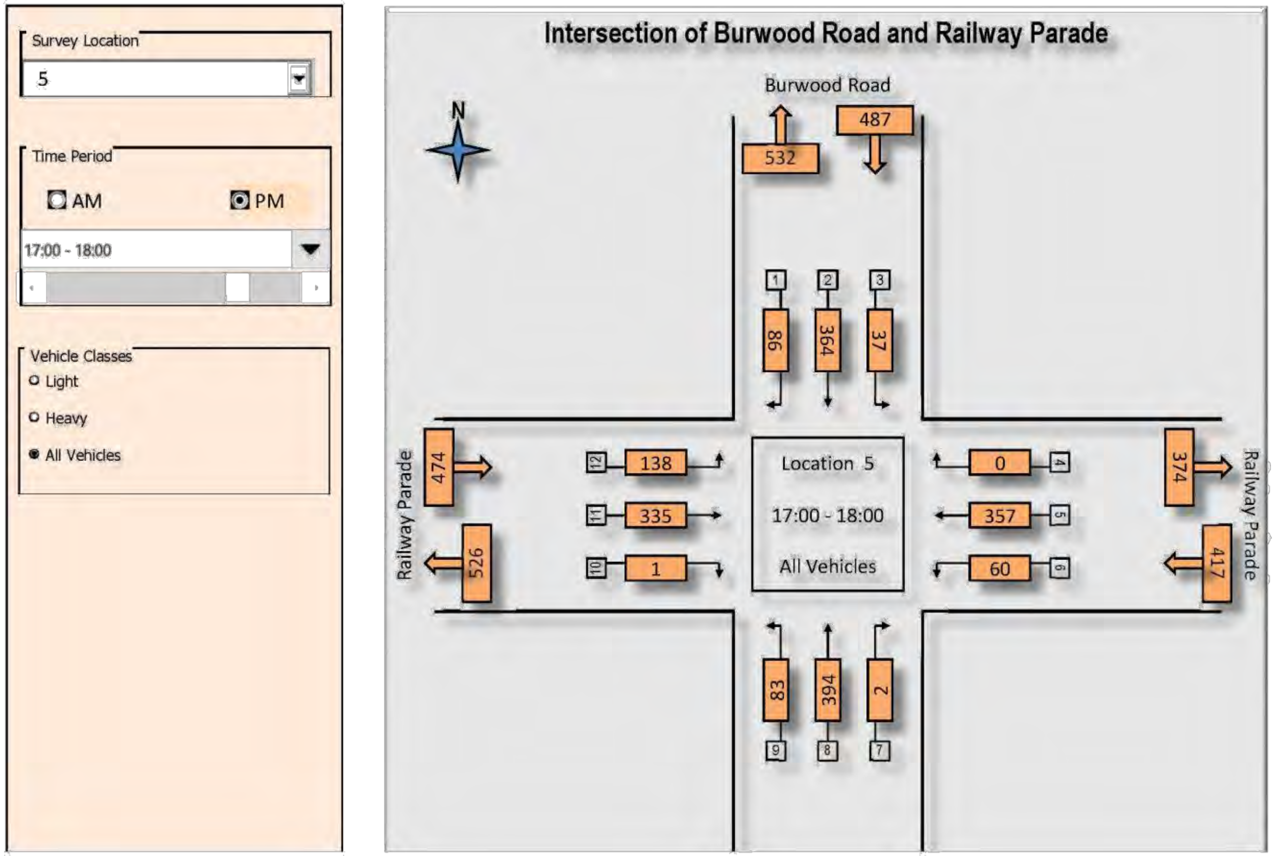



austraffic
Intersection Traffic Flow Diagram
Survey Location
5
Time Period
AM
PM
8:00 - 9:00
Vehicle Classes
Light
Heavy
All Vehicles
Intersection of Burwood Road and Railway Parade
Burwood Road
N
790
474
1
2
3
98
306
70
Railway Parade
573
540
12
11
10
209
364
0
Location 5
8:00 - 9:00
All Vehicles
0
387
62
4
5
6
434
449
Railway Parade
55
581
0
9
8
7

Intersection Traffic Flow Diagram



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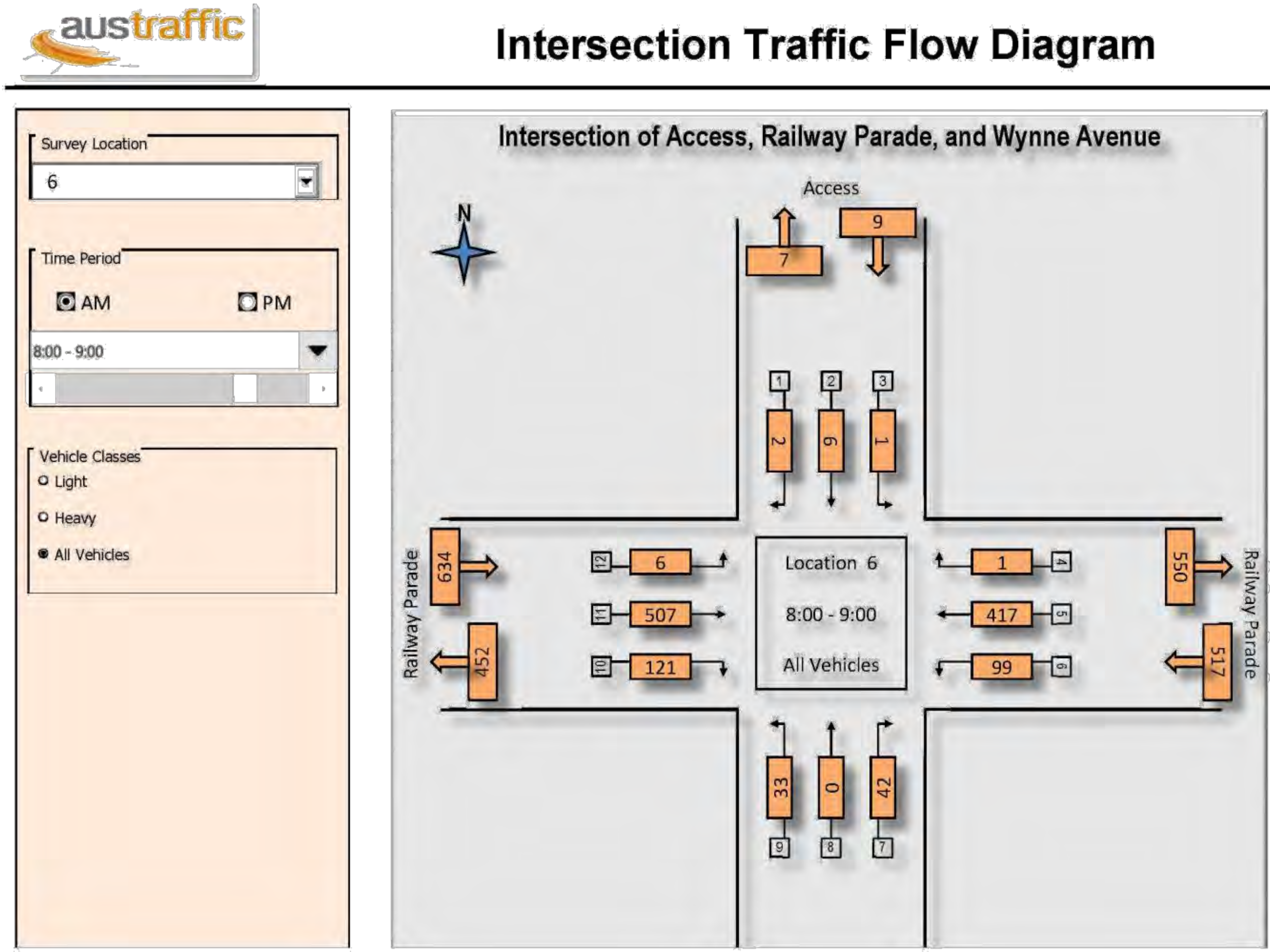

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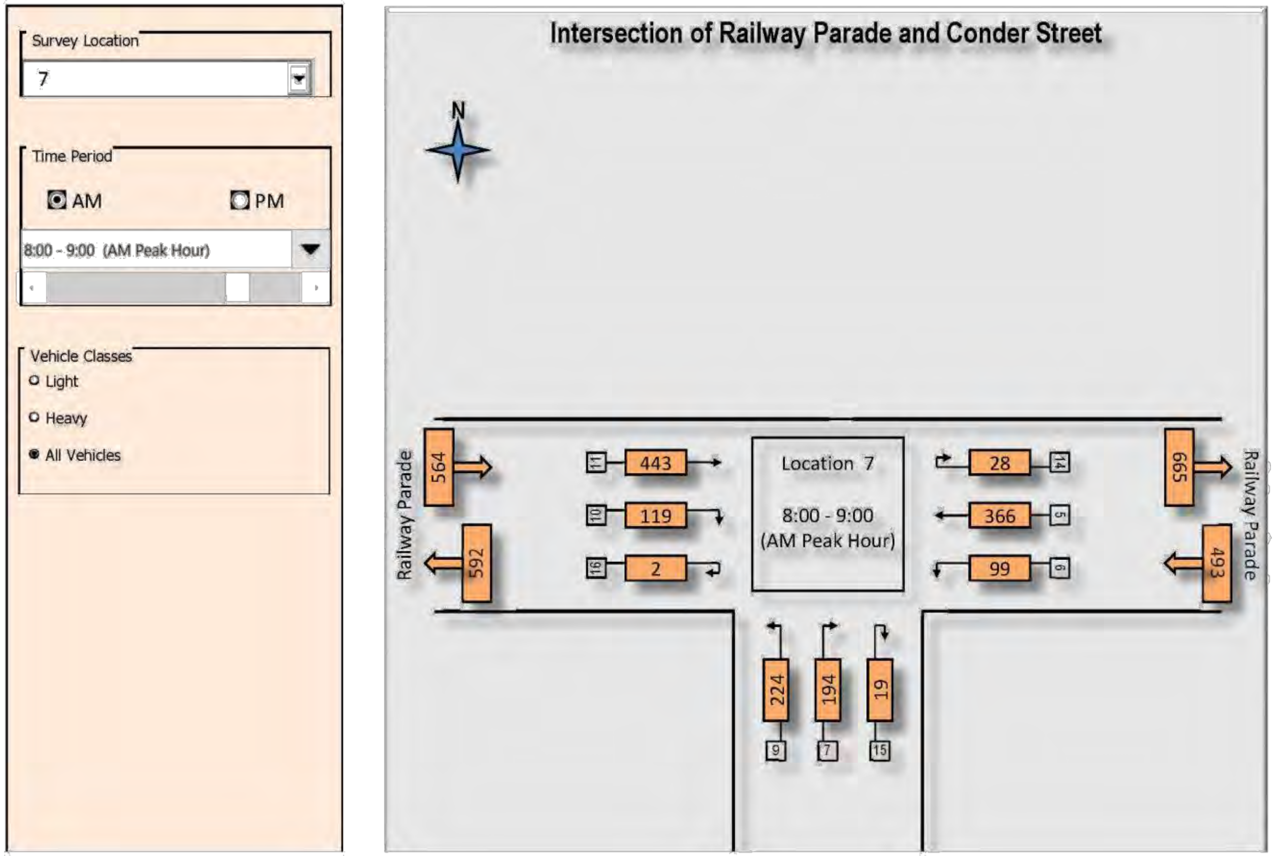
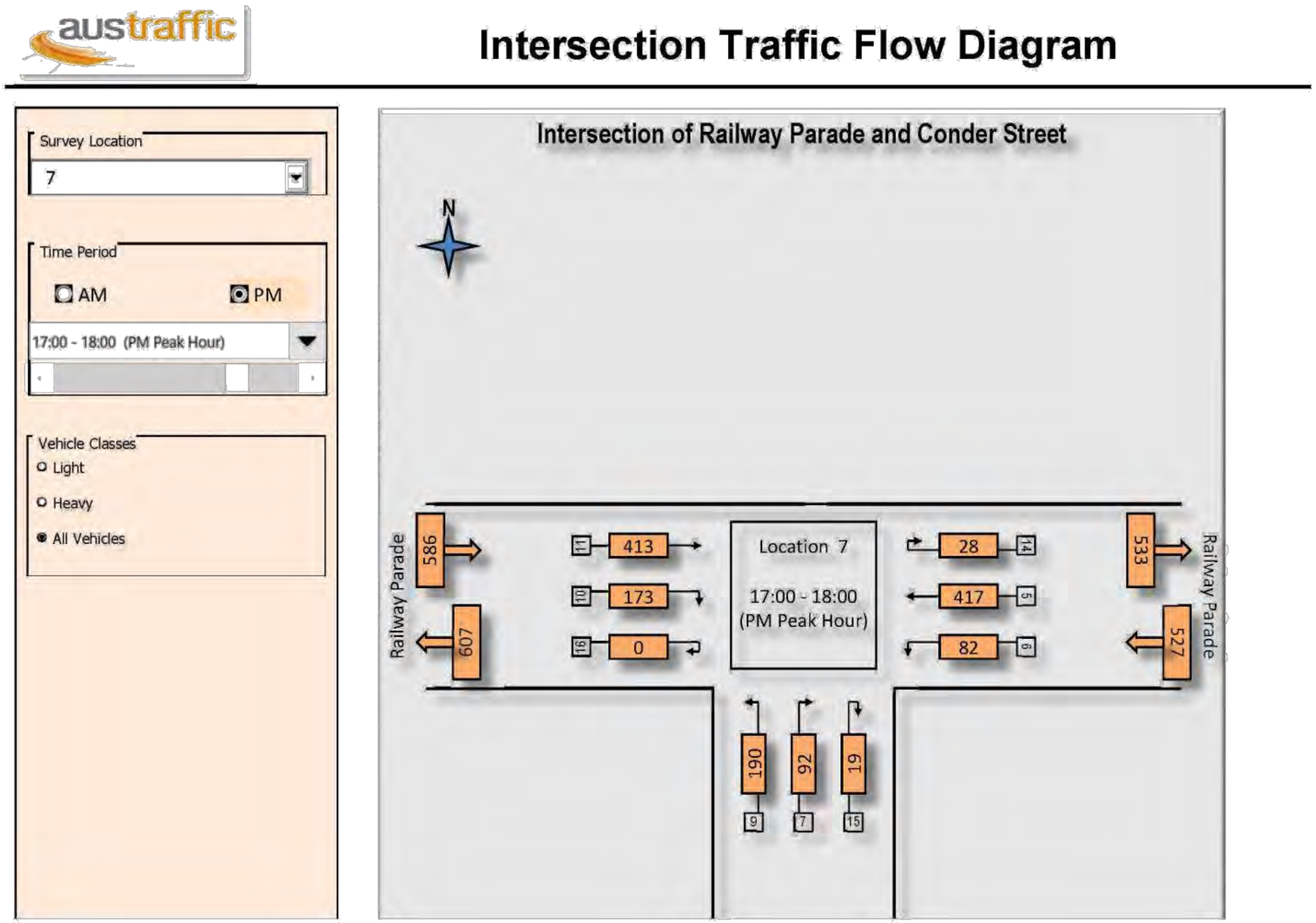
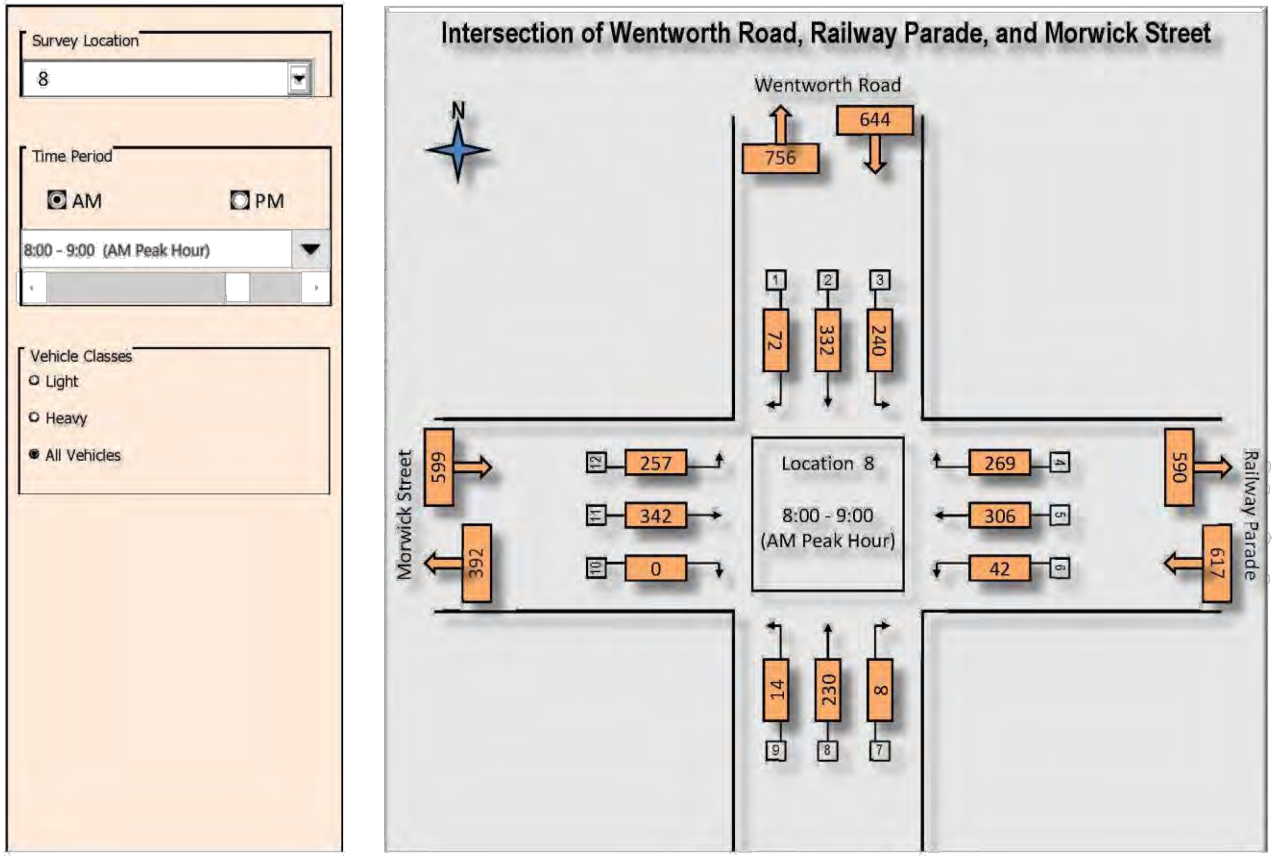



austraffic
Intersection Traffic Flow Diagram
Survey Location
7
Time Period
AM
PM
17:00 - 18:00 (PM Peak Hour)
Vehicle Classes
Light
Heavy
All Vehicles
Intersection of Railway Parade and Conder Street
N
Railway Parade
586
607
413
173
0
Location 7
17:00 - 18:00
(PM Peak Hour)
28
417
82
14
5
6
533
527
Railway Parade
190
92
19
9
7
15

Intersection Traffic Flow Diagram



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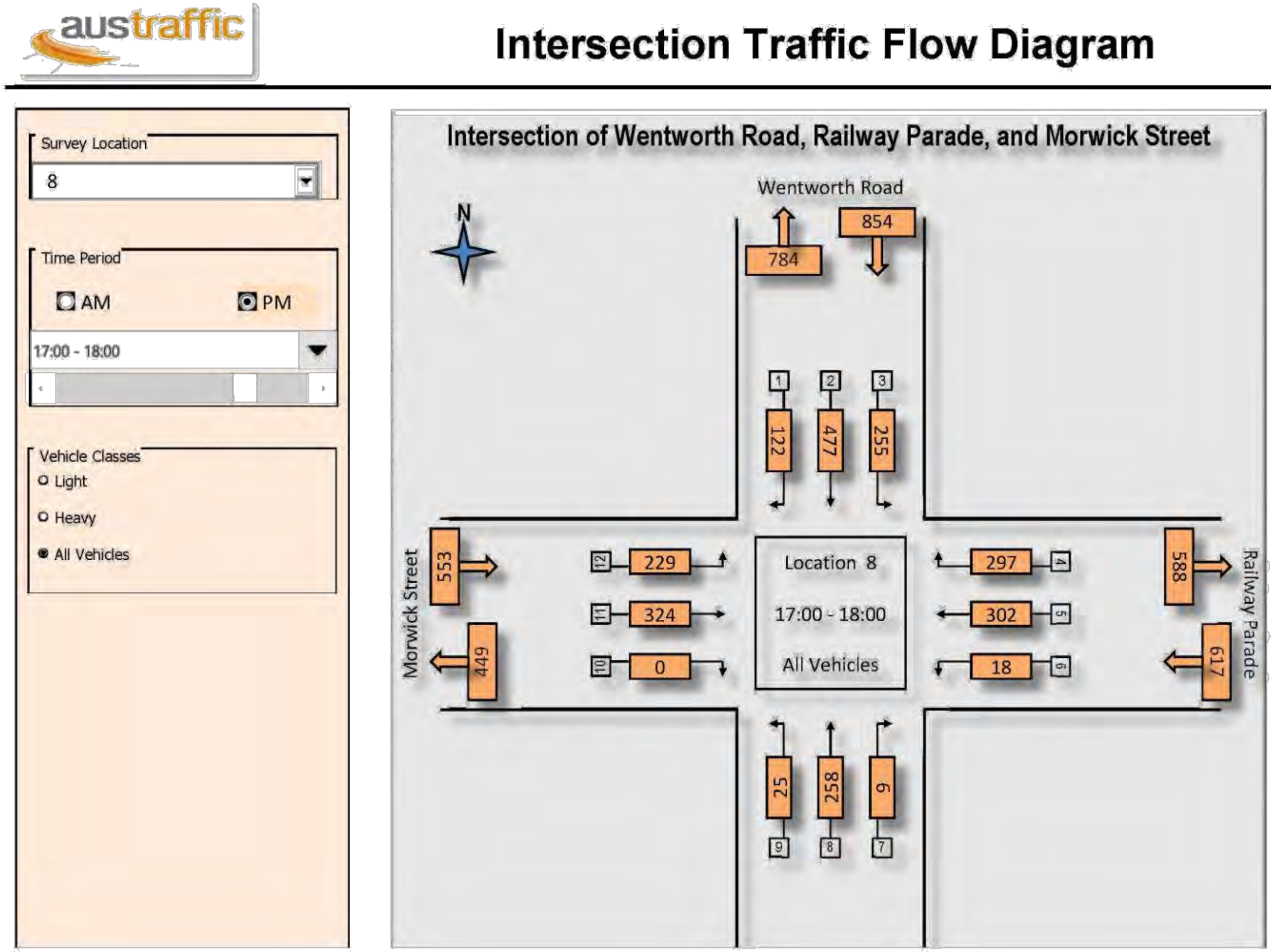

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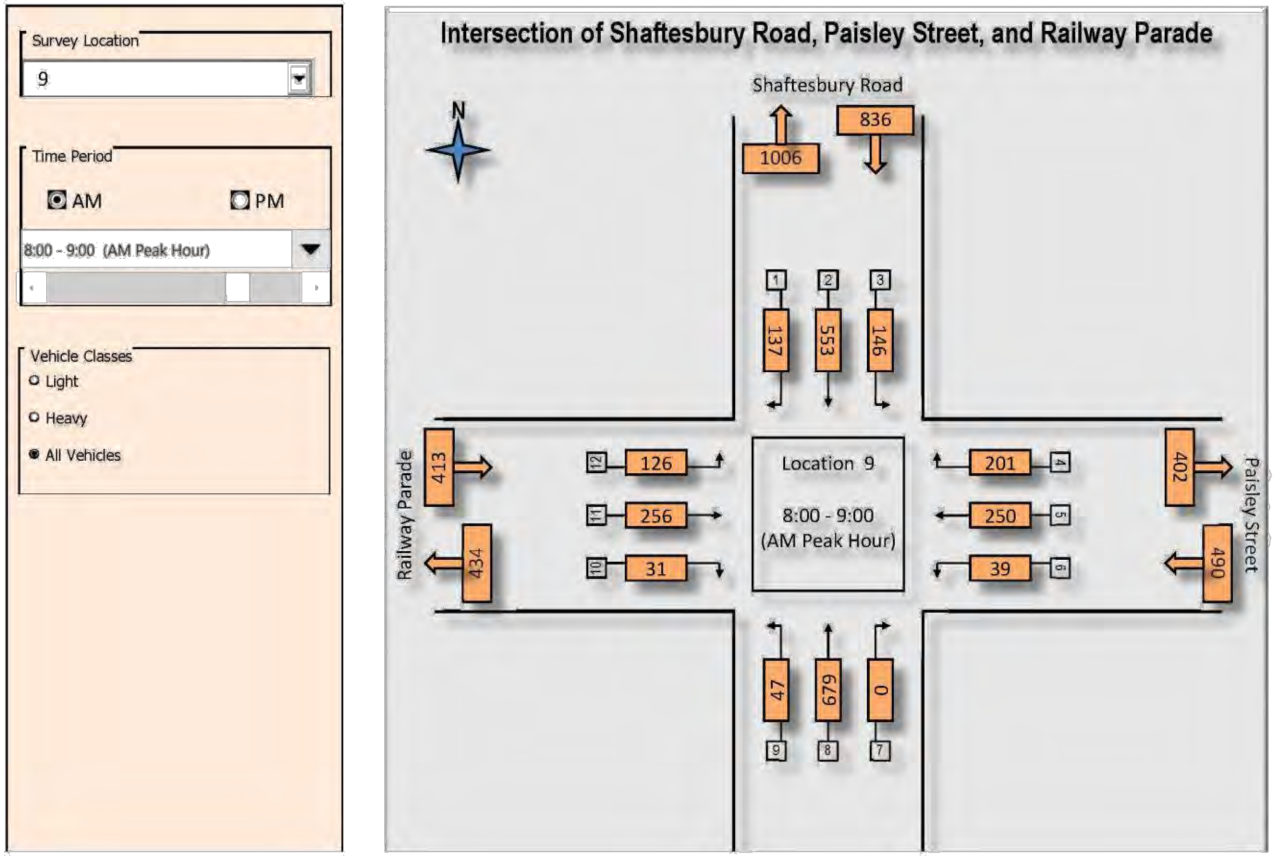

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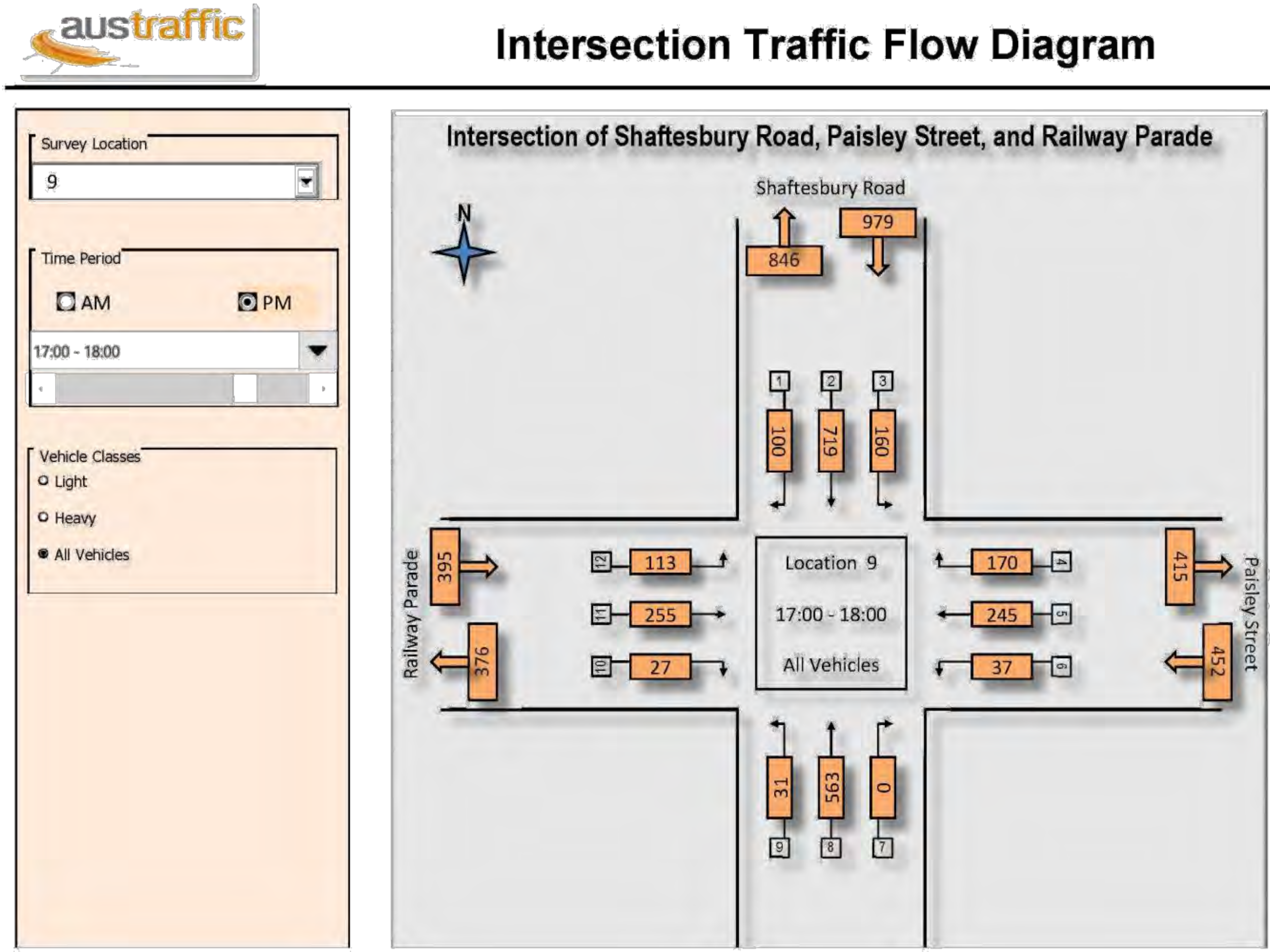

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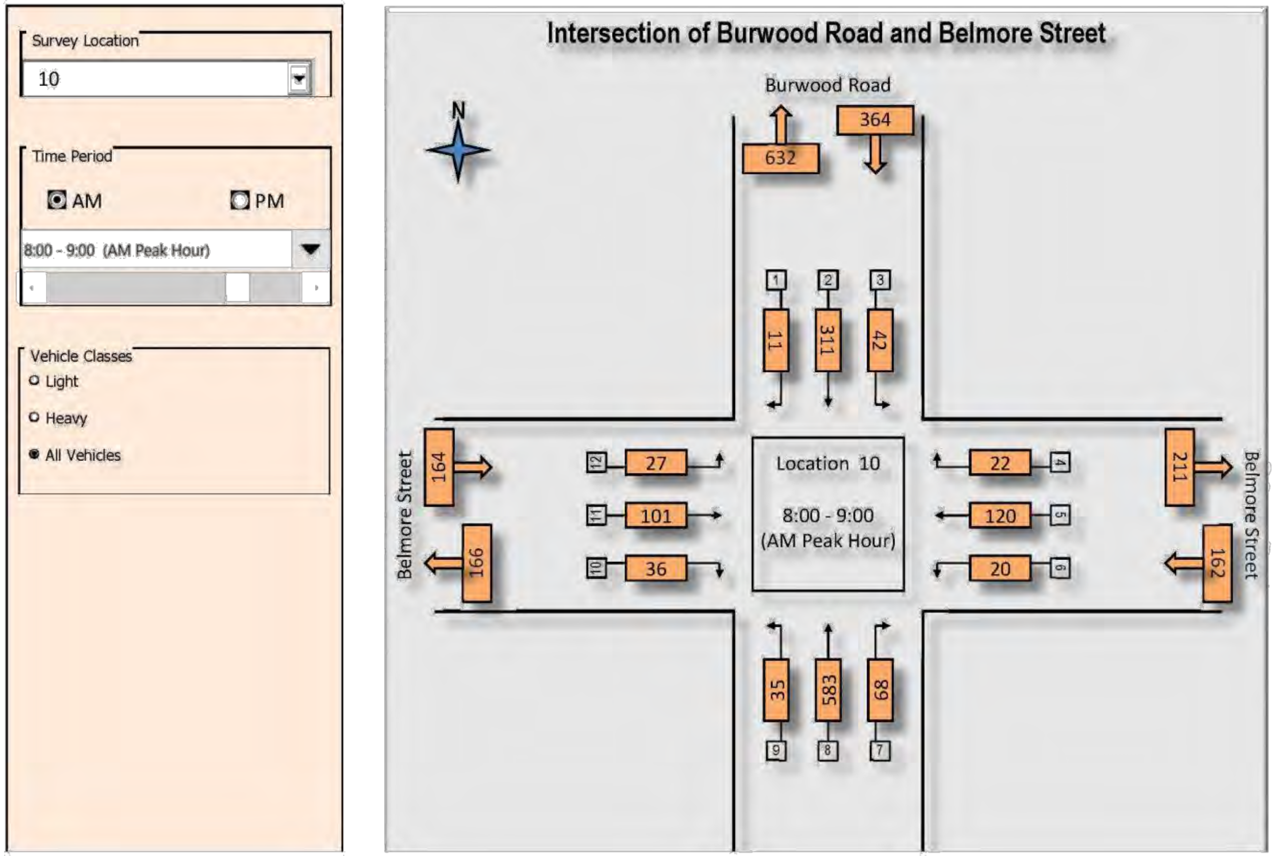

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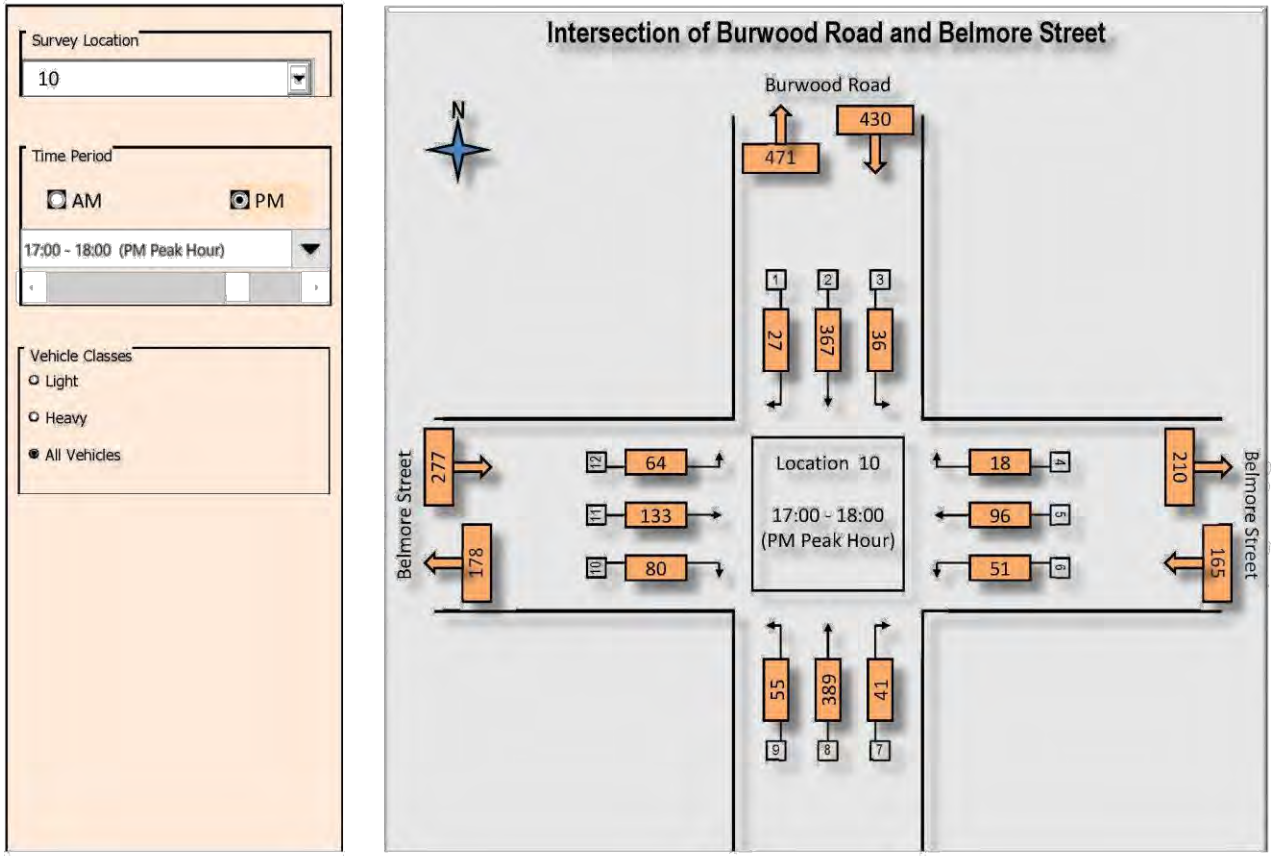

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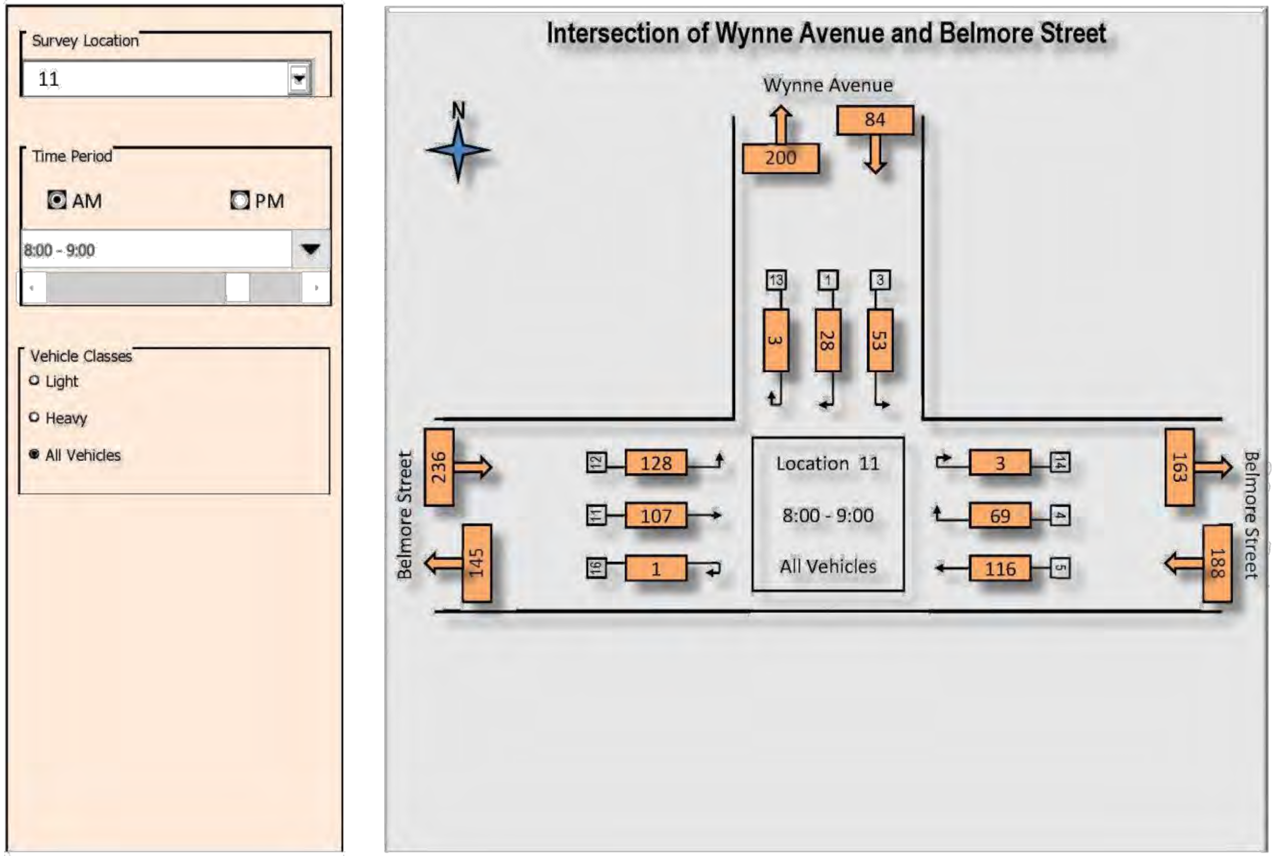

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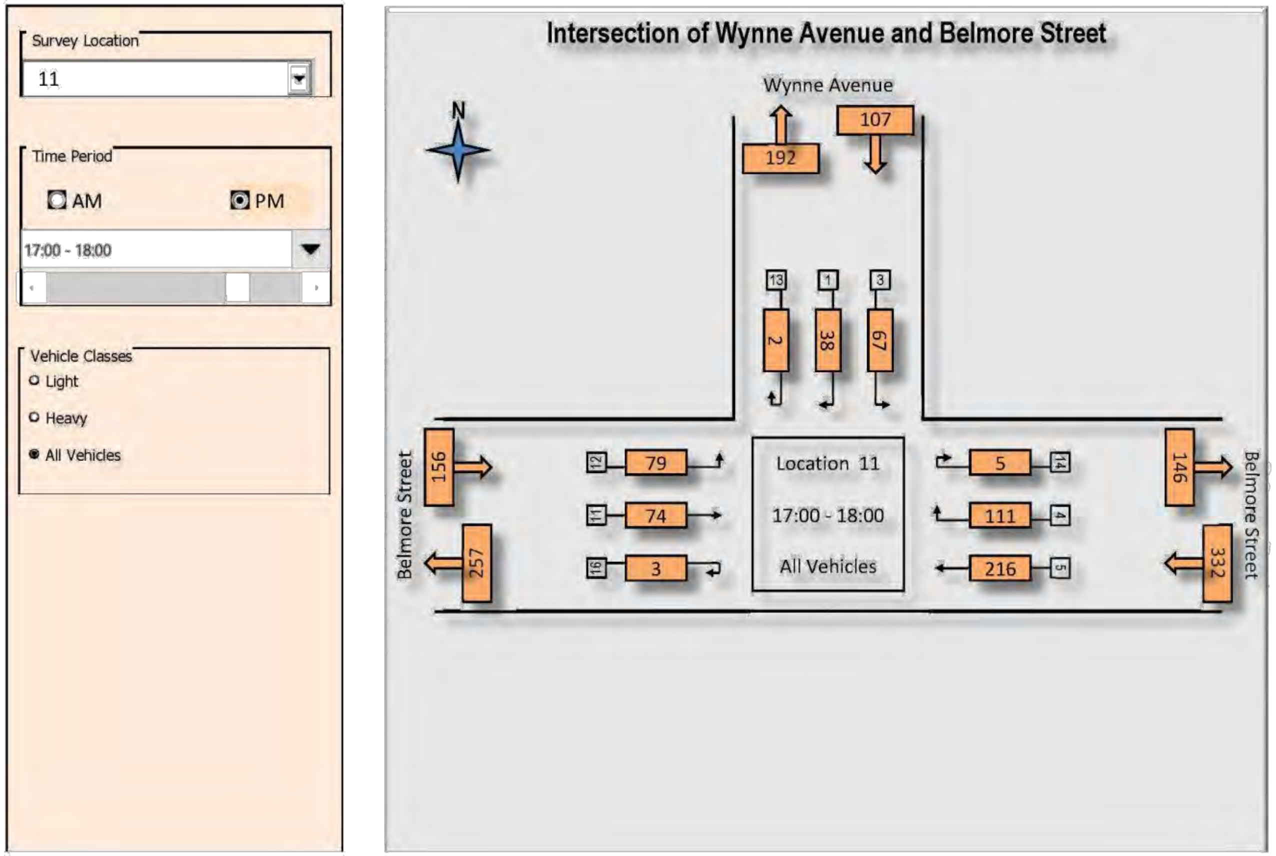

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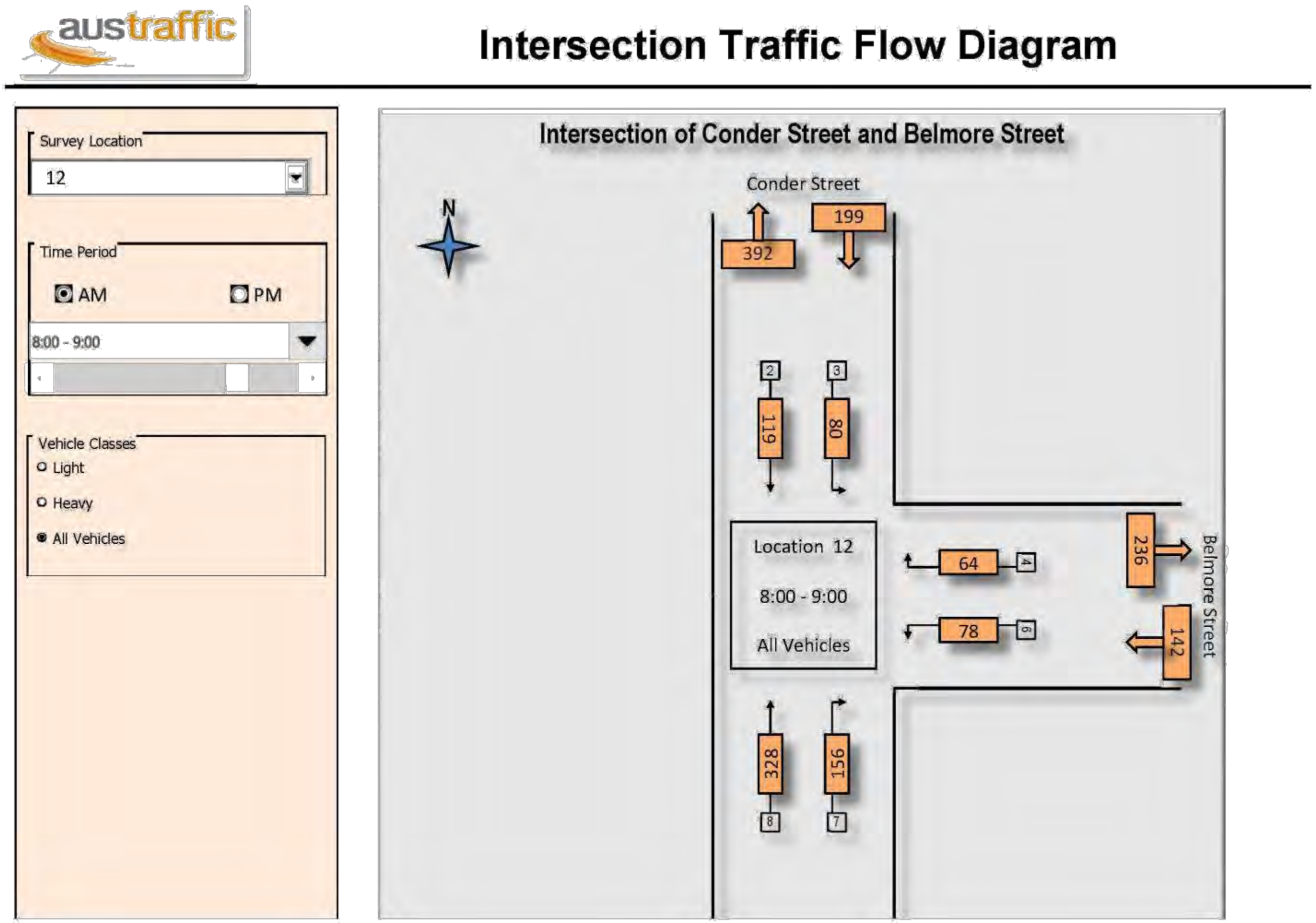

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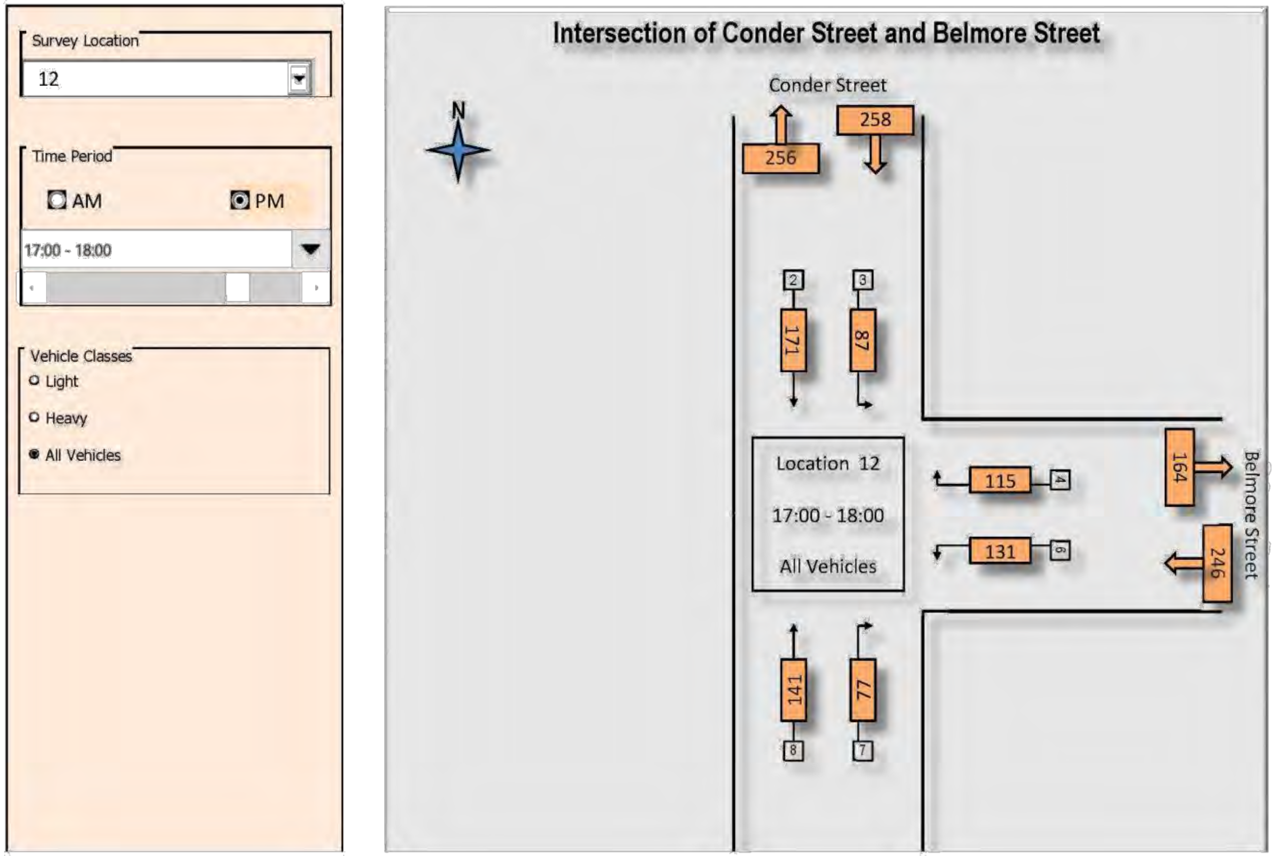

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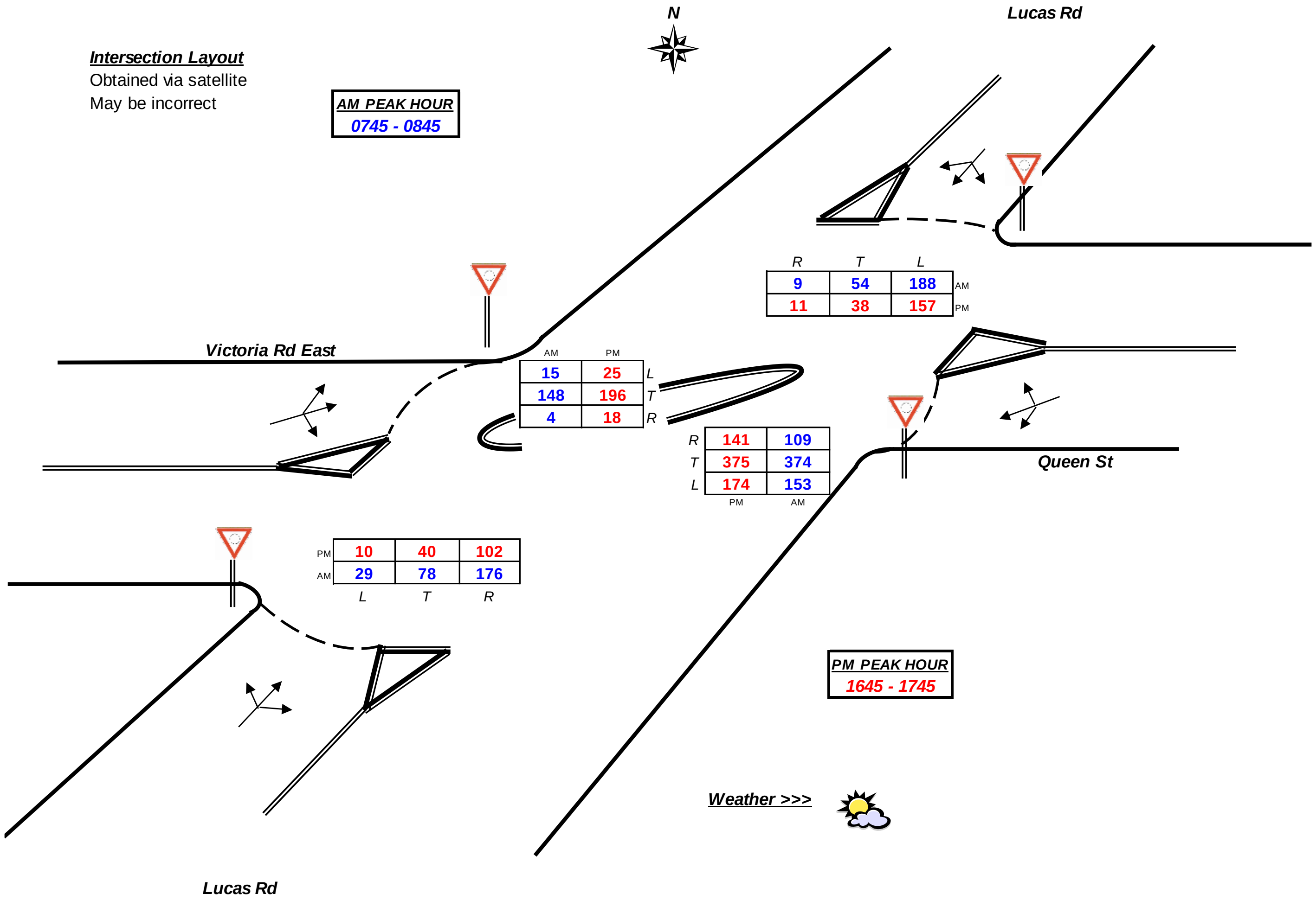
Ph.88196847, Mob.0418-239019

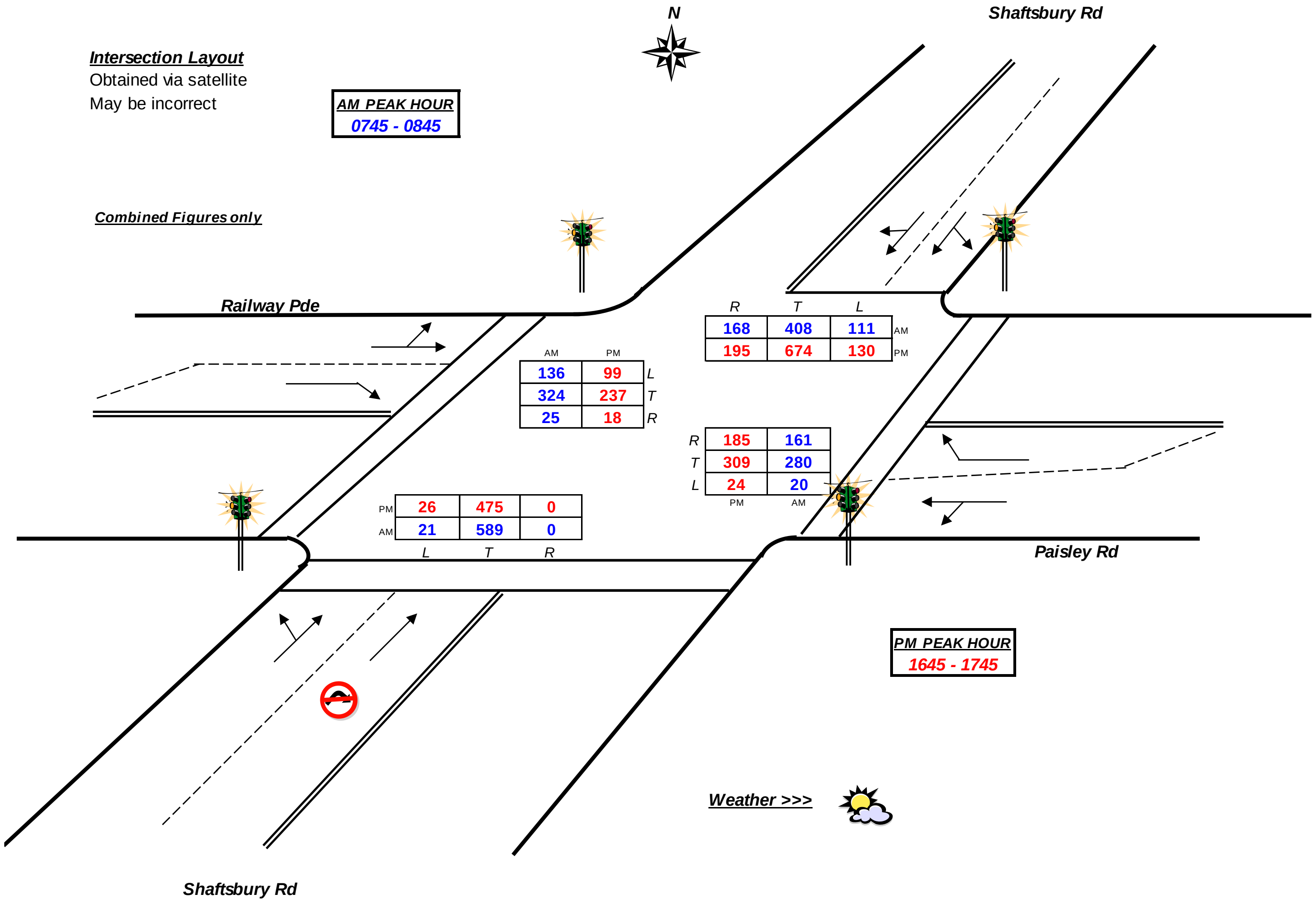
Client : Road Delay Solutions
Job No/Name : 6510 BURWOOD Town Centre Counts
Day/Date : Thursday 20th July 23017

Intersection Layout
Obtained via satellite
May be incorrect



R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

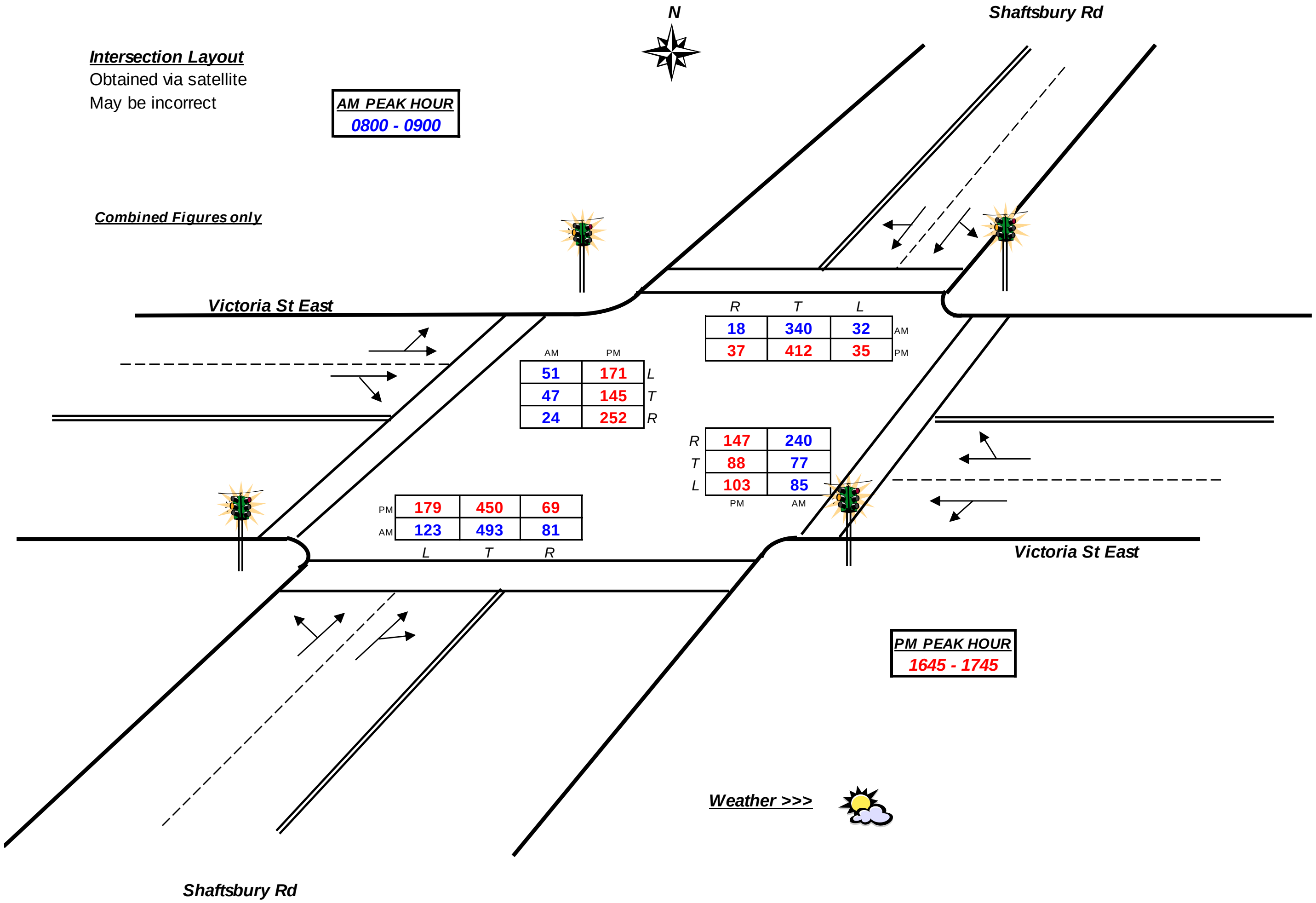
Client	: Road Delay Solutions
Job No/Name	: 6510 BURWOOD Town Centre Counts
Day/Date	: Thursday 20th July 23017



ROAD DELAY SOLUTIONS

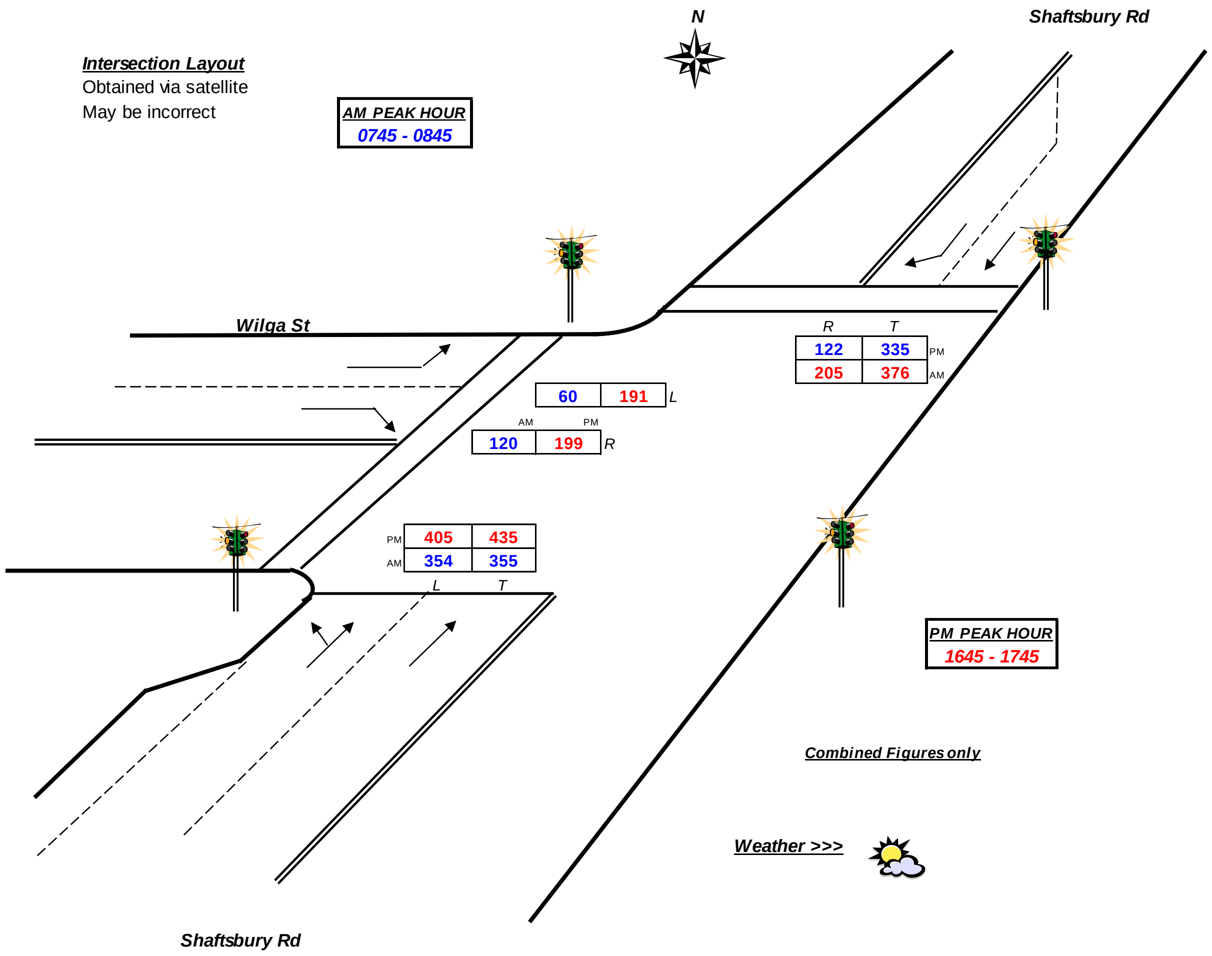
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : Road Delay Solutions
Job No/Name : 6510 BURWOOD Town Centre Counts
Day/Date : Thursday 20th July 23017



R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : Road Delay Solutions
Job No/Name : 6510 BURWOOD Town Centre Counts
Day/Date : Thursday 20th July 23017



APPENDIX B – SIDRA OUTPUTS

2017 Road Network with/without Development Generation

NETWORK LAYOUT

Network: N101 [2017 AM Base Burwood Town Centre]

SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
0107	NA	2017 AM Shaftesbury Rd, Railway Pde and Paisley St
0144	NA	2017 AM Shaftesbury Rd and Wilga St
0784	NA	2017 AM Shaftesbury Road and Victoria Street
GW01	NA	2017 AM Shaftesbury Rd and George St
GW02	NA	2017 AM Shaftesbury Rd and Deane St
GW04	NA	2017 AM Burwood Rd and Victoria St
GW03	NA	2017 AM Burwood Rd and George St
0174	NA	2017 AM Burwood Rd and Deane St
0014	NA	2017 AM Burwood Rd and Railway Pde
1639	NA	2017 AM Burwood Rd and Belmore St
1843	NA	2017 AM Railway Pde and Wynne Ave
R0001	NA	2017 AM Railway Pde and Conder St
R0002	NA	2017 AM Belmore St and Wynne Ave
GW05	NA	2017 AM Belmore St and Conder St
1183	NA	2017 AM Wentworth Rd, Railway Pde and Morwick St

NETWORK SUMMARY

Network: N101 [2017 AM Base Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values				
Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	2.97			
Speed Efficiency	0.37			
Congestion Coefficient	2.72			
Travel Speed (Average)	22.0 km/h		2.3 km/h	15.0 km/h
Travel Distance (Total)	6945.9 veh-km/h		466.5 ped-km/h	10207.4 pers-km/h
Travel Time (Total)	315.1 veh-h/h		205.2 ped-h/h	680.8 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	22994 veh/h		13777 ped/h	51223 pers/h
Arrival Flows (Total for all Sites)	22897 veh/h		13777 ped/h	50889 pers/h
Demand Flows (Entry Total)	5666 veh/h			
Midblock Inflows (Total)	1921 veh/h			
Midblock Outflows (Total)	-1847 veh/h			
Percent Heavy Vehicles (Demand)	3.9 %			
Percent Heavy Vehicles (Arrival)	4.0 %			
Degree of Saturation	1.184			
Control Delay (Total)	175.03 veh-h/h		105.49 ped-h/h	379.63 pers-h/h
Control Delay (Average)	27.5 sec		27.6 sec	26.9 sec
Control Delay (Worst Lane)	227.1 sec			
Control Delay (Worst Movement)	227.1 sec		44.8 sec	227.1 sec
Geometric Delay (Average)	1.6 sec			
Stop-Line Delay (Average)	25.9 sec			
Queue Storage Ratio (Worst Lane)	1.10			
Total Effective Stops	14769 veh/h		10119 ped/h	32220 pers/h
Effective Stop Rate	0.65 per veh	2.1 per km	0.73 per ped	0.63 per pers
Proportion Queued	0.59		0.73	0.60
Performance Index	1405.3		261.4	1666.7
Cost (Total)	14081.67 $/h	2.03 $/km	5170.17 $/h	19251.84 $/h
Fuel Consumption (Total)	1009.6 L/h	145.4 mL/km		
Fuel Economy	14.5 L/100km			
Carbon Dioxide (Total)	2385.4 kg/h	343.4 g/km		
Hydrocarbons (Total)	0.256 kg/h	0.037 g/km		
Carbon Monoxide (Total)	2.219 kg/h	0.319 g/km		
NOx (Total)	3.022 kg/h	0.435 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 4.8 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	11,037,330 veh/y	6,612,885 ped/y	24,587,120 pers/y
Delay	84,016 veh-h/y	50,635 ped-h/y	182,225 pers-h/y
Effective Stops	7,089,102 veh/y	4,857,004 ped/y	15,465,740 pers/y
Travel Distance	3,334,013 veh-km/y	223,913 ped-km/y	4,899,546 pers-km/y
Travel Time	151,232 veh-h/y	98,479 ped-h/y	326,802 pers-h/y
Cost	6,759,204 $/y	2,481,681 $/y	9,240,884 $/y
Fuel Consumption	484,618 L/y		
Carbon Dioxide	1,145,015 kg/y		

NETWORK SUMMARY

Network: N101 [2017 AM Development Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values				
Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	3.40			
Speed Efficiency	0.41			
Congestion Coefficient	2.46			
Travel Speed (Average)	24.4 km/h		2.3 km/h	16.6 km/h
Travel Distance (Total)	6597.2 veh-km/h		466.5 ped-km/h	9848.0 pers-km/h
Travel Time (Total)	270.6 veh-h/h		204.4 ped-h/h	594.1 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	21685 veh/h		13777 ped/h	49326 pers/h
Arrival Flows (Total for all Sites)	21685 veh/h		13777 ped/h	49326 pers/h
Demand Flows (Entry Total)	5475 veh/h			
Midblock Inflows (Total)	1790 veh/h			
Midblock Outflows (Total)	-1702 veh/h			
Percent Heavy Vehicles (Demand)	3.7 %			
Percent Heavy Vehicles (Arrival)	3.7 %			
Degree of Saturation	1.021			
Control Delay (Total)	138.97 veh-h/h		104.76 ped-h/h	303.35 pers-h/h
Control Delay (Average)	23.1 sec		27.4 sec	22.1 sec
Control Delay (Worst Lane)	106.3 sec			
Control Delay (Worst Movement)	106.3 sec		46.2 sec	106.3 sec
Geometric Delay (Average)	1.5 sec			
Stop-Line Delay (Average)	21.5 sec			
Queue Storage Ratio (Worst Lane)	1.00			
Total Effective Stops	12412 veh/h		9905 ped/h	28169 pers/h
Effective Stop Rate	0.57 per veh	1.9 per km	0.72 per ped	0.57 per pers
Proportion Queued	0.56		0.72	0.58
Performance Index	1188.4		259.5	1447.8
Cost (Total)	11584.43 $/h	1.76 $/km	5151.78 $/h	16736.21 $/h
Fuel Consumption (Total)	896.6 L/h	135.9 mL/km		
Fuel Economy	13.6 L/100km			
Carbon Dioxide (Total)	2116.2 kg/h	320.8 g/km		
Hydrocarbons (Total)	0.212 kg/h	0.032 g/km		
Carbon Monoxide (Total)	1.914 kg/h	0.290 g/km		
NOx (Total)	2.429 kg/h	0.368 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 136.5 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	10,408,930 veh/y	6,612,885 ped/y	23,676,270 pers/y
Delay	66,704 veh-h/y	50,285 ped-h/y	145,609 pers-h/y
Effective Stops	5,957,549 veh/y	4,754,171 ped/y	13,520,920 pers/y
Travel Distance	3,166,633 veh-km/y	223,913 ped-km/y	4,727,046 pers-km/y
Travel Time	129,874 veh-h/y	98,129 ped-h/y	285,145 pers-h/y
Cost	5,560,526 $/y	2,472,856 $/y	8,033,381 $/y
Fuel Consumption	430,390 L/y		
Carbon Dioxide	1,015,785 kg/y		

NETWORK SUMMARY

Network: N101 [2017 PM Base Burwood Town Centre]

New Network
Network Cycle Time = 110 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values				
Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	3.31			
Speed Efficiency	0.40			
Congestion Coefficient	2.52			
Travel Speed (Average)	23.9 km/h		2.2 km/h	16.3 km/h
Travel Distance (Total)	7226.6 veh-km/h		479.9 ped-km/h	10509.8 pers-km/h
Travel Time (Total)	303.0 veh-h/h		217.1 ped-h/h	645.5 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	22775 veh/h		14157 ped/h	50357 pers/h
Arrival Flows (Total for all Sites)	22775 veh/h		14157 ped/h	50357 pers/h
Demand Flows (Entry Total)	5663 veh/h			
Midblock Inflows (Total)	1720 veh/h			
Midblock Outflows (Total)	-849 veh/h			
Percent Heavy Vehicles (Demand)	3.2 %			
Percent Heavy Vehicles (Arrival)	3.2 %			
Degree of Saturation	0.970			
Control Delay (Total)	160.53 veh-h/h		114.56 ped-h/h	341.26 pers-h/h
Control Delay (Average)	25.4 sec		29.1 sec	24.4 sec
Control Delay (Worst Lane)	85.7 sec			
Control Delay (Worst Movement)	85.7 sec		49.9 sec	85.7 sec
Geometric Delay (Average)	1.7 sec			
Stop-Line Delay (Average)	23.7 sec			
Queue Storage Ratio (Worst Lane)	1.20			
Total Effective Stops	13462 veh/h		10208 ped/h	29665 pers/h
Effective Stop Rate	0.59 per veh	1.9 per km	0.72 per ped	0.59 per pers
Proportion Queued	0.58		0.72	0.59
Performance Index	1340.0		273.8	1613.8
Cost (Total)	12534.88 $/h	1.73 $/km	5470.82 $/h	18005.71 $/h
Fuel Consumption (Total)	963.7 L/h	133.4 mL/km		
Fuel Economy	13.3 L/100km			
Carbon Dioxide (Total)	2273.0 kg/h	314.5 g/km		
Hydrocarbons (Total)	0.228 kg/h	0.032 g/km		
Carbon Monoxide (Total)	2.060 kg/h	0.285 g/km		
NOx (Total)	2.192 kg/h	0.303 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 22.5 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	10,931,870 veh/y	6,795,285 ped/y	24,171,310 pers/y
Delay	77,055 veh-h/y	54,990 ped-h/y	163,807 pers-h/y
Effective Stops	6,461,620 veh/y	4,899,613 ped/y	14,239,410 pers/y
Travel Distance	3,468,788 veh-km/y	230,334 ped-km/y	5,044,684 pers-km/y
Travel Time	145,426 veh-h/y	104,206 ped-h/y	309,820 pers-h/y
Cost	6,016,745 $/y	2,625,995 $/y	8,642,739 $/y
Fuel Consumption	462,585 L/y		
Carbon Dioxide	1,091,037 kg/y		

NETWORK SUMMARY

Network: N101 [2017 PM Development Burwood Town Centre]

New Network
Network Cycle Time = 110 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values

Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	3.40			
Speed Efficiency	0.41			
Congestion Coefficient	2.46			
Travel Speed (Average)	24.4 km/h		2.2 km/h	16.3 km/h
Travel Distance (Total)	6903.7 veh-km/h		479.9 ped-km/h	10050.5 pers-km/h
Travel Time (Total)	283.4 veh-h/h		215.4 ped-h/h	615.0 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	21432 veh/h		14157 ped/h	47938 pers/h
Arrival Flows (Total for all Sites)	21432 veh/h		14157 ped/h	47938 pers/h
Demand Flows (Entry Total)	5306 veh/h			
Midblock Inflows (Total)	1567 veh/h			
Midblock Outflows (Total)	-1085 veh/h			
Percent Heavy Vehicles (Demand)	3.3 %			
Percent Heavy Vehicles (Arrival)	3.3 %			
Degree of Saturation	0.970			
Control Delay (Total)	146.90 veh-h/h		112.84 ped-h/h	319.11 pers-h/h
Control Delay (Average)	24.7 sec		28.7 sec	24.0 sec
Control Delay (Worst Lane)	85.7 sec			
Control Delay (Worst Movement)	85.7 sec		49.9 sec	85.7 sec
Geometric Delay (Average)	1.6 sec			
Stop-Line Delay (Average)	23.1 sec			
Queue Storage Ratio (Worst Lane)	1.00			
Total Effective Stops	12377 veh/h		10201 ped/h	28211 pers/h
Effective Stop Rate	0.58 per veh	1.8 per km	0.72 per ped	0.59 per pers
Proportion Queued	0.57		0.72	0.59
Performance Index	1278.8		272.0	1550.9
Cost (Total)	11695.64 $/h	1.69 $/km	5427.34 $/h	17122.98 $/h
Fuel Consumption (Total)	914.7 L/h	132.5 mL/km		
Fuel Economy	13.2 L/100km			
Carbon Dioxide (Total)	2159.2 kg/h	312.8 g/km		
Hydrocarbons (Total)	0.214 kg/h	0.031 g/km		
Carbon Monoxide (Total)	1.946 kg/h	0.282 g/km		
NOx (Total)	2.342 kg/h	0.339 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 4.0 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	10,287,160 veh/y	6,795,285 ped/y	23,010,280 pers/y
Delay	70,510 veh-h/y	54,161 ped-h/y	153,175 pers-h/y
Effective Stops	5,941,125 veh/y	4,896,416 ped/y	13,541,220 pers/y
Travel Distance	3,313,790 veh-km/y	230,334 ped-km/y	4,824,260 pers-km/y
Travel Time	136,030 veh-h/y	103,378 ped-h/y	295,214 pers-h/y
Cost	5,613,910 $/y	2,605,121 $/y	8,219,030 $/y
Fuel Consumption	439,055 L/y		
Carbon Dioxide	1,036,426 kg/y		

NETWORK SUMMARY

Network: N101 [2017 WE Base Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values				
Performance Measure	**Vehicles**	**Per Unit Distance**	**Pedestrians**	**Persons**
Network Level of Service (LOS)	LOS E			
Travel Time Index	3.52			
Speed Efficiency	0.42			
Congestion Coefficient	2.40			
Travel Speed (Average)	25.0 km/h		2.2 km/h	16.7 km/h
Travel Distance (Total)	6822.0 veh-km/h		468.6 ped-km/h	9949.7 pers-km/h
Travel Time (Total)	272.7 veh-h/h		210.4 ped-h/h	596.5 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	22032 veh/h		13836 ped/h	48542 pers/h
Arrival Flows (Total for all Sites)	22032 veh/h		13836 ped/h	48542 pers/h
Demand Flows (Entry Total)	5637 veh/h			
Midblock Inflows (Total)	1807 veh/h			
Midblock Outflows (Total)	-1550 veh/h			
Percent Heavy Vehicles (Demand)	3.2 %			
Percent Heavy Vehicles (Arrival)	3.2 %			
Degree of Saturation	0.957			
Control Delay (Total)	140.46 veh-h/h		110.32 ped-h/h	307.70 pers-h/h
Control Delay (Average)	23.0 sec		28.7 sec	22.8 sec
Control Delay (Worst Lane)	70.1 sec			
Control Delay (Worst Movement)	70.1 sec		44.8 sec	70.1 sec
Geometric Delay (Average)	1.8 sec			
Stop-Line Delay (Average)	21.2 sec			
Queue Storage Ratio (Worst Lane)	1.12			
Total Effective Stops	12881 veh/h		10343 ped/h	28978 pers/h
Effective Stop Rate	0.58 per veh	1.9 per km	0.75 per ped	0.60 per pers
Proportion Queued	0.57		0.76	0.60
Performance Index	1203.6		267.9	1471.5
Cost (Total)	11484.12 $/h	1.68 $/km	5303.11 $/h	16787.22 $/h
Fuel Consumption (Total)	915.7 L/h	134.2 mL/km		
Fuel Economy	13.4 L/100km			
Carbon Dioxide (Total)	2159.6 kg/h	316.6 g/km		
Hydrocarbons (Total)	0.217 kg/h	0.032 g/km		
Carbon Monoxide (Total)	2.013 kg/h	0.295 g/km		
NOx (Total)	2.060 kg/h	0.302 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 5.5 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values			
Performance Measure	**Vehicles**	**Pedestrians**	**Persons**
Demand Flows (Total for all Sites)	10,575,160 veh/y	6,641,179 ped/y	23,299,990 pers/y
Delay	67,420 veh-h/y	52,954 ped-h/y	147,698 pers-h/y
Effective Stops	6,182,880 veh/y	4,964,596 ped/y	13,909,200 pers/y
Travel Distance	3,274,564 veh-km/y	224,909 ped-km/y	4,775,864 pers-km/y
Travel Time	130,876 veh-h/y	101,012 ped-h/y	286,299 pers-h/y
Cost	5,512,377 $/y	2,545,491 $/y	8,057,867 $/y
Fuel Consumption	439,547 L/y		
Carbon Dioxide	1,036,589 kg/y		

NETWORK SUMMARY

Network: N101 [2017 WE Development Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values				
Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	2.93			
Speed Efficiency	0.36			
Congestion Coefficient	2.75			
Travel Speed (Average)	21.8 km/h		2.3 km/h	15.8 km/h
Travel Distance (Total)	7060.4 veh-km/h		468.6 ped-km/h	10189.0 pers-km/h
Travel Time (Total)	323.4 veh-h/h		202.9 ped-h/h	645.7 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	22225 veh/h		13836 ped/h	48499 pers/h
Arrival Flows (Total for all Sites)	22155 veh/h		13836 ped/h	48416 pers/h
Demand Flows (Entry Total)	5557 veh/h			
Midblock Inflows (Total)	1857 veh/h			
Midblock Outflows (Total)	-1420 veh/h			
Percent Heavy Vehicles (Demand)	3.1 %			
Percent Heavy Vehicles (Arrival)	3.1 %			
Degree of Saturation	1.296			
Control Delay (Total)	185.15 veh-h/h		102.80 ped-h/h	350.78 pers-h/h
Control Delay (Average)	30.1 sec		26.7 sec	26.1 sec
Control Delay (Worst Lane)	325.0 sec			
Control Delay (Worst Movement)	326.5 sec		44.8 sec	326.5 sec
Geometric Delay (Average)	1.6 sec			
Stop-Line Delay (Average)	28.4 sec			
Queue Storage Ratio (Worst Lane)	1.12			
Total Effective Stops	13698 veh/h		10075 ped/h	29583 pers/h
Effective Stop Rate	0.62 per veh	1.9 per km	0.73 per ped	0.61 per pers
Proportion Queued	0.58		0.73	0.59
Performance Index	1391.6		258.9	1650.5
Cost (Total)	13024.51 $/h	1.84 $/km	5113.70 $/h	18138.21 $/h
Fuel Consumption (Total)	993.4 L/h	140.7 mL/km		
Fuel Economy	14.1 L/100km			
Carbon Dioxide (Total)	2342.3 kg/h	331.7 g/km		
Hydrocarbons (Total)	0.236 kg/h	0.033 g/km		
Carbon Monoxide (Total)	2.118 kg/h	0.300 g/km		
NOx (Total)	2.084 kg/h	0.295 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 6.1 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	10,668,130 veh/y	6,641,179 ped/y	23,279,750 pers/y
Delay	88,872 veh-h/y	49,346 ped-h/y	168,372 pers-h/y
Effective Stops	6,574,829 veh/y	4,836,034 ped/y	14,199,990 pers/y
Travel Distance	3,389,011 veh-km/y	224,909 ped-km/y	4,890,716 pers-km/y
Travel Time	155,223 veh-h/y	97,404 ped-h/y	309,950 pers-h/y
Cost	6,251,765 $/y	2,454,574 $/y	8,706,339 $/y
Fuel Consumption	476,850 L/y		
Carbon Dioxide	1,124,288 kg/y		

2026 Do Nothing Network

NETWORK SUMMARY

Network: N101 [2026 AM Base Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values				
Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	3.29			
Speed Efficiency	0.40			
Congestion Coefficient	2.52			
Travel Speed (Average)	23.8 km/h		2.3 km/h	16.5 km/h
Travel Distance (Total)	7147.8 veh-km/h		466.5 ped-km/h	10466.3 pers-km/h
Travel Time (Total)	300.6 veh-h/h		204.8 ped-h/h	635.1 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	22656 veh/h		13777 ped/h	50533 pers/h
Arrival Flows (Total for all Sites)	22656 veh/h		13777 ped/h	50533 pers/h
Demand Flows (Entry Total)	5920 veh/h			
Midblock Inflows (Total)	1472 veh/h			
Midblock Outflows (Total)	-1213 veh/h			
Percent Heavy Vehicles (Demand)	3.7 %			
Percent Heavy Vehicles (Arrival)	3.7 %			
Degree of Saturation	1.104			
Control Delay (Total)	157.67 veh-h/h		105.15 ped-h/h	332.17 pers-h/h
Control Delay (Average)	25.1 sec		27.5 sec	23.7 sec
Control Delay (Worst Lane)	162.7 sec			
Control Delay (Worst Movement)	162.7 sec		44.8 sec	162.7 sec
Geometric Delay (Average)	1.6 sec			
Stop-Line Delay (Average)	23.5 sec			
Queue Storage Ratio (Worst Lane)	1.21			
Total Effective Stops	14325 veh/h		10141 ped/h	31552 pers/h
Effective Stop Rate	0.63 per veh	2.0 per km	0.74 per ped	0.62 per pers
Proportion Queued	0.60		0.74	0.61
Performance Index	1319.4		261.2	1580.6
Cost (Total)	12739.93 $/h	1.78 $/km	5161.63 $/h	17901.56 $/h
Fuel Consumption (Total)	981.3 L/h	137.3 mL/km		
Fuel Economy	13.7 L/100km			
Carbon Dioxide (Total)	2316.7 kg/h	324.1 g/km		
Hydrocarbons (Total)	0.234 kg/h	0.033 g/km		
Carbon Monoxide (Total)	2.103 kg/h	0.294 g/km		
NOx (Total)	2.636 kg/h	0.369 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 64.2 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	10,874,780 veh/y	6,612,885 ped/y	24,255,870 pers/y
Delay	75,684 veh-h/y	50,472 ped-h/y	159,441 pers-h/y
Effective Stops	6,875,779 veh/y	4,867,801 ped/y	15,145,190 pers/y
Travel Distance	3,430,958 veh-km/y	223,913 ped-km/y	5,023,801 pers-km/y
Travel Time	144,265 veh-h/y	98,317 ped-h/y	304,865 pers-h/y
Cost	6,115,169 $/y	2,477,582 $/y	8,592,751 $/y
Fuel Consumption	471,002 L/y		
Carbon Dioxide	1,111,993 kg/y		

NETWORK SUMMARY

Network: N101 [2026 PM Base Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values

Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	3.10			
Speed Efficiency	0.38			
Congestion Coefficient	2.64			
Travel Speed (Average)	22.7 km/h		2.3 km/h	16.2 km/h
Travel Distance (Total)	7858.2 veh-km/h		479.9 ped-km/h	11362.5 pers-km/h
Travel Time (Total)	345.8 veh-h/h		209.8 ped-h/h	700.5 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	25160 veh/h		14157 ped/h	54041 pers/h
Arrival Flows (Total for all Sites)	25160 veh/h		14157 ped/h	54041 pers/h
Demand Flows (Entry Total)	6125 veh/h			
Midblock Inflows (Total)	2588 veh/h			
Midblock Outflows (Total)	-2331 veh/h			
Percent Heavy Vehicles (Demand)	3.2 %			
Percent Heavy Vehicles (Arrival)	3.2 %			
Degree of Saturation	1.204			
Control Delay (Total)	188.95 veh-h/h		107.25 ped-h/h	376.99 pers-h/h
Control Delay (Average)	27.0 sec		27.3 sec	25.1 sec
Control Delay (Worst Lane)	243.1 sec			
Control Delay (Worst Movement)	244.6 sec		46.8 sec	244.6 sec
Geometric Delay (Average)	1.7 sec			
Stop-Line Delay (Average)	25.4 sec			
Queue Storage Ratio (Worst Lane)	1.00			
Total Effective Stops	16035 veh/h		10416 ped/h	34216 pers/h
Effective Stop Rate	0.64 per veh	2.0 per km	0.74 per ped	0.63 per pers
Proportion Queued	0.60		0.74	0.61
Performance Index	1490.8		267.7	1758.5
Cost (Total)	14522.50 $/h	1.85 $/km	5286.63 $/h	19809.13 $/h
Fuel Consumption (Total)	1079.6 L/h	137.4 mL/km		
Fuel Economy	13.7 L/100km			
Carbon Dioxide (Total)	2546.2 kg/h	324.0 g/km		
Hydrocarbons (Total)	0.258 kg/h	0.033 g/km		
Carbon Monoxide (Total)	2.289 kg/h	0.291 g/km		
NOx (Total)	2.534 kg/h	0.322 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 7.3 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	12,076,800 veh/y	6,795,285 ped/y	25,939,610 pers/y
Delay	90,697 veh-h/y	51,481 ped-h/y	180,957 pers-h/y
Effective Stops	7,696,698 veh/y	4,999,789 ped/y	16,423,850 pers/y
Travel Distance	3,771,946 veh-km/y	230,334 ped-km/y	5,453,987 pers-km/y
Travel Time	166,003 veh-h/y	100,698 ped-h/y	336,232 pers-h/y
Cost	6,970,803 $/y	2,537,582 $/y	9,508,385 $/y
Fuel Consumption	518,184 L/y		
Carbon Dioxide	1,222,182 kg/y		

NETWORK SUMMARY

Network: N101 [2026 WE Base Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values

Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	3.69			
Speed Efficiency	0.43			
Congestion Coefficient	2.31			
Travel Speed (Average)	25.9 km/h		2.3 km/h	17.4 km/h
Travel Distance (Total)	6920.4 veh-km/h		468.6 ped-km/h	10086.7 pers-km/h
Travel Time (Total)	266.8 veh-h/h		201.5 ped-h/h	580.6 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	22237 veh/h		13836 ped/h	49321 pers/h
Arrival Flows (Total for all Sites)	22237 veh/h		13836 ped/h	49321 pers/h
Demand Flows (Entry Total)	5815 veh/h			
Midblock Inflows (Total)	2190 veh/h			
Midblock Outflows (Total)	-1998 veh/h			
Percent Heavy Vehicles (Demand)	3.2 %			
Percent Heavy Vehicles (Arrival)	3.2 %			
Degree of Saturation	0.905			
Control Delay (Total)	132.39 veh-h/h		101.36 ped-h/h	289.08 pers-h/h
Control Delay (Average)	21.4 sec		26.4 sec	21.1 sec
Control Delay (Worst Lane)	63.4 sec			
Control Delay (Worst Movement)	63.4 sec		44.8 sec	63.4 sec
Geometric Delay (Average)	1.9 sec			
Stop-Line Delay (Average)	19.5 sec			
Queue Storage Ratio (Worst Lane)	1.09			
Total Effective Stops	12766 veh/h		10047 ped/h	28847 pers/h
Effective Stop Rate	0.57 per veh	1.8 per km	0.73 per ped	0.58 per pers
Proportion Queued	0.56		0.73	0.58
Performance Index	1131.4		257.3	1388.7
Cost (Total)	11276.60 $/h	1.63 $/km	5077.33 $/h	16353.93 $/h
Fuel Consumption (Total)	915.3 L/h	132.3 mL/km		
Fuel Economy	13.2 L/100km			
Carbon Dioxide (Total)	2158.8 kg/h	311.9 g/km		
Hydrocarbons (Total)	0.216 kg/h	0.031 g/km		
Carbon Monoxide (Total)	2.023 kg/h	0.292 g/km		
NOx (Total)	2.075 kg/h	0.300 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 5.7 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	10,673,690 veh/y	6,641,179 ped/y	23,673,840 pers/y
Delay	63,547 veh-h/y	48,654 ped-h/y	138,759 pers-h/y
Effective Stops	6,127,609 veh/y	4,822,464 ped/y	13,846,690 pers/y
Travel Distance	3,321,772 veh-km/y	224,909 ped-km/y	4,841,626 pers-km/y
Travel Time	128,077 veh-h/y	96,711 ped-h/y	278,707 pers-h/y
Cost	5,412,768 $/y	2,437,120 $/y	7,849,887 $/y
Fuel Consumption	439,354 L/y		
Carbon Dioxide	1,036,225 kg/y		

2026 Development on S94 Network

NETWORK SUMMARY

Network: N101 [2026 AM S94 Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values

Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	2.46			
Speed Efficiency	0.32			
Congestion Coefficient	3.12			
Travel Speed (Average)	19.3 km/h		2.3 km/h	14.4 km/h
Travel Distance (Total)	7269.0 veh-km/h		490.5 ped-km/h	10396.6 pers-km/h
Travel Time (Total)	377.4 veh-h/h		214.2 ped-h/h	723.9 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	22100 veh/h		14459 ped/h	48613 pers/h
Arrival Flows (Total for all Sites)	22030 veh/h		14459 ped/h	48529 pers/h
Demand Flows (Entry Total)	6051 veh/h			
Midblock Inflows (Total)	2775 veh/h			
Midblock Outflows (Total)	-2273 veh/h			
Percent Heavy Vehicles (Demand)	3.2 %			
Percent Heavy Vehicles (Arrival)	3.2 %			
Degree of Saturation	1.158			
Control Delay (Total)	231.55 veh-h/h		109.35 ped-h/h	417.35 pers-h/h
Control Delay (Average)	37.8 sec		27.2 sec	31.0 sec
Control Delay (Worst Lane)	206.1 sec			
Control Delay (Worst Movement)	206.8 sec		44.5 sec	206.8 sec
Geometric Delay (Average)	1.8 sec			
Stop-Line Delay (Average)	36.0 sec			
Queue Storage Ratio (Worst Lane)	1.02			
Total Effective Stops	16214 veh/h		10729 ped/h	33436 pers/h
Effective Stop Rate	0.74 per veh	2.2 per km	0.74 per ped	0.69 per pers
Proportion Queued	0.66		0.74	0.66
Performance Index	1546.1		273.8	1819.9
Cost (Total)	14941.03 $/h	2.06 $/km	5396.89 $/h	20337.92 $/h
Fuel Consumption (Total)	1092.4 L/h	150.3 mL/km		
Fuel Economy	15.0 L/100km			
Carbon Dioxide (Total)	2576.5 kg/h	354.5 g/km		
Hydrocarbons (Total)	0.262 kg/h	0.036 g/km		
Carbon Monoxide (Total)	2.267 kg/h	0.312 g/km		
NOx (Total)	2.500 kg/h	0.344 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 126.6 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	10,608,120 veh/y	6,940,334 ped/y	23,334,280 pers/y
Delay	111,145 veh-h/y	52,486 ped-h/y	200,328 pers-h/y
Effective Stops	7,782,721 veh/y	5,149,790 ped/y	16,049,280 pers/y
Travel Distance	3,489,120 veh-km/y	235,461 ped-km/y	4,990,376 pers-km/y
Travel Time	181,175 veh-h/y	102,798 ped-h/y	347,468 pers-h/y
Cost	7,171,694 $/y	2,590,506 $/y	9,762,201 $/y
Fuel Consumption	524,358 L/y		
Carbon Dioxide	1,236,722 kg/y		

NETWORK SUMMARY

Network: N101 [2026 PM S94 Burwood Town Centre]

New Network
Network Cycle Time = 110 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values

Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	2.36			
Speed Efficiency	0.31			
Congestion Coefficient	3.20			
Travel Speed (Average)	18.7 km/h		2.2 km/h	14.1 km/h
Travel Distance (Total)	8036.9 veh-km/h		503.9 ped-km/h	11471.6 pers-km/h
Travel Time (Total)	428.8 veh-h/h		231.3 ped-h/h	813.0 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	23788 veh/h		14824 ped/h	51584 pers/h
Arrival Flows (Total for all Sites)	23736 veh/h		14824 ped/h	51521 pers/h
Demand Flows (Entry Total)	6225 veh/h			
Midblock Inflows (Total)	3581 veh/h			
Midblock Outflows (Total)	-2565 veh/h			
Percent Heavy Vehicles (Demand)	2.9 %			
Percent Heavy Vehicles (Arrival)	2.9 %			
Degree of Saturation	1.121			
Control Delay (Total)	257.66 veh-h/h		123.59 ped-h/h	468.63 pers-h/h
Control Delay (Average)	39.1 sec		30.0 sec	32.7 sec
Control Delay (Worst Lane)	176.8 sec			
Control Delay (Worst Movement)	180.5 sec		49.6 sec	180.5 sec
Geometric Delay (Average)	1.6 sec			
Stop-Line Delay (Average)	37.5 sec			
Queue Storage Ratio (Worst Lane)	1.05			
Total Effective Stops	16433 veh/h		10920 ped/h	34294 pers/h
Effective Stop Rate	0.69 per veh	2.0 per km	0.74 per ped	0.67 per pers
Proportion Queued	0.64		0.74	0.64
Performance Index	1659.1		291.9	1951.0
Cost (Total)	16776.82 $/h	2.09 $/km	5827.88 $/h	22604.70 $/h
Fuel Consumption (Total)	1197.4 L/h	149.0 mL/km		
Fuel Economy	14.9 L/100km			
Carbon Dioxide (Total)	2823.1 kg/h	351.3 g/km		
Hydrocarbons (Total)	0.290 kg/h	0.036 g/km		
Carbon Monoxide (Total)	2.501 kg/h	0.311 g/km		
NOx (Total)	2.450 kg/h	0.305 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 6.2 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	11,418,370 veh/y	7,115,660 ped/y	24,760,200 pers/y
Delay	123,677 veh-h/y	59,321 ped-h/y	224,943 pers-h/y
Effective Stops	7,887,672 veh/y	5,241,542 ped/y	16,461,180 pers/y
Travel Distance	3,857,696 veh-km/y	241,891 ped-km/y	5,506,367 pers-km/y
Travel Time	205,819 veh-h/y	111,007 ped-h/y	390,217 pers-h/y
Cost	8,052,876 $/y	2,797,381 $/y	10,850,260 $/y
Fuel Consumption	574,753 L/y		
Carbon Dioxide	1,355,111 kg/y		

NETWORK SUMMARY

Network: N101 [2026 WE S94 Burwood Town Centre]

New Network
Network Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Network Performance - Hourly Values

Performance Measure	Vehicles	Per Unit Distance	Pedestrians	Persons
Network Level of Service (LOS)	LOS E			
Travel Time Index	2.27			
Speed Efficiency	0.30			
Congestion Coefficient	3.28			
Travel Speed (Average)	18.3 km/h		2.3 km/h	13.9 km/h
Travel Distance (Total)	7426.3 veh-km/h		493.0 ped-km/h	10714.8 pers-km/h
Travel Time (Total)	406.5 veh-h/h		217.8 ped-h/h	769.2 pers-h/h
Desired Speed	60.0 km/h			
Demand Flows (Total for all Sites)	22566 veh/h		14518 ped/h	49949 pers/h
Arrival Flows (Total for all Sites)	22514 veh/h		14518 ped/h	49886 pers/h
Demand Flows (Entry Total)	6199 veh/h			
Midblock Inflows (Total)	2850 veh/h			
Midblock Outflows (Total)	-2244 veh/h			
Percent Heavy Vehicles (Demand)	2.9 %			
Percent Heavy Vehicles (Arrival)	2.9 %			
Degree of Saturation	1.358			
Control Delay (Total)	256.85 veh-h/h		112.42 ped-h/h	453.60 pers-h/h
Control Delay (Average)	41.1 sec		27.9 sec	32.7 sec
Control Delay (Worst Lane)	375.1 sec			
Control Delay (Worst Movement)	375.1 sec		44.4 sec	375.1 sec
Geometric Delay (Average)	1.6 sec			
Stop-Line Delay (Average)	39.5 sec			
Queue Storage Ratio (Worst Lane)	1.00			
Total Effective Stops	16203 veh/h		10815 ped/h	34097 pers/h
Effective Stop Rate	0.72 per veh	2.2 per km	0.74 per ped	0.68 per pers
Proportion Queued	0.64		0.74	0.65
Performance Index	1601.7		277.9	1879.6
Cost (Total)	16030.78 $/h	2.16 $/km	5487.70 $/h	21518.47 $/h
Fuel Consumption (Total)	1130.2 L/h	152.2 mL/km		
Fuel Economy	15.2 L/100km			
Carbon Dioxide (Total)	2663.7 kg/h	358.7 g/km		
Hydrocarbons (Total)	0.275 kg/h	0.037 g/km		
Carbon Monoxide (Total)	2.357 kg/h	0.317 g/km		
NOx (Total)	2.147 kg/h	0.289 g/km		

Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 150.2 %
Number of Iterations: 10 (maximum specified: 10)
Network Level of Service (LOS) Method: SIDRA Speed Efficiency.
Software Setup used: New South Wales.

Network Performance - Annual Values

Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total for all Sites)	10,831,720 veh/y	6,968,629 ped/y	23,975,520 pers/y
Delay	123,286 veh-h/y	53,962 ped-h/y	217,727 pers-h/y
Effective Stops	7,777,275 veh/y	5,191,412 ped/y	16,366,700 pers/y
Travel Distance	3,564,612 veh-km/y	236,648 ped-km/y	5,143,094 pers-km/y
Travel Time	195,100 veh-h/y	104,528 ped-h/y	369,232 pers-h/y
Cost	7,694,772 $/y	2,634,096 $/y	10,328,870 $/y
Fuel Consumption	542,474 L/y		
Carbon Dioxide	1,278,584 kg/y		

2017 Base Shaftesbury Road Intersections – Movements

MOVEMENT SUMMARY

Site: 0144 [2017 AM Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	373	0.0	0.312	8.9	LOS A	4.1	28.8	0.48	0.69	37.8
2	T1	374	0.0	0.867	28.4	LOS B	11.1	77.4	1.00	1.11	30.6
Approach		746	0.0	0.867	18.7	LOS B	11.1	77.4	0.74	0.90	33.1
North: Shaftesbry Road											
8	T1	353	0.0	0.391	9.7	LOS A	5.8	40.3	0.70	0.60	41.1
9	R2	128	0.0	0.573	29.2	LOS C	3.3	22.8	0.99	0.81	32.9
Approach		481	0.0	0.573	14.9	LOS B	5.8	40.3	0.78	0.65	38.0
West: Wilga Street											
10	L2	63	0.0	0.077	13.4	LOS A	0.9	6.3	0.61	0.68	40.3
12	R2	126	0.0	0.338	24.0	LOS B	2.8	19.5	0.90	0.77	27.2
Approach		189	0.0	0.338	20.5	LOS B	2.8	19.5	0.80	0.74	32.4
All Vehicles		1417	0.0	0.867	17.6	LOS B	11.1	77.4	0.76	0.79	34.8

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	19.5	LOS B	0.2	0.2	0.89	0.89
P4	West Full Crossing	212	17.0	LOS B	0.2	0.2	0.83	0.83
All Pedestrians		351	18.0	LOS B			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: ROAD DELAY SOLUTIONS PTY LTD | Processed: Wednesday, 19 June 2019 3:24:59 PM
Project: C:\Users\Glen Varley\Documents\28 34 Victoria St Burwood\2019 Revised Development\Sidra\2017 Base Victoria St Dev.sip7

MOVEMENT SUMMARY

Site: 0107 [2017 AM Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	22	33.3	0.849	49.4	LOS D	15.3	112.9	1.00	1.03	23.7
2	T1	620	4.2	0.849	45.0	LOS D	15.7	114.0	1.00	1.03	8.7
Approach		642	5.2	0.849	45.2	LOS D	15.7	114.0	1.00	1.03	9.5
East: Paisley Street											
4	L2	21	10.0	0.547	34.2	LOS C	11.7	82.9	0.89	0.76	31.5
5	T1	295	0.4	0.547	28.7	LOS C	11.7	82.9	0.89	0.76	40.3
6	R2	169	5.0	0.846	54.0	LOS D	8.4	61.3	1.00	1.00	19.1
Approach		485	2.4	0.846	37.8	LOS C	11.7	82.9	0.93	0.85	31.8
North: Shaftesbury Road											
7	L2	117	5.4	0.690	28.0	LOS B	18.0	133.0	0.88	0.80	32.4
8	T1	429	7.1	0.690	26.7	LOS B	18.0	133.0	0.89	0.82	12.3
9	R2	177	3.0	0.690	43.7	LOS D	9.3	67.1	0.98	0.98	25.6
Approach		723	5.8	0.690	31.1	LOS C	18.0	133.0	0.91	0.86	21.1
West: Railway Parade											
10	L2	143	0.0	0.861	45.2	LOS D	23.1	164.7	0.99	1.02	18.9
11	T1	341	3.4	0.861	39.7	LOS C	23.1	164.7	0.99	1.02	35.7
12	R2	26	0.0	0.127	45.7	LOS D	1.1	7.6	0.93	0.71	25.2
Approach		511	2.3	0.861	41.6	LOS C	23.1	164.7	0.99	1.00	30.4
All Vehicles		2361	4.2	0.861	38.5	LOS C	23.1	164.7	0.96	0.93	24.4

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	29.7	LOS C	0.1	0.1	0.81	0.81
P2	East Full Crossing	25	21.4	LOS C	0.0	0.0	0.69	0.69
P4	West Full Crossing	48	34.7	LOS D	0.1	0.1	0.88	0.88
All Pedestrians		140	29.9	LOS C			0.81	0.81

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 0784 [2017 AM Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	129	0.0	0.714	21.9	LOS B	10.8	75.3	0.93	0.87	31.1
2	T1	519	0.0	0.714	19.2	LOS B	10.8	75.3	0.95	0.88	23.4
3	R2	85	0.0	0.714	27.3	LOS B	6.8	47.7	0.99	0.90	32.4
Approach		734	0.0	0.714	20.6	LOS B	10.8	75.3	0.95	0.88	26.6
East: Victoria Street											
4	L2	89	0.0	0.892	35.0	LOS C	13.3	93.3	1.00	1.14	28.5
5	T1	81	0.0	0.892	30.5	LOS C	13.3	93.3	1.00	1.14	31.5
6	R2	253	0.0	0.892	35.0	LOS C	13.3	93.3	1.00	1.14	28.0
Approach		423	0.0	0.892	34.2	LOS C	13.3	93.3	1.00	1.14	28.9
North: Shaftesbury Road											
7	L2	34	0.0	0.803	32.1	LOS C	5.8	40.7	1.00	0.99	30.4
8	T1	358	0.0	0.803	27.6	LOS B	5.8	40.7	1.00	0.99	19.6
9	R2	19	0.0	0.803	32.3	LOS C	5.6	39.5	1.00	0.99	25.5
Approach		411	0.0	0.803	28.2	LOS B	5.8	40.7	1.00	0.99	21.2
West: Victoria Street											
10	L2	54	0.0	0.103	19.3	LOS B	1.0	7.0	0.77	0.70	30.0
11	T1	49	0.0	0.109	11.7	LOS A	1.2	8.6	0.70	0.60	40.8
12	R2	25	0.0	0.109	16.2	LOS B	1.2	8.6	0.70	0.60	34.7
Approach		128	0.0	0.109	15.7	LOS B	1.2	8.6	0.73	0.64	35.9
All Vehicles		1696	0.0	0.892	25.5	LOS B	13.3	93.3	0.96	0.95	27.0

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	16.9	LOS B	0.1	0.1	0.82	0.82
P2	East Full Crossing	74	19.4	LOS B	0.1	0.1	0.88	0.88
P3	North Full Crossing	189	16.9	LOS B	0.2	0.2	0.83	0.83
P4	West Full Crossing	221	17.0	LOS B	0.3	0.3	0.83	0.83
All Pedestrians		611	17.2	LOS B			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 0144 [2017 PM Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	426	0.0	0.343	9.2	LOS A	5.4	37.7	0.46	0.69	37.6
2	T1	458	0.0	0.825	27.3	LOS B	14.7	102.7	1.00	1.02	31.0
Approach		884	0.0	0.825	18.6	LOS B	14.7	102.7	0.74	0.86	33.3
North: Shaftesbry Road											
8	T1	291	0.0	0.287	8.9	LOS A	4.8	33.9	0.60	0.51	48.4
9	R2	216	0.0	0.867	41.4	LOS C	7.5	52.8	1.00	1.02	31.7
Approach		506	0.0	0.867	22.8	LOS B	7.5	52.8	0.77	0.73	38.4
West: Wilga Street											
10	L2	201	0.0	0.258	18.0	LOS B	3.9	27.2	0.69	0.75	42.7
12	R2	209	0.0	0.612	31.4	LOS C	6.0	42.0	0.97	0.82	25.7
Approach		411	0.0	0.612	24.8	LOS B	6.0	42.0	0.83	0.79	34.7
All Vehicles		1801	0.0	0.867	21.2	LOS B	14.7	102.7	0.77	0.81	35.2

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	24.4	LOS C	0.2	0.2	0.91	0.91
P4	West Full Crossing	212	16.3	LOS B	0.3	0.3	0.74	0.74
All Pedestrians		351	19.5	LOS B			0.81	0.81

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: ROAD DELAY SOLUTIONS PTY LTD | Processed: Wednesday, 19 June 2019 3:25:01 PM
Project: C:\Users\Glen Varley\Documents\28 34 Victoria St Burwood\2019 Revised Development\Sidra\2017 Base Victoria St Dev.sip7

MOVEMENT SUMMARY

Site: 0107 [2017 PM Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	33	22.6	0.828	57.3	LOS E	16.0	118.0	1.00	1.03	21.8
2	T1	593	4.4	0.828	50.0	LOS D	16.4	119.1	1.00	1.01	7.9
Approach		625	5.4	0.828	50.3	LOS D	16.4	119.1	1.00	1.01	9.1
East: Paisley Street											
4	L2	39	5.4	0.626	41.0	LOS C	13.1	92.3	0.94	0.80	26.0
5	T1	258	0.4	0.626	36.4	LOS C	13.1	92.3	0.94	0.80	33.2
6	R2	179	4.7	0.826	58.0	LOS E	9.6	69.7	1.00	0.94	20.1
Approach		476	2.4	0.826	44.9	LOS D	13.1	92.3	0.97	0.85	28.0
North: Shaftesbury Road											
7	L2	168	3.8	0.800	30.7	LOS C	29.1	210.3	0.91	0.86	29.3
8	T1	757	4.0	0.800	32.2	LOS C	29.1	210.3	0.94	0.89	11.1
9	R2	105	5.0	0.800	46.8	LOS D	17.6	127.5	1.00	0.95	23.7
Approach		1031	4.1	0.800	33.4	LOS C	29.1	210.3	0.94	0.89	17.2
West: Railway Parade											
10	L2	119	0.0	0.836	47.7	LOS D	19.0	136.4	0.99	1.01	16.5
11	T1	268	4.3	0.836	43.1	LOS D	19.0	136.4	0.99	1.01	31.1
12	R2	28	0.0	0.127	48.0	LOS D	1.3	8.9	0.93	0.71	22.8
Approach		416	2.8	0.836	44.7	LOS D	19.0	136.4	0.99	0.99	26.3
All Vehicles		2547	3.9	0.836	41.6	LOS C	29.1	210.3	0.97	0.93	20.7

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	36.2	LOS D	0.2	0.2	0.85	0.85
P2	East Full Crossing	25	19.2	LOS B	0.0	0.0	0.62	0.62
P4	West Full Crossing	48	37.9	LOS D	0.1	0.1	0.87	0.87
All Pedestrians		140	33.7	LOS D			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [2017 PM Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shaftesbury Road											
1	L2	188	0.0	0.677	20.3	LOS B	9.8	68.6	0.90	0.83	31.6
2	T1	474	0.0	0.677	18.2	LOS B	9.8	68.6	0.93	0.85	23.9
3	R2	73	0.0	0.677	25.7	LOS B	7.0	49.3	0.97	0.87	33.3
Approach		735	0.0	0.677	19.5	LOS B	9.8	68.6	0.93	0.85	27.6
East: Victoria Street											
4	L2	108	0.0	0.763	26.5	LOS B	9.2	64.1	0.98	0.95	32.0
5	T1	93	0.0	0.763	22.0	LOS B	9.2	64.1	0.98	0.95	34.9
6	R2	155	0.0	0.763	26.5	LOS B	9.2	64.1	0.98	0.95	31.5
Approach		356	0.0	0.763	25.3	LOS B	9.2	64.1	0.98	0.95	32.6
North: Shaftesbury Road											
7	L2	37	0.0	0.826	31.6	LOS C	7.9	55.3	1.00	1.03	30.6
8	T1	434	0.0	0.826	27.5	LOS B	7.9	55.3	1.00	1.03	19.6
9	R2	39	0.0	0.826	32.7	LOS C	6.5	45.6	1.00	1.03	25.2
Approach		509	0.0	0.826	28.2	LOS B	7.9	55.3	1.00	1.03	21.3
West: Victoria Street											
10	L2	180	0.0	0.371	21.6	LOS B	3.7	26.2	0.86	0.77	28.7
11	T1	153	0.0	0.739	19.5	LOS B	10.2	71.5	0.96	0.91	36.1
12	R2	265	0.0	0.739	24.1	LOS B	10.2	71.5	0.96	0.91	28.9
Approach		598	0.0	0.739	22.2	LOS B	10.2	71.5	0.93	0.87	31.3
All Vehicles		2198	0.0	0.826	23.2	LOS B	10.2	71.5	0.95	0.91	28.5

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	18.6	LOS B	0.2	0.2	0.86	0.86
P2	East Full Crossing	74	19.4	LOS B	0.1	0.1	0.88	0.88
P3	North Full Crossing	189	18.6	LOS B	0.2	0.2	0.87	0.87
P4	West Full Crossing	221	15.4	LOS B	0.2	0.2	0.79	0.79
All Pedestrians		611	17.5	LOS B			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

ROAD DELAY SOLUTIONS

MOVEMENT SUMMARY

Site: 0144 [2017 WE Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shaftesbury Road											
1	L2	333	0.0	0.274	9.4	LOS A	4.1	29.0	0.45	0.68	37.4
2	T1	407	0.0	0.779	25.6	LOS B	12.4	86.7	0.98	0.95	31.8
Approach		740	0.0	0.779	18.3	LOS B	12.4	86.7	0.75	0.83	33.6
North: Shaftesbry Road											
8	T1	360	0.0	0.355	9.3	LOS A	6.3	43.9	0.63	0.54	48.0
9	R2	221	0.0	0.789	36.8	LOS C	7.1	50.0	1.00	0.93	33.3
Approach		581	0.0	0.789	19.8	LOS B	7.1	50.0	0.77	0.69	40.1
West: Wilga Street											
10	L2	146	0.0	0.181	16.9	LOS B	2.7	18.6	0.65	0.73	43.4
12	R2	119	0.0	0.348	29.6	LOS C	3.2	22.3	0.91	0.77	26.5
Approach		265	0.0	0.348	22.6	LOS B	3.2	22.3	0.77	0.75	36.5
All Vehicles		1586	0.0	0.789	19.6	LOS B	12.4	86.7	0.76	0.77	36.6

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	24.4	LOS C	0.2	0.2	0.91	0.91
P4	West Full Crossing	212	17.0	LOS B	0.3	0.3	0.76	0.76
All Pedestrians		351	20.0	LOS B			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 0107 [2017 WE Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	37	20.0	0.795	48.7	LOS D	14.9	109.5	1.00	1.00	23.9
2	T1	632	4.2	0.795	41.9	LOS C	15.3	110.8	1.00	0.98	9.2
Approach		668	5.0	0.795	42.3	LOS C	15.3	110.8	1.00	0.98	10.5
East: Paisley Street											
4	L2	26	8.0	0.631	39.5	LOS C	10.8	76.5	0.96	0.81	26.6
5	T1	240	0.4	0.631	34.9	LOS C	10.8	76.5	0.96	0.81	33.7
6	R2	202	4.2	0.836	53.1	LOS D	9.9	71.5	1.00	0.96	21.2
Approach		468	2.5	0.836	43.0	LOS D	10.8	76.5	0.98	0.87	28.3
North: Shaftesbury Road											
7	L2	148	4.3	0.800	29.2	LOS C	26.4	192.0	0.91	0.87	30.0
8	T1	653	4.7	0.800	29.0	LOS C	26.4	192.0	0.93	0.89	12.0
9	R2	132	4.0	0.800	47.2	LOS D	12.3	89.1	1.00	0.96	23.4
Approach		933	4.5	0.800	31.6	LOS C	26.4	192.0	0.93	0.89	18.6
West: Railway Parade											
10	L2	140	0.0	0.769	38.7	LOS C	12.8	92.7	0.98	0.95	17.7
11	T1	184	6.3	0.769	34.2	LOS C	12.8	92.7	0.98	0.95	33.4
12	R2	31	0.0	0.123	42.6	LOS D	1.2	8.5	0.91	0.71	24.3
Approach		355	3.3	0.769	36.7	LOS C	12.8	92.7	0.97	0.93	26.3
All Vehicles		2424	4.1	0.836	37.5	LOS C	26.4	192.0	0.97	0.92	21.4

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	35.7	LOS D	0.2	0.2	0.89	0.89
P2	East Full Crossing	25	18.1	LOS B	0.0	0.0	0.63	0.63
P4	West Full Crossing	48	33.0	LOS D	0.1	0.1	0.86	0.86
All Pedestrians		140	31.6	LOS D			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [2017 WE Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	304	0.0	0.653	21.4	LOS B	8.5	59.3	0.91	0.84	30.0
2	T1	422	0.0	0.653	16.8	LOS B	8.6	60.2	0.91	0.81	25.2
3	R2	42	0.0	0.653	21.3	LOS B	8.6	60.2	0.91	0.81	35.9
Approach		768	0.0	0.653	18.8	LOS B	8.6	60.2	0.91	0.82	28.3
East: Victoria Street											
4	L2	75	0.0	0.623	23.5	LOS B	7.0	49.0	0.92	0.82	37.7
5	T1	126	0.0	0.623	18.0	LOS B	7.0	49.0	0.92	0.82	41.8
6	R2	109	0.0	0.623	23.5	LOS B	7.0	49.0	0.92	0.82	37.0
Approach		311	0.0	0.623	21.2	LOS B	7.0	49.0	0.92	0.82	39.2
North: Shaftesbury Road											
7	L2	23	0.0	0.780	30.8	LOS C	7.2	50.6	1.00	0.95	34.6
8	T1	394	0.0	0.780	25.9	LOS B	7.2	50.6	1.00	0.95	21.7
9	R2	47	0.0	0.780	32.5	LOS C	5.4	37.6	1.00	0.94	27.3
Approach		464	0.0	0.780	26.8	LOS B	7.2	50.6	1.00	0.95	23.4
West: Victoria Street											
10	L2	267	0.0	0.551	23.5	LOS B	5.9	41.3	0.91	0.81	29.9
11	T1	136	0.0	0.791	21.5	LOS B	11.5	80.5	0.98	0.96	39.4
12	R2	305	0.0	0.791	27.1	LOS B	11.5	80.5	0.98	0.96	29.6
Approach		708	0.0	0.791	24.7	LOS B	11.5	80.5	0.95	0.91	32.2
All Vehicles		2252	0.0	0.791	22.6	LOS B	11.5	80.5	0.95	0.87	30.7

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	18.6	LOS B	0.2	0.2	0.86	0.86
P2	East Full Crossing	74	19.4	LOS B	0.1	0.1	0.88	0.88
P3	North Full Crossing	189	18.6	LOS B	0.2	0.2	0.87	0.87
P4	West Full Crossing	221	15.4	LOS B	0.2	0.2	0.79	0.79
All Pedestrians		611	17.5	LOS B			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

2017 Development Shaftesbury Road Intersections – Movements

MOVEMENT SUMMARY

Site: 0144 [2017 AM Dev Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	81	0.0	0.064	10.2	LOS A	1.3	9.0	0.35	0.62	36.7
2	T1	699	0.0	0.938	54.2	LOS D	43.4	303.9	1.00	1.16	22.6
Approach		780	0.0	0.938	49.6	LOS D	43.4	303.9	0.93	1.11	23.2
North: Shaftesbry Road											
8	T1	297	0.0	0.237	8.1	LOS A	6.0	42.2	0.45	0.39	42.4
9	R2	304	0.0	0.959	75.2	LOS F	19.7	137.7	1.00	1.11	21.6
Approach		601	0.0	0.959	42.1	LOS C	19.7	137.7	0.73	0.76	27.4
West: Wilga Street											
10	L2	48	0.0	0.067	24.8	LOS B	1.5	10.2	0.65	0.68	34.8
12	R2	113	0.0	0.464	49.5	LOS D	5.3	36.9	0.97	0.78	18.6
Approach		161	0.0	0.464	42.1	LOS C	5.3	36.9	0.88	0.75	23.6
All Vehicles		1542	0.0	0.959	45.9	LOS D	43.4	303.9	0.85	0.93	24.9

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	44.4	LOS E	0.4	0.4	0.95	0.95
P4	West Full Crossing	212	17.0	LOS B	0.4	0.4	0.59	0.59
All Pedestrians		351	27.9	LOS C			0.73	0.73

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: ROAD DELAY SOLUTIONS PTY LTD | Processed: Wednesday, 19 June 2019 3:25:00 PM
Project: C:\Users\Glen Varley\Documents\28 34 Victoria St Burwood\2019 Revised Development\Sidra\2017 Base Victoria St Dev.sip7

MOVEMENT SUMMARY

Site: 0107 [2017 AM Dev Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	49	14.9	0.836	40.0	LOS C	11.8	87.1	1.00	1.03	26.5
2	T1	581	4.5	0.836	35.6	LOS C	12.2	88.5	1.00	1.03	10.4
Approach		631	5.3	0.836	35.9	LOS C	12.2	88.5	1.00	1.03	12.5
East: Paisley Street											
4	L2	62	3.4	0.745	33.7	LOS C	12.4	87.1	0.98	0.90	30.9
5	T1	301	0.3	0.745	28.4	LOS B	12.4	87.1	0.98	0.90	39.7
6	R2	166	5.1	0.808	42.1	LOS C	6.4	46.5	1.00	0.99	21.6
Approach		529	2.2	0.808	33.3	LOS C	12.4	87.1	0.98	0.93	33.0
North: Shaftesbury Road											
7	L2	89	7.1	0.579	22.6	LOS B	11.0	80.8	0.84	0.76	35.4
8	T1	529	5.8	0.579	21.4	LOS B	11.0	80.8	0.87	0.76	14.2
9	R2	56	9.4	0.579	27.4	LOS B	8.3	61.7	0.91	0.76	32.6
Approach		675	6.2	0.579	22.1	LOS B	11.0	80.8	0.87	0.76	20.7
West: Railway Parade											
10	L2	24	0.0	0.747	33.2	LOS C	11.9	85.3	0.96	0.89	21.6
11	T1	328	3.5	0.747	27.7	LOS B	11.9	85.3	0.96	0.89	41.1
12	R2	26	0.0	0.123	36.9	LOS C	0.8	5.9	0.93	0.71	28.1
Approach		379	3.1	0.747	28.7	LOS C	11.9	85.3	0.96	0.88	39.0
All Vehicles		2214	4.5	0.836	29.8	LOS C	12.4	88.5	0.95	0.90	27.6

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	27.5	LOS C	0.1	0.1	0.89	0.89
P2	East Full Crossing	25	18.6	LOS B	0.0	0.0	0.73	0.73
P4	West Full Crossing	48	28.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		140	26.2	LOS C			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 0784 [2017 AM Dev Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated   Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	151	1.0	0.662	32.3	LOS C	19.0	137.1	0.89	0.80	25.7
2	T1	482	5.0	0.662	31.1	LOS C	19.0	137.1	0.91	0.81	17.8
3	R2	128	0.0	0.662	42.2	LOS C	13.1	94.0	0.96	0.82	26.6
Approach		761	3.4	0.662	33.2	LOS C	19.0	137.1	0.92	0.81	21.6
East: Victoria Street											
4	L2	19	0.0	0.683	38.8	LOS C	16.0	111.7	0.94	0.83	27.4
5	T1	115	0.0	0.683	34.2	LOS C	16.0	111.7	0.94	0.83	30.5
6	R2	232	0.0	0.683	38.8	LOS C	16.0	111.7	0.94	0.83	26.9
Approach		365	0.0	0.683	37.3	LOS C	16.0	111.7	0.94	0.83	28.2
North: Shaftesbury Road											
7	L2	34	0.0	0.691	48.0	LOS D	10.7	77.8	0.99	0.86	25.0
8	T1	353	5.0	0.691	44.6	LOS D	10.7	77.8	0.99	0.86	14.3
9	R2	23	2.0	0.691	50.6	LOS D	9.1	66.0	1.00	0.86	19.4
Approach		409	4.4	0.691	45.3	LOS D	10.7	77.8	0.99	0.86	15.8
West: Victoria Street											
10	L2	66	0.0	0.104	28.7	LOS C	2.2	15.4	0.72	0.71	25.3
11	T1	3	0.0	0.117	21.5	LOS B	2.5	17.8	0.68	0.70	34.7
12	R2	78	0.0	0.117	26.0	LOS B	2.5	17.8	0.68	0.70	27.2
Approach		147	0.0	0.117	27.1	LOS B	2.5	17.8	0.70	0.71	26.5
All Vehicles		1683	2.6	0.691	36.5	LOS C	19.0	137.1	0.92	0.82	22.5

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	22.6	LOS C	0.2	0.2	0.67	0.67
P2	East Full Crossing	74	38.0	LOS D	0.2	0.2	0.87	0.87
P3	North Full Crossing	189	22.6	LOS C	0.4	0.4	0.68	0.68
P4	West Full Crossing	221	21.3	LOS C	0.4	0.4	0.66	0.66
All Pedestrians		611	24.0	LOS C			0.69	0.69

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 0107 [2017 PM Dev Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	33	22.6	0.748	39.9	LOS C	9.6	71.4	0.99	0.96	26.6
2	T1	531	5.0	0.748	33.3	LOS C	10.0	72.9	0.99	0.94	11.0
Approach		563	6.0	0.748	33.7	LOS C	10.0	72.9	0.99	0.94	12.6
East: Paisley Street											
4	L2	22	9.5	0.749	34.7	LOS C	11.4	80.5	0.99	0.92	28.3
5	T1	307	0.3	0.749	30.1	LOS C	11.4	80.5	0.99	0.92	35.3
6	R2	53	16.0	0.366	40.0	LOS C	1.8	14.7	0.98	0.74	24.5
Approach		382	3.0	0.749	31.7	LOS C	11.4	80.5	0.99	0.89	33.8
North: Shaftesbury Road											
7	L2	174	3.6	0.723	22.1	LOS B	16.6	121.0	0.87	0.81	33.3
8	T1	536	5.7	0.723	21.6	LOS B	16.6	121.0	0.90	0.83	14.7
9	R2	106	5.0	0.723	35.7	LOS C	8.3	60.9	0.99	0.90	27.0
Approach		816	5.2	0.723	23.6	LOS B	16.6	121.0	0.91	0.84	22.9
West: Railway Parade											
10	L2	85	0.0	0.721	31.7	LOS C	9.6	69.4	0.96	0.91	19.0
11	T1	222	5.2	0.721	27.2	LOS B	9.6	69.4	0.96	0.91	36.0
12	R2	28	0.0	0.178	38.7	LOS C	1.0	6.7	0.96	0.71	25.4
Approach		336	3.4	0.721	29.3	LOS C	9.6	69.4	0.96	0.89	30.7
All Vehicles		2097	4.7	0.749	28.7	LOS C	16.6	121.0	0.95	0.88	26.0

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	29.3	LOS C	0.1	0.1	0.92	0.92
P2	East Full Crossing	25	15.8	LOS B	0.0	0.0	0.67	0.67
P4	West Full Crossing	48	28.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		140	26.6	LOS C			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [2017 PM Dev Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated   Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	49	0.0	0.690	24.4	LOS B	14.7	102.6	0.90	0.80	30.1
2	T1	469	0.0	0.690	20.4	LOS B	14.7	102.6	0.90	0.80	23.2
3	R2	118	0.0	0.690	40.3	LOS C	4.9	34.2	1.00	0.87	26.6
Approach		637	0.0	0.690	24.4	LOS B	14.7	102.6	0.92	0.81	24.9
East: Victoria Street											
4	L2	61	0.0	0.710	29.6	LOS C	12.9	90.3	0.95	0.86	30.8
5	T1	127	0.0	0.710	25.0	LOS B	12.9	90.3	0.95	0.86	33.7
6	R2	215	0.0	0.710	29.6	LOS C	12.9	90.3	0.95	0.86	30.3
Approach		403	0.0	0.710	28.1	LOS B	12.9	90.3	0.95	0.86	31.6
North: Shaftesbury Road											
7	L2	36	0.0	0.654	33.1	LOS C	8.7	60.7	0.97	0.83	30.0
8	T1	461	0.0	0.654	29.0	LOS C	8.7	60.7	0.97	0.83	19.1
9	R2	17	0.0	0.654	33.9	LOS C	8.3	58.0	0.97	0.84	24.9
Approach		514	0.0	0.654	29.4	LOS C	8.7	60.7	0.97	0.83	20.5
West: Victoria Street											
10	L2	27	0.0	0.121	19.5	LOS B	1.9	13.4	0.68	0.59	31.9
11	T1	201	0.0	0.603	17.7	LOS B	12.2	85.1	0.80	0.74	37.1
12	R2	297	0.0	0.603	23.4	LOS B	12.2	85.1	0.86	0.80	29.2
Approach		525	0.0	0.603	21.0	LOS B	12.2	85.1	0.83	0.76	33.1
All Vehicles		2079	0.0	0.710	25.5	LOS B	14.7	102.6	0.91	0.81	27.9

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	18.0	LOS B	0.2	0.2	0.72	0.72
P2	East Full Crossing	74	25.8	LOS C	0.1	0.1	0.86	0.86
P3	North Full Crossing	189	18.0	LOS B	0.3	0.3	0.72	0.72
P4	West Full Crossing	221	19.5	LOS B	0.3	0.3	0.75	0.75
All Pedestrians		611	19.5	LOS B			0.75	0.75

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 0144 [2017 WE Dev Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shaftesbury Road											
1	L2	24	0.0	0.017	7.2	LOS A	0.2	1.7	0.25	0.58	39.6
2	T1	777	0.0	0.892	36.2	LOS C	38.2	267.5	0.99	1.05	27.6
Approach		801	0.0	0.892	35.3	LOS C	38.2	267.5	0.97	1.04	27.8
North: Shaftesbry Road											
8	T1	475	0.0	0.396	9.6	LOS A	10.6	74.0	0.55	0.49	47.7
9	R2	167	0.0	0.897	60.7	LOS E	8.7	61.0	1.00	1.00	26.2
Approach		642	0.0	0.897	22.9	LOS B	10.6	74.0	0.67	0.62	37.9
West: Wilga Street											
10	L2	72	0.0	0.123	29.4	LOS C	2.3	15.8	0.75	0.73	36.6
12	R2	102	0.0	0.379	44.4	LOS D	4.2	29.4	0.95	0.78	21.0
Approach		174	0.0	0.379	38.2	LOS C	4.2	29.4	0.87	0.76	27.8
All Vehicles		1617	0.0	0.897	30.7	LOS C	38.2	267.5	0.84	0.84	31.3

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	39.4	LOS D	0.3	0.3	0.94	0.94
P4	West Full Crossing	212	12.4	LOS B	0.3	0.3	0.53	0.53
All Pedestrians		351	23.1	LOS C			0.69	0.69

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: ROAD DELAY SOLUTIONS PTY LTD | Processed: Wednesday, 19 June 2019 3:25:03 PM
Project: C:\Users\Glen Varley\Documents\28 34 Victoria St Burwood\2019 Revised Development\Sidra\2017 Base Victoria St Dev.sip7

MOVEMENT SUMMARY

Site: 0107 [2017 WE Dev Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated   Cycle Time = 80 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	37	20.0	0.738	41.8	LOS C	13.1	96.2	0.98	0.94	26.0
2	T1	663	4.0	0.738	34.5	LOS C	13.5	97.7	0.98	0.91	10.7
Approach		700	4.8	0.738	34.9	LOS C	13.5	97.7	0.98	0.92	12.1
East: Paisley Street											
4	L2	59	3.6	0.737	35.9	LOS C	13.8	97.2	0.97	0.89	27.7
5	T1	304	0.3	0.737	31.3	LOS C	13.8	97.2	0.97	0.89	34.8
6	R2	61	13.8	0.319	41.9	LOS C	2.3	18.2	0.96	0.75	24.0
Approach		424	2.7	0.737	33.5	LOS C	13.8	97.2	0.97	0.87	32.7
North: Shaftesbury Road											
7	L2	119	5.3	0.617	24.2	LOS B	14.2	104.0	0.84	0.76	32.3
8	T1	567	5.4	0.617	24.6	LOS B	14.2	104.0	0.88	0.77	13.6
9	R2	31	17.2	0.617	34.7	LOS C	9.3	68.5	0.95	0.80	27.8
Approach		717	5.9	0.617	24.9	LOS B	14.2	104.0	0.88	0.77	19.4
West: Railway Parade											
10	L2	82	0.0	0.715	34.4	LOS C	12.1	87.0	0.95	0.89	18.6
11	T1	262	4.4	0.715	29.9	LOS C	12.1	87.0	0.95	0.89	35.1
12	R2	31	0.0	0.145	40.5	LOS C	1.1	7.9	0.93	0.71	24.8
Approach		375	3.1	0.715	31.7	LOS C	12.1	87.0	0.95	0.88	30.6
All Vehicles		2216	4.5	0.738	30.9	LOS C	14.2	104.0	0.94	0.85	24.7

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	29.8	LOS C	0.1	0.1	0.86	0.86
P2	East Full Crossing	25	18.9	LOS B	0.0	0.0	0.69	0.69
P4	West Full Crossing	48	28.1	LOS C	0.1	0.1	0.84	0.84
All Pedestrians		140	27.3	LOS C			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [2017 WE Dev Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shaftesbury Road											
1	L2	138	0.0	0.817	36.7	LOS C	24.9	174.2	0.97	0.94	24.2
2	T1	466	0.0	0.817	33.1	LOS C	24.9	174.2	0.97	0.94	17.3
3	R2	189	0.0	0.817	50.6	LOS D	10.5	73.5	1.00	0.95	23.8
Approach		794	0.0	0.817	37.9	LOS C	24.9	174.2	0.98	0.94	20.8
East: Victoria Street											
4	L2	74	0.0	0.870	46.2	LOS D	25.1	175.7	1.00	0.99	27.3
5	T1	141	0.0	0.870	40.6	LOS C	25.1	175.7	1.00	0.99	31.3
6	R2	298	0.0	0.870	46.1	LOS D	25.1	175.7	1.00	0.99	26.7
Approach		513	0.0	0.870	44.6	LOS D	25.1	175.7	1.00	0.99	28.1
North: Shaftesbury Road											
7	L2	51	0.0	0.847	49.9	LOS D	16.3	114.2	1.00	1.00	26.6
8	T1	507	0.0	0.847	45.5	LOS D	16.3	114.2	1.00	1.00	14.8
9	R2	47	0.0	0.847	52.5	LOS D	13.0	91.3	1.00	0.99	20.1
Approach		605	0.0	0.847	46.4	LOS D	16.3	114.2	1.00	1.00	16.5
West: Victoria Street											
10	L2	141	0.0	0.219	28.1	LOS B	4.4	30.8	0.75	0.75	27.4
11	T1	186	0.0	0.714	25.2	LOS B	19.7	137.9	0.91	0.84	37.7
12	R2	341	0.0	0.714	30.7	LOS C	19.7	137.9	0.91	0.84	27.8
Approach		668	0.0	0.714	28.6	LOS C	19.7	137.9	0.87	0.82	31.2
All Vehicles		2580	0.0	0.870	38.8	LOS C	25.1	175.7	0.96	0.93	24.1

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	20.1	LOS C	0.2	0.2	0.67	0.67
P2	East Full Crossing	74	32.2	LOS D	0.2	0.2	0.85	0.85
P3	North Full Crossing	189	20.2	LOS C	0.3	0.3	0.67	0.67
P4	West Full Crossing	221	21.6	LOS C	0.4	0.4	0.70	0.70
All Pedestrians		611	22.1	LOS C			0.70	0.70

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

2026 Do Nothing Shaftesbury Road Intersections

MOVEMENT SUMMARY

Site: 0144 [2026 AM Do Nothing Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated   Cycle Time = 100 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	84	0.0	0.065	9.8	LOS A	1.3	9.1	0.34	0.62	36.0
2	T1	769	0.0	0.996	79.3	LOS F	58.1	407.0	1.00	1.35	18.0
Approach		854	0.0	0.996	72.4	LOS F	58.1	407.0	0.94	1.28	18.6
North: Shaftesbry Road											
8	T1	422	0.0	0.333	8.7	LOS A	9.3	64.8	0.49	0.43	41.8
9	R2	296	0.0	0.986	86.9	LOS F	20.6	144.5	1.00	1.17	19.3
Approach		718	0.0	0.986	40.9	LOS C	20.6	144.5	0.70	0.74	27.1
West: Wilga Street											
10	L2	123	0.0	0.172	26.5	LOS B	4.0	27.7	0.70	0.73	33.5
12	R2	69	0.0	0.283	48.2	LOS D	3.2	22.1	0.94	0.75	17.7
Approach		193	0.0	0.283	34.3	LOS C	4.0	27.7	0.79	0.74	28.1
All Vehicles		1764	0.0	0.996	55.5	LOS D	58.1	407.0	0.82	1.00	22.5

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	44.4	LOS E	0.4	0.4	0.95	0.95
P4	West Full Crossing	212	16.4	LOS B	0.3	0.3	0.58	0.58
All Pedestrians		351	27.5	LOS C			0.72	0.72

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: C:\Users\Glen Varley\Documents\28 34 Victoria St Burwood\2019 Revised Development\Sidra\2026 Burwood Towers Do Nothing.sip7

MOVEMENT SUMMARY

Site: 0107 [2026 AM Do Nothing Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	49	14.9	0.957	75.6	LOS F	18.4	135.9	1.00	1.24	18.3
2	T1	524	5.0	0.957	71.2	LOS F	18.9	138.0	1.00	1.24	5.8
Approach		574	5.9	0.957	71.6	LOS F	18.9	138.0	1.00	1.24	7.3
East: Paisley Street											
4	L2	41	5.1	0.486	34.3	LOS C	11.2	79.2	0.85	0.74	30.9
5	T1	245	0.4	0.486	28.9	LOS C	11.2	79.2	0.85	0.74	39.7
6	R2	194	4.3	0.950	74.2	LOS F	12.3	89.1	1.00	1.17	16.1
Approach		480	2.4	0.950	47.7	LOS D	12.3	89.1	0.91	0.91	27.6
North: Shaftesbury Road											
7	L2	79	8.0	0.808	37.5	LOS C	24.5	179.9	0.95	0.91	28.1
8	T1	591	5.2	0.808	37.8	LOS C	24.5	179.9	0.96	0.97	9.5
9	R2	149	3.5	0.808	51.9	LOS D	13.9	101.0	1.00	1.13	23.3
Approach		819	5.1	0.808	40.4	LOS C	24.5	179.9	0.97	0.99	15.4
West: Railway Parade											
10	L2	113	0.0	0.908	54.6	LOS D	31.5	224.5	1.00	1.09	17.5
11	T1	439	2.6	0.908	49.1	LOS D	31.5	224.5	1.00	1.09	32.9
12	R2	33	0.0	0.146	49.1	LOS D	1.5	10.3	0.93	0.72	24.2
Approach		584	2.0	0.908	50.1	LOS D	31.5	224.5	1.00	1.07	29.4
All Vehicles		2457	4.0	0.957	51.4	LOS D	31.5	224.5	0.97	1.05	20.7

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	29.7	LOS C	0.1	0.1	0.77	0.77
P2	East Full Crossing	25	24.5	LOS C	0.1	0.1	0.70	0.70
P4	West Full Crossing	48	40.6	LOS E	0.1	0.1	0.90	0.90
All Pedestrians		140	32.5	LOS D			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 0784 [2026 AM Do Nothing Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	108	0.0	0.644	34.0	LOS C	17.7	124.0	0.90	0.80	25.1
2	T1	597	0.0	0.644	28.2	LOS B	19.1	133.5	0.89	0.80	18.9
3	R2	205	0.0	0.644	31.3	LOS C	19.1	133.5	0.87	0.80	30.5
Approach		911	0.0	0.644	29.6	LOS C	19.1	133.5	0.88	0.80	23.3
East: Victoria Street											
4	L2	67	0.0	0.653	35.6	LOS C	16.8	117.4	0.91	0.83	28.3
5	T1	79	0.0	0.653	31.0	LOS C	16.8	117.4	0.91	0.83	31.4
6	R2	254	0.0	0.653	35.6	LOS C	16.8	117.4	0.91	0.83	27.8
Approach		400	0.0	0.653	34.7	LOS C	16.8	117.4	0.91	0.83	28.7
North: Shaftesbury Road											
7	L2	19	0.0	0.605	42.2	LOS C	11.8	82.8	0.95	0.80	26.8
8	T1	469	0.0	0.605	38.4	LOS C	11.8	82.8	0.95	0.80	16.0
9	R2	19	0.0	0.605	43.8	LOS D	10.8	75.9	0.96	0.80	21.4
Approach		507	0.0	0.605	38.8	LOS C	11.8	82.8	0.95	0.80	16.8
West: Victoria Street											
10	L2	15	0.0	0.043	23.3	LOS B	1.0	6.7	0.63	0.56	29.2
11	T1	72	0.0	0.216	19.5	LOS B	5.3	36.9	0.66	0.65	36.2
12	R2	118	0.0	0.216	24.3	LOS B	5.3	36.9	0.68	0.68	28.6
Approach		204	0.0	0.216	22.5	LOS B	5.3	36.9	0.67	0.66	32.0
All Vehicles		2022	0.0	0.653	32.2	LOS C	19.1	133.5	0.89	0.79	24.1

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	20.0	LOS B	0.2	0.2	0.63	0.63
P2	East Full Crossing	74	33.7	LOS D	0.2	0.2	0.82	0.82
P3	North Full Crossing	189	20.0	LOS C	0.3	0.3	0.64	0.64
P4	West Full Crossing	221	24.0	LOS C	0.4	0.4	0.70	0.70
All Pedestrians		611	23.1	LOS C			0.68	0.68

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 0144 [2026 PM Do Nothing Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	191	0.0	0.138	7.3	LOS A	1.8	12.9	0.30	0.62	39.5
2	T1	656	0.0	0.872	30.8	LOS C	25.5	178.6	0.99	1.08	29.6
Approach		846	0.0	0.872	25.5	LOS B	25.5	178.6	0.84	0.98	30.9
North: Shaftesbry Road											
8	T1	497	0.0	0.457	9.9	LOS A	10.1	70.6	0.64	0.56	47.4
9	R2	118	0.0	0.741	43.8	LOS D	4.4	31.0	1.00	0.88	30.8
Approach		615	0.0	0.741	16.4	LOS B	10.1	70.6	0.71	0.62	42.1
West: Wilga Street											
10	L2	84	0.0	0.132	22.7	LOS B	2.0	14.0	0.72	0.73	40.0
12	R2	57	0.0	0.179	33.1	LOS C	1.7	12.0	0.89	0.74	24.9
Approach		141	0.0	0.179	26.9	LOS B	2.0	14.0	0.79	0.73	34.6
All Vehicles		1602	0.0	0.872	22.1	LOS B	25.5	178.6	0.78	0.82	35.1

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	29.4	LOS C	0.3	0.3	0.92	0.92
P4	West Full Crossing	212	13.3	LOS B	0.3	0.3	0.62	0.62
All Pedestrians		351	19.7	LOS B			0.74	0.74

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: ROAD DELAY SOLUTIONS PTY LTD | Processed: Thursday, 23 May 2019 10:51:54 AM
Project: C:\Users\Glen Varley\Documents\28 34 Victoria St Burwood\2019 Revised Development\Sidra\2026 Burwood Towers Do Nothing.sip7

MOVEMENT SUMMARY

Site: 101 [2026 PM Do Nothing Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 110 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	59	0.0	0.531	33.5	LOS C	16.1	112.7	0.84	0.74	25.5
2	T1	509	0.0	0.531	29.4	LOS C	16.1	112.7	0.84	0.75	18.6
3	R2	173	0.0	0.531	34.9	LOS C	15.2	106.2	0.85	0.77	29.0
Approach		741	0.0	0.531	31.0	LOS C	16.1	112.7	0.84	0.76	22.6
East: Victoria Street											
4	L2	105	0.0	0.517	32.0	LOS C	15.5	108.2	0.82	0.79	29.7
5	T1	92	0.0	0.517	27.4	LOS B	15.5	108.2	0.82	0.79	32.7
6	R2	182	0.0	0.517	32.0	LOS C	15.5	108.2	0.82	0.79	29.2
Approach		379	0.0	0.517	30.9	LOS C	15.5	108.2	0.82	0.79	30.3
North: Shaftesbury Road											
7	L2	54	0.0	0.528	36.3	LOS C	14.6	102.1	0.86	0.75	28.8
8	T1	531	0.0	0.528	33.4	LOS C	14.6	102.1	0.88	0.76	17.4
9	R2	47	0.0	0.528	39.9	LOS C	13.3	93.2	0.89	0.77	22.5
Approach		632	0.0	0.528	34.1	LOS C	14.6	102.1	0.88	0.76	19.2
West: Victoria Street											
10	L2	162	0.0	0.203	25.6	LOS B	5.4	37.7	0.66	0.73	26.7
11	T1	193	0.0	0.544	22.0	LOS B	18.2	127.5	0.76	0.75	35.1
12	R2	289	0.0	0.544	26.5	LOS B	18.2	127.5	0.76	0.75	27.7
Approach		644	0.0	0.544	24.9	LOS B	18.2	127.5	0.74	0.75	30.3
All Vehicles		2396	0.0	0.544	30.2	LOS C	18.2	127.5	0.82	0.76	25.5

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	18.1	LOS B	0.2	0.2	0.58	0.58
P2	East Full Crossing	74	27.7	LOS C	0.2	0.2	0.71	0.71
P3	North Full Crossing	189	18.2	LOS B	0.3	0.3	0.58	0.58
P4	West Full Crossing	221	28.6	LOS C	0.5	0.5	0.72	0.72
All Pedestrians		611	23.1	LOS C			0.65	0.65

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 0107 [2026 PM Do Nothong Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 110 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shaftesbury Road											
1	L2	22	33.3	0.746	59.9	LOS E	13.2	98.8	1.00	0.94	21.2
2	T1	482	5.5	0.746	51.9	LOS D	13.7	100.4	1.00	0.92	7.7
Approach		504	6.7	0.746	52.2	LOS D	13.7	100.4	1.00	0.92	8.6
East: Paisley Street											
4	L2	22	9.5	0.693	25.8	LOS B	16.1	113.0	0.92	0.80	32.2
5	T1	438	0.2	0.693	21.2	LOS B	16.1	113.0	0.92	0.80	38.7
6	R2	126	6.7	0.435	50.3	LOS D	6.3	46.3	0.95	0.79	21.8
Approach		586	2.0	0.693	27.7	LOS B	16.1	113.0	0.92	0.80	34.9
North: Shaftesbury Road											
7	L2	104	6.1	0.706	34.2	LOS C	22.5	163.9	0.89	0.80	27.9
8	T1	652	4.7	0.706	35.2	LOS C	22.5	163.9	0.93	0.82	10.4
9	R2	48	10.9	0.706	46.5	LOS D	15.2	111.7	0.97	0.85	23.9
Approach		804	5.2	0.706	35.7	LOS C	22.5	163.9	0.92	0.82	15.0
West: Railway Parade											
10	L2	122	0.0	0.706	40.9	LOS C	16.9	121.6	0.93	0.86	17.5
11	T1	253	4.6	0.706	36.3	LOS C	16.9	121.6	0.93	0.86	32.9
12	R2	28	0.0	0.281	62.0	LOS E	1.6	11.0	0.99	0.72	19.8
Approach		403	2.9	0.706	39.5	LOS C	16.9	121.6	0.94	0.85	27.2
All Vehicles		2298	4.3	0.746	38.0	LOS C	22.5	163.9	0.94	0.84	23.3

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	35.3	LOS D	0.2	0.2	0.80	0.80
P2	East Full Crossing	25	25.6	LOS C	0.1	0.1	0.68	0.68
P4	West Full Crossing	48	42.9	LOS E	0.1	0.1	0.88	0.88
All Pedestrians		140	36.2	LOS D			0.81	0.81

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 0144 [2026 WE Do Nothing Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated   Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	132	0.0	0.087	6.6	LOS A	1.3	8.9	0.22	0.59	40.2
2	T1	515	0.0	0.800	36.1	LOS C	24.4	170.5	0.98	0.92	27.7
Approach		646	0.0	0.800	30.1	LOS C	24.4	170.5	0.82	0.85	29.0
North: Shaftesbry Road											
8	T1	242	0.0	0.270	17.7	LOS B	7.2	50.4	0.66	0.56	40.6
9	R2	92	0.0	0.704	59.3	LOS E	4.8	33.5	1.00	0.84	26.5
Approach		334	0.0	0.704	29.1	LOS C	7.2	50.4	0.75	0.63	34.5
West: Wilga Street											
10	L2	146	0.0	0.179	23.7	LOS B	4.3	30.1	0.64	0.73	39.4
12	R2	415	0.0	0.792	42.3	LOS C	19.4	135.7	0.95	0.89	21.6
Approach		561	0.0	0.792	37.5	LOS C	19.4	135.7	0.87	0.85	26.5
All Vehicles		1541	0.0	0.800	32.6	LOS C	24.4	170.5	0.82	0.80	29.3

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	29.0	LOS C	0.3	0.3	0.76	0.76
P4	West Full Crossing	212	20.0	LOS C	0.4	0.4	0.64	0.64
All Pedestrians		351	23.6	LOS C			0.69	0.69

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 0107 [2026 WE Do Nothing Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated   Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	15	50.0	0.871	60.3	LOS E	17.9	132.0	1.00	1.08	21.1
2	T1	642	4.1	0.871	53.6	LOS D	18.2	131.5	1.00	1.07	7.5
Approach		657	5.1	0.871	53.7	LOS D	18.2	132.0	1.00	1.07	8.0
East: Paisley Street											
4	L2	16	13.3	0.371	24.5	LOS B	4.7	33.5	0.88	0.72	32.8
5	T1	153	0.7	0.371	19.8	LOS B	4.7	33.5	0.88	0.72	39.2
6	R2	49	17.0	0.119	36.1	LOS C	1.9	15.1	0.81	0.72	25.7
Approach		218	5.3	0.371	23.8	LOS B	4.7	33.5	0.86	0.72	36.1
North: Shaftesbury Road											
7	L2	149	4.2	0.838	38.5	LOS C	29.4	213.3	0.96	0.94	26.3
8	T1	711	4.3	0.838	39.5	LOS C	29.4	213.3	0.97	0.96	9.5
9	R2	65	8.1	0.838	52.3	LOS D	16.5	120.4	1.00	1.00	22.3
Approach		925	4.6	0.838	40.3	LOS C	29.4	213.3	0.97	0.96	14.6
West: Railway Parade											
10	L2	91	0.0	0.783	49.6	LOS D	12.1	87.7	1.00	0.99	16.2
11	T1	169	6.8	0.783	45.0	LOS D	12.1	87.7	1.00	0.99	30.5
12	R2	31	0.0	0.126	47.0	LOS D	1.3	9.4	0.92	0.72	23.1
Approach		291	4.0	0.783	46.6	LOS D	12.1	87.7	0.99	0.96	25.2
All Vehicles		2091	4.7	0.871	43.7	LOS D	29.4	213.3	0.97	0.97	18.0

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	42.4	LOS E	0.2	0.2	0.92	0.92
P2	East Full Crossing	25	23.1	LOS C	0.0	0.0	0.68	0.68
P4	West Full Crossing	48	37.9	LOS D	0.1	0.1	0.87	0.87
All Pedestrians		140	37.4	LOS D			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [2026 WE Do Nothing Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Shaftesbury Road											
1	L2	124	0.0	0.617	18.5	LOS B	8.8	61.6	0.86	0.77	33.2
2	T1	307	0.0	0.617	13.9	LOS A	8.8	61.6	0.86	0.77	27.2
3	R2	243	0.0	0.814	31.8	LOS C	6.8	47.6	1.00	0.99	29.2
Approach		675	0.0	0.814	21.2	LOS B	8.8	61.6	0.91	0.85	29.3
East: Victoria Street											
4	L2	96	0.0	0.864	33.4	LOS C	11.5	80.6	1.00	1.07	32.0
5	T1	93	0.0	0.864	27.9	LOS B	11.5	80.6	1.00	1.07	36.1
6	R2	201	0.0	0.864	33.4	LOS C	11.5	80.6	1.00	1.07	31.4
Approach		389	0.0	0.864	32.1	LOS C	11.5	80.6	1.00	1.07	32.8
North: Shaftesbury Road											
7	L2	27	0.0	0.785	32.5	LOS C	5.7	39.6	1.00	0.94	33.6
8	T1	344	0.0	0.785	26.9	LOS B	5.8	40.8	1.00	0.94	21.1
9	R2	47	0.0	0.785	32.4	LOS C	5.8	40.8	1.00	0.94	27.4
Approach		419	0.0	0.785	27.9	LOS B	5.8	40.8	1.00	0.94	23.2
West: Victoria Street											
10	L2	109	0.0	0.226	21.8	LOS B	2.2	15.2	0.82	0.75	31.0
11	T1	163	0.0	0.852	25.2	LOS B	13.8	96.5	1.00	1.06	37.6
12	R2	316	0.0	0.852	30.8	LOS C	13.8	96.5	1.00	1.06	27.8
Approach		588	0.0	0.852	27.6	LOS B	13.8	96.5	0.97	1.00	31.7
All Vehicles		2072	0.0	0.864	26.4	LOS B	13.8	96.5	0.96	0.95	29.9

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	18.6	LOS B	0.2	0.2	0.86	0.86
P2	East Full Crossing	74	19.4	LOS B	0.1	0.1	0.88	0.88
P3	North Full Crossing	189	18.6	LOS B	0.2	0.2	0.87	0.87
P4	West Full Crossing	221	15.4	LOS B	0.2	0.2	0.79	0.79
All Pedestrians		611	17.5	LOS B			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

2026 Development with S94 Shaftesbury Road Intersections

MOVEMENT SUMMARY

Site: 0144 [2026 AM S94 Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	215	0.0	0.150	8.0	LOS A	2.8	19.4	0.29	0.62	38.8
2	T1	827	0.0	0.908	40.8	LOS C	46.0	322.0	1.00	1.07	26.1
Approach		1042	0.0	0.908	34.0	LOS C	46.0	322.0	0.85	0.98	27.5
North: Shaftesbry Road											
8	T1	466	0.0	0.368	9.0	LOS A	10.5	73.7	0.51	0.45	41.6
9	R2	198	0.0	0.875	61.4	LOS E	11.0	77.1	1.00	0.99	24.1
Approach		664	0.0	0.875	24.6	LOS B	11.0	77.1	0.65	0.61	33.1
West: Wilga Street											
10	L2	63	0.0	0.108	30.9	LOS C	2.2	15.3	0.75	0.71	32.4
12	R2	118	0.0	0.481	49.6	LOS D	5.5	38.8	0.97	0.79	18.6
Approach		181	0.0	0.481	43.1	LOS D	5.5	38.8	0.89	0.76	23.7
All Vehicles		1887	0.0	0.908	31.6	LOS C	46.0	322.0	0.79	0.83	29.0

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	44.4	LOS E	0.4	0.4	0.95	0.95
P4	West Full Crossing	212	12.6	LOS B	0.3	0.3	0.50	0.50
All Pedestrians		351	25.2	LOS C			0.68	0.68

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: ROAD DELAY SOLUTIONS PTY LTD | Processed: Monday, 27 May 2019 9:01:09 AM
Project: C:\Users\Glen Varley\Documents\28 34 Victoria St Burwood\2019 Revised Development\Sidra\2026 Burwood Towers S94.sip7

MOVEMENT SUMMARY

Site: 0107 [2026 AM S94 Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	39	18.9	0.762	45.4	LOS D	15.4	113.1	0.98	0.91	24.9
2	T1	609	4.3	0.762	41.0	LOS C	15.8	114.8	0.98	0.91	9.3
Approach		648	5.2	0.762	41.2	LOS C	15.8	114.8	0.98	0.91	10.8
East: Paisley Street											
4	L2	44	4.8	0.572	45.1	LOS D	8.9	63.5	0.95	0.80	26.2
5	T1	154	0.7	0.572	40.0	LOS C	8.9	63.5	0.95	0.80	35.0
6	R2	172	4.9	0.780	54.3	LOS D	8.9	65.1	1.00	0.92	19.1
Approach		369	3.1	0.780	47.3	LOS D	8.9	65.1	0.98	0.85	26.5
North: Shaftesbury Road											
7	L2	128	4.9	0.581	22.8	LOS B	17.0	124.0	0.75	0.72	35.3
8	T1	574	5.3	0.581	23.9	LOS B	17.0	124.0	0.80	0.79	13.2
9	R2	112	4.7	0.581	34.5	LOS C	12.4	90.5	0.89	0.91	29.2
Approach		814	5.2	0.581	25.1	LOS B	17.0	124.0	0.80	0.79	21.2
West: Railway Parade											
10	L2	115	0.0	0.759	47.7	LOS D	13.4	97.0	0.98	0.90	18.3
11	T1	163	7.1	0.759	42.1	LOS C	13.4	97.0	0.98	0.90	34.7
12	R2	38	0.0	0.157	48.2	LOS D	1.7	11.8	0.92	0.73	24.4
Approach		316	3.7	0.759	44.9	LOS D	13.4	97.0	0.97	0.88	27.4
All Vehicles		2147	4.6	0.780	36.7	LOS C	17.0	124.0	0.91	0.85	21.6

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	40.6	LOS E	0.2	0.2	0.90	0.90
P2	East Full Crossing	25	16.8	LOS B	0.0	0.0	0.58	0.58
P4	West Full Crossing	48	34.5	LOS D	0.1	0.1	0.83	0.83
All Pedestrians		140	34.2	LOS D			0.82	0.82

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 0784 [2026 AM S94 Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	194	0.0	0.749	43.3	LOS D	17.2	120.7	0.98	0.88	21.5
2	T1	556	0.0	0.749	33.9	LOS C	22.3	156.0	0.96	0.86	16.9
3	R2	125	0.0	0.749	36.3	LOS C	22.3	156.0	0.94	0.86	28.9
Approach		875	0.0	0.749	36.4	LOS C	22.3	156.0	0.96	0.87	20.4
East: Victoria Street											
4	L2	55	0.0	0.753	33.4	LOS C	23.1	161.6	0.93	0.87	29.0
5	T1	87	0.0	0.753	28.8	LOS C	23.1	161.6	0.93	0.87	32.0
6	R2	400	0.0	0.753	33.4	LOS C	23.1	161.6	0.93	0.87	28.5
Approach		542	0.0	0.753	32.7	LOS C	23.1	161.6	0.93	0.87	29.2
North: Shaftesbury Road											
7	L2	29	0.0	0.745	46.2	LOS D	14.9	104.6	0.99	0.90	25.6
8	T1	471	0.0	0.745	41.7	LOS C	15.1	105.6	0.99	0.89	14.9
9	R2	126	0.0	0.745	46.2	LOS D	15.1	105.6	0.99	0.89	20.3
Approach		626	0.0	0.745	42.8	LOS D	15.1	105.6	0.99	0.89	16.8
West: Victoria Street											
10	L2	69	0.0	0.085	21.8	LOS B	1.9	13.6	0.61	0.69	28.6
11	T1	51	0.0	0.210	16.0	LOS B	5.3	37.0	0.61	0.67	37.6
12	R2	139	0.0	0.210	20.6	LOS B	5.3	37.0	0.61	0.67	30.6
Approach		259	0.0	0.210	20.0	LOS B	5.3	37.0	0.61	0.67	31.9
All Vehicles		2302	0.0	0.753	35.4	LOS C	23.1	161.6	0.92	0.85	23.1

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	16.3	LOS B	0.2	0.2	0.57	0.57
P2	East Full Crossing	74	34.6	LOS D	0.2	0.2	0.83	0.83
P3	North Full Crossing	189	16.4	LOS B	0.3	0.3	0.57	0.57
P4	West Full Crossing	221	28.4	LOS C	0.5	0.5	0.76	0.76
All Pedestrians		611	22.9	LOS C			0.67	0.67

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 0144 [2026 PM S94 Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	134	0.0	0.101	8.3	LOS A	1.6	11.1	0.33	0.62	38.4
2	T1	615	0.0	0.814	27.8	LOS B	23.7	166.1	0.96	0.94	30.8
Approach		748	0.0	0.814	24.3	LOS B	23.7	166.1	0.85	0.88	31.6
North: Shaftesbry Road											
8	T1	442	0.0	0.378	8.8	LOS A	8.9	62.0	0.55	0.49	48.5
9	R2	205	0.0	0.804	47.2	LOS D	8.7	61.2	1.00	0.92	29.8
Approach		647	0.0	0.804	21.0	LOS B	8.9	62.0	0.70	0.62	39.2
West: Wilga Street											
10	L2	122	0.0	0.181	24.3	LOS B	3.3	22.8	0.72	0.74	39.1
12	R2	137	0.0	0.491	40.6	LOS C	5.1	35.8	0.96	0.79	22.2
Approach		259	0.0	0.491	32.9	LOS C	5.1	35.8	0.85	0.77	30.6
All Vehicles		1655	0.0	0.814	24.4	LOS B	23.7	166.1	0.79	0.76	34.3

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	34.4	LOS D	0.3	0.3	0.93	0.93
P4	West Full Crossing	212	14.5	LOS B	0.3	0.3	0.61	0.61
All Pedestrians		351	22.4	LOS C			0.73	0.73

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: ROAD DELAY SOLUTIONS PTY LTD | Processed: Friday, 21 June 2019 4:59:10 PM
Project: C:\Users\Glen Varley\Documents\28 34 Victoria St Burwood\2019 Revised Development\Sidra\2026 Burwood Towers S94.sip7

MOVEMENT SUMMARY

Site: 0107 [2026 PM S94 Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 110 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	119	6.2	0.823	53.6	LOS D	15.4	113.3	1.00	1.01	22.4
2	T1	474	5.6	0.823	50.9	LOS D	17.0	124.6	1.00	0.99	7.8
Approach		593	5.7	0.823	51.4	LOS D	17.0	124.6	1.00	0.99	11.8
East: Paisley Street											
4	L2	20	10.5	0.497	27.2	LOS B	6.7	47.4	0.92	0.76	31.5
5	T1	196	0.5	0.497	22.5	LOS B	6.7	47.4	0.92	0.76	38.1
6	R2	124	6.8	0.253	38.3	LOS C	5.2	38.7	0.82	0.76	25.0
Approach		340	3.4	0.497	28.6	LOS C	6.7	47.4	0.88	0.76	33.5
North: Shaftesbury Road											
7	L2	137	4.6	0.816	38.6	LOS C	30.2	220.0	0.94	0.90	26.3
8	T1	656	4.7	0.816	39.8	LOS C	30.2	220.0	0.96	0.91	9.4
9	R2	92	5.7	0.816	56.1	LOS D	15.7	114.7	1.00	0.96	21.3
Approach		884	4.8	0.816	41.3	LOS C	30.2	220.0	0.96	0.92	14.8
West: Railway Parade											
10	L2	189	0.0	0.564	25.0	LOS B	5.9	43.2	0.92	0.79	19.7
11	T1	41	28.2	0.564	20.5	LOS B	5.9	43.2	0.92	0.79	37.5
12	R2	45	0.0	0.147	47.5	LOS D	2.1	14.8	0.89	0.73	22.9
Approach		276	4.2	0.564	28.0	LOS B	5.9	43.2	0.91	0.78	22.8
All Vehicles		2093	4.7	0.823	40.4	LOS C	30.2	220.0	0.95	0.89	19.2

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	46.5	LOS E	0.2	0.2	0.92	0.92
P2	East Full Crossing	25	24.9	LOS C	0.1	0.1	0.67	0.67
P4	West Full Crossing	48	42.0	LOS E	0.1	0.1	0.87	0.87
All Pedestrians		140	41.0	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [2026 PM S94 Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 110 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	87	0.0	0.410	28.5	LOS C	12.5	87.7	0.75	0.68	27.5
2	T1	473	0.0	0.410	24.3	LOS B	12.5	87.7	0.75	0.69	20.7
3	R2	98	0.0	0.410	29.2	LOS C	12.2	85.4	0.76	0.69	31.6
Approach		658	0.0	0.410	25.6	LOS B	12.5	87.7	0.75	0.69	24.1
East: Victoria Street											
4	L2	97	0.0	0.741	39.8	LOS C	22.8	159.8	0.95	0.86	27.0
5	T1	116	0.0	0.741	35.2	LOS C	22.8	159.8	0.95	0.86	30.0
6	R2	263	0.0	0.741	39.8	LOS C	22.8	159.8	0.95	0.86	26.5
Approach		476	0.0	0.741	38.7	LOS C	22.8	159.8	0.95	0.86	27.5
North: Shaftesbury Road											
7	L2	124	0.0	0.714	50.6	LOS D	14.1	98.7	0.99	0.86	23.9
8	T1	435	0.0	0.714	44.8	LOS D	15.7	109.9	0.99	0.86	14.2
9	R2	20	0.0	0.714	48.8	LOS D	15.7	109.9	0.98	0.86	20.0
Approach		579	0.0	0.714	46.2	LOS D	15.7	109.9	0.99	0.86	17.2
West: Victoria Street											
10	L2	127	0.0	0.177	28.6	LOS C	4.5	31.4	0.70	0.73	25.3
11	T1	128	0.0	0.480	24.9	LOS B	14.9	104.4	0.78	0.76	33.8
12	R2	256	0.0	0.480	29.5	LOS C	14.9	104.4	0.78	0.76	26.2
Approach		512	0.0	0.480	28.1	LOS B	14.9	104.4	0.76	0.75	28.5
All Vehicles		2224	0.0	0.741	34.3	LOS C	22.8	159.8	0.86	0.78	24.2

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	21.1	LOS C	0.2	0.2	0.62	0.62
P2	East Full Crossing	74	37.8	LOS D	0.2	0.2	0.83	0.83
P3	North Full Crossing	189	21.2	LOS C	0.4	0.4	0.62	0.62
P4	West Full Crossing	221	49.6	LOS E	0.7	0.7	0.95	0.95
All Pedestrians		611	33.5	LOS D			0.77	0.77

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 0144 [2026 WE S94 Shaftesbury Rd and Wilga St]

Burwood Town Centre
Signals - Fixed Time Isolated   Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	24	0.0	0.018	8.1	LOS A	0.3	2.1	0.27	0.59	38.6
2	T1	683	0.0	0.796	27.7	LOS B	29.8	208.4	0.93	0.86	30.9
Approach		707	0.0	0.796	27.0	LOS B	29.8	208.4	0.91	0.85	31.0
North: Shaftesbry Road											
8	T1	548	0.0	0.561	9.6	LOS A	13.2	92.4	0.54	0.48	47.7
9	R2	197	0.0	0.757	54.1	LOS D	10.0	69.8	1.00	0.87	27.8
Approach		745	0.0	0.757	21.3	LOS B	13.2	92.4	0.66	0.58	38.9
West: Wilga Street											
10	L2	146	0.0	0.239	31.7	LOS C	5.2	36.3	0.77	0.76	35.6
12	R2	119	0.0	0.493	50.7	LOS D	5.6	39.2	0.97	0.79	19.3
Approach		265	0.0	0.493	40.2	LOS C	5.6	39.2	0.86	0.77	28.5
All Vehicles		1718	0.0	0.796	26.6	LOS B	29.8	208.4	0.79	0.73	33.6

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	North Full Crossing	139	44.4	LOS E	0.4	0.4	0.95	0.95
P4	West Full Crossing	212	13.6	LOS B	0.3	0.3	0.52	0.52
All Pedestrians		351	25.8	LOS C			0.69	0.69

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 0107 [2026 WE S94 Shaftesbury Rd, Railway Pde and Paisley St]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	15	50.0	0.787	42.3	LOS C	9.9	73.5	1.00	0.99	25.7
2	T1	533	4.9	0.787	35.7	LOS C	10.1	73.6	1.00	0.98	10.5
Approach		547	6.2	0.787	35.9	LOS C	10.1	73.6	1.00	0.98	11.2
East: Paisley Street											
4	L2	17	12.5	0.726	35.6	LOS C	9.6	68.0	0.99	0.90	28.0
5	T1	261	0.4	0.726	31.0	LOS C	9.6	68.0	0.99	0.90	35.1
6	R2	96	8.8	0.639	41.7	LOS C	3.5	26.4	1.00	0.83	24.0
Approach		374	3.1	0.726	33.9	LOS C	9.6	68.0	0.99	0.88	32.4
North: Shaftesbury Road											
7	L2	140	4.5	0.813	25.3	LOS B	22.8	164.9	0.91	0.91	31.8
8	T1	880	3.5	0.813	24.9	LOS B	22.8	164.9	0.94	0.94	13.5
9	R2	95	5.6	0.813	34.7	LOS C	15.1	109.2	1.00	1.00	27.7
Approach		1115	3.8	0.813	25.8	LOS B	22.8	164.9	0.94	0.94	19.1
West: Railway Parade											
10	L2	179	0.0	0.625	19.0	LOS B	5.5	40.3	0.93	0.80	21.1
11	T1	93	12.5	0.625	14.4	LOS A	5.5	40.3	0.93	0.80	40.3
12	R2	38	0.0	0.238	39.0	LOS C	1.3	9.1	0.97	0.72	25.3
Approach		309	3.7	0.625	20.1	LOS B	5.5	40.3	0.93	0.79	27.2
All Vehicles		2345	4.2	0.813	28.7	LOS C	22.8	164.9	0.96	0.92	22.9

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	66	29.3	LOS C	0.1	0.1	0.92	0.92
P2	East Full Crossing	25	14.5	LOS B	0.0	0.0	0.64	0.64
P4	West Full Crossing	48	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		140	26.6	LOS C			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [2026 WE S94 Shaftesbury Road and Victoria Street]

Burwood Town Centre
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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: Shaftesbury Road											
1	L2	154	0.0	0.833	33.5	LOS C	19.8	138.9	0.98	1.00	25.3
2	T1	389	0.0	0.833	28.9	LOS C	19.8	138.9	0.98	1.00	18.8
3	R2	203	0.0	0.846	44.2	LOS D	8.0	55.8	1.00	1.00	25.3
Approach		746	0.0	0.846	34.0	LOS C	19.8	138.9	0.99	1.00	22.7
East: Victoria Street											
4	L2	92	0.0	0.868	39.9	LOS C	19.3	135.0	1.00	1.02	29.3
5	T1	109	0.0	0.868	34.4	LOS C	19.3	135.0	1.00	1.02	33.4
6	R2	286	0.0	0.868	39.9	LOS C	19.3	135.0	1.00	1.02	28.7
Approach		487	0.0	0.868	38.6	LOS C	19.3	135.0	1.00	1.02	30.0
North: Shaftesbury Road											
7	L2	32	0.0	0.873	44.9	LOS D	12.4	86.5	1.00	1.05	28.4
8	T1	543	0.0	0.873	39.2	LOS C	12.7	88.6	1.00	1.05	16.5
9	R2	47	0.0	0.873	44.7	LOS D	12.7	88.6	1.00	1.05	22.6
Approach		622	0.0	0.873	39.9	LOS C	12.7	88.6	1.00	1.05	17.9
West: Victoria Street											
10	L2	92	0.0	0.149	23.6	LOS B	2.2	15.6	0.74	0.73	29.9
11	T1	158	0.0	0.606	18.8	LOS B	12.3	86.2	0.86	0.80	41.1
12	R2	285	0.0	0.606	24.4	LOS B	12.3	86.2	0.86	0.80	31.4
Approach		535	0.0	0.606	22.6	LOS B	12.3	86.2	0.84	0.79	34.7
All Vehicles		2391	0.0	0.873	33.9	LOS C	19.8	138.9	0.96	0.97	25.8

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	126	18.0	LOS B	0.2	0.2	0.72	0.72
P2	East Full Crossing	74	27.5	LOS C	0.1	0.1	0.89	0.89
P3	North Full Crossing	189	18.0	LOS B	0.3	0.3	0.72	0.72
P4	West Full Crossing	221	19.5	LOS B	0.3	0.3	0.75	0.75
All Pedestrians		611	19.7	LOS B			0.75	0.75

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

APPENDIX C – PERFORMANCE INDICATORS

Level of Service (LoS)

Intersection performance is best measured by the indicators of Level of Service (LoS), Average Vehicle Delay (AVD) and the Degree of Saturation (DS) during peak hours.

This is defined as the assessment of a qualitative effect of factors influencing vehicle movement through the intersection. Factors such as speed, traffic volume, geometric layout, delay and capacity are qualified and applied to the specific intersection control mode, as shown in *Table 1*.

The measure of average delay assessed for traffic signal operation is over all movements. For roundabouts and priority controlled intersections, the critical criterion for assessment is the movement with the highest delay per vehicle.

Simillarly, Network and Route performance is best assessed by the Average Vehicle Delay (AVD) and LoS.

The Network performance is an index based on the operation of traffic within a given road network of linked intersections controlled by like and/or differing control methods. As with intersections, the LoA is rated between 'A' being good to 'F' being completely unsatisfactory and highly congested raaaequiring mitigation treatment. The Route LoS may be the result of a single intersection within the network or a group of intersections. It is the engineer's or planner's responsibility to analyse and determine the critical factors impacting the network operation.

The Route performance again is an indexed value based on the AVD along a defined path. The LoS between 'A' and 'F' is derived from the AVD and reported after consideration of each lanes operation under the specific control method at each intersection in the network.

Average Vehicle Delay (AVD)

The AVD is a measure of the operational performance of a road network or an intersection. AVD is determined globally over a road network or within a cordon during an assignment model run. The AVD exhibited on comparable network models, for analogous peak periods, forms the basis of comparing the operational performance of the road network.

AVD is used in the determination of intersection Level of Service. Generally, the total delay incurred by vehicles through an intersection is averaged to give an indicative delay on any specific approach. Longer delays do occur but only the average over the peak hour period is reported.

Degree of Saturation (DS)

The DS of an intersection is generally taken as the highest ratio of traffic volume on an approach compared with its theoretical capacity, and is a measure of the utilisation of available green time.

The DS reported is generally of a critical movement through the intersection rather than the DS of the intersection unless equal saturation occurs on all approaches.

For intersections controlled by traffic signals, generally both queue length and delay increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its DS is kept below 0.875. When the DS exceeds 0.9, extensive queues can be expected.

Table 13 Performance Indicators by Control Method

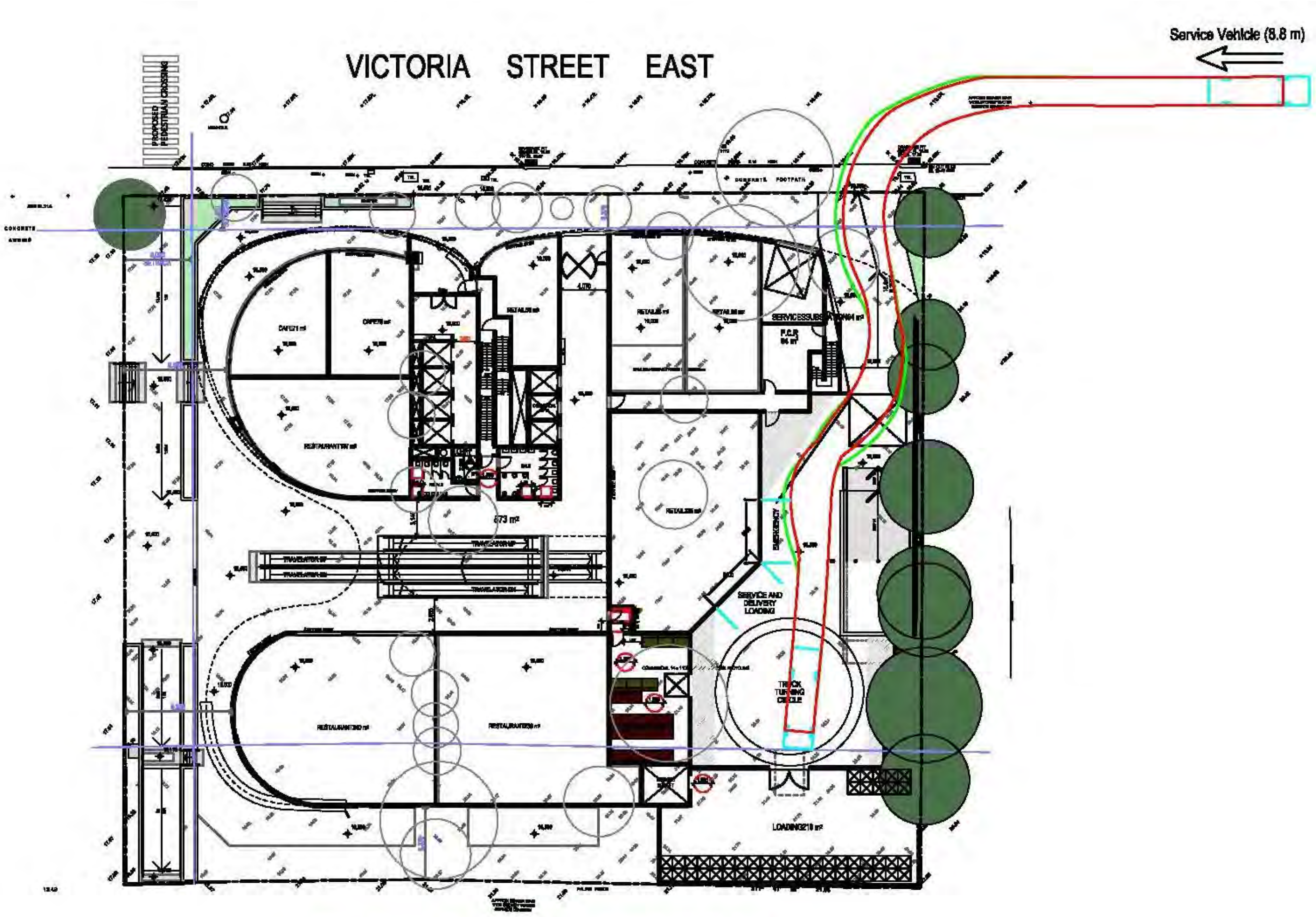
Intersection Control	Performance Measure [Unit]
Sign or Priority Control	Delay of critical movement(s) [seconds/vehicle]
	Average Vehicle Delay [seconds/vehicle]
	Queue length of critical movement(s) [metres]
Traffic Signal Control	Delay of critical movement(s) [seconds/vehicle]
	Degree of Saturation [ratio of vehicles to capacity]
	Average Vehicle Delay [seconds/vehicle]
	Cycle Length [seconds]
	Queue length of critical movement(s) [metres]
Roundabout Control	Delay of critical movement(s) [seconds/vehicle]
	Degree of Saturation[ratio of vehicles to capacity]
	Average Vehicle Delay [seconds/vehicle]
	Queue length of critical movement(s) [metres]

Table 14 Qualified Level of Service by Differing Control Methods

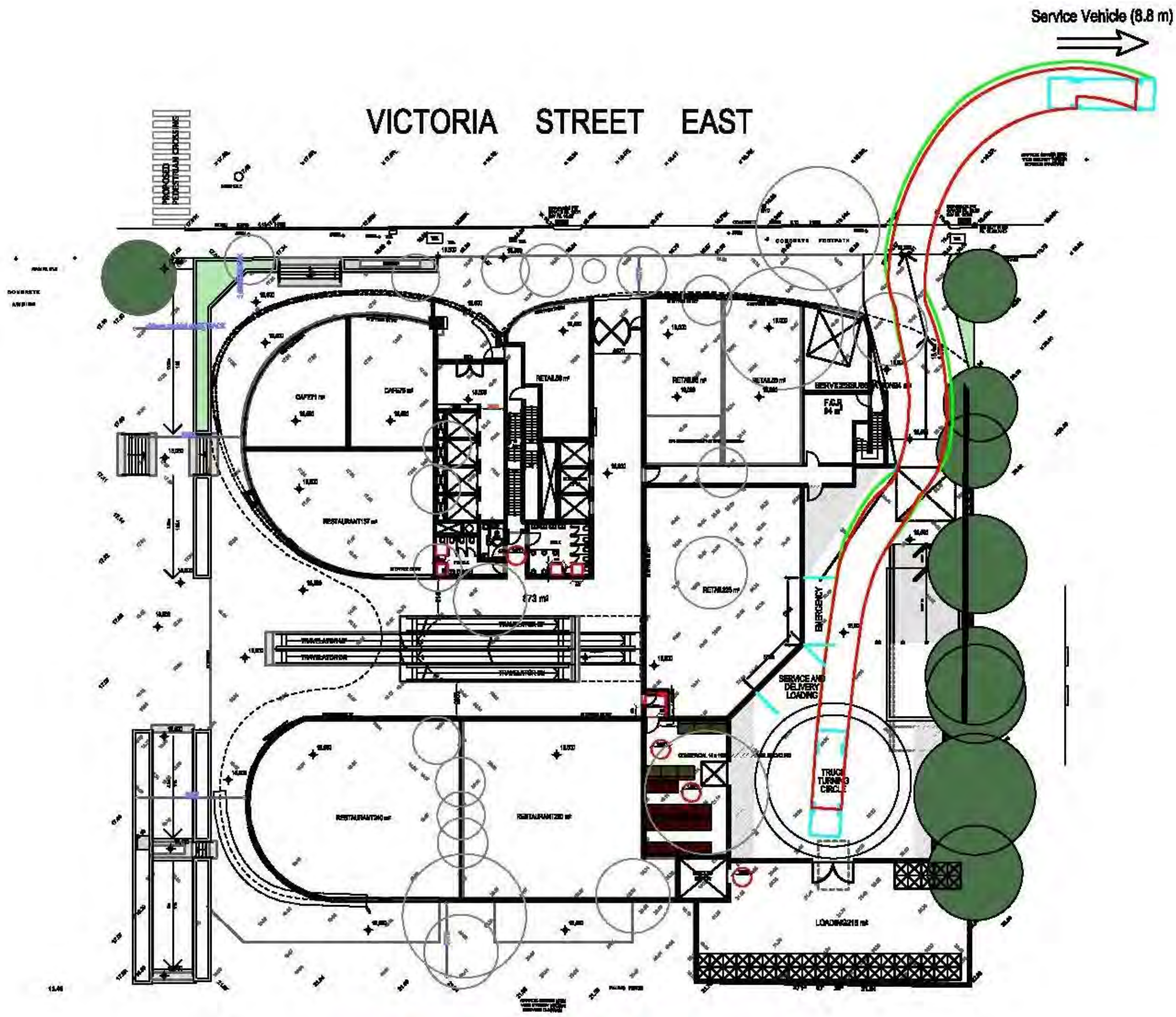
LOS	AVD secs	Traffic Signals and Roundabout	Give Way and Stop Sign Priority Control
A	1 to 14	Good operation.	Good operation
B	14 to 28	Good operation with acceptable delays and spare capacity.	Good operation with acceptable delays and spare capacity.
C	28 to 42	Satisfactory.	Satisfactory but accident study and operational analysis required.
D	42 to 56	Operating near capacity.	Near capacity. Acceptable LOS for new developments. Accident study and operational analysis required.
E	56 to 70	Unsatisfactory. Traffic signals incidence will cause excessive delays. Requires additional capacity. Roundabouts require alternative control mode.	At capacity. Requires alternative control mode.
F	>70	Unsatisfactory. Over capacity and unstable operation.	Over capacity. Unstable and unsafe operation.

APPENDIX D – TURN PATHS

SERVICE VEHICLE – LOADING DOCK AREA

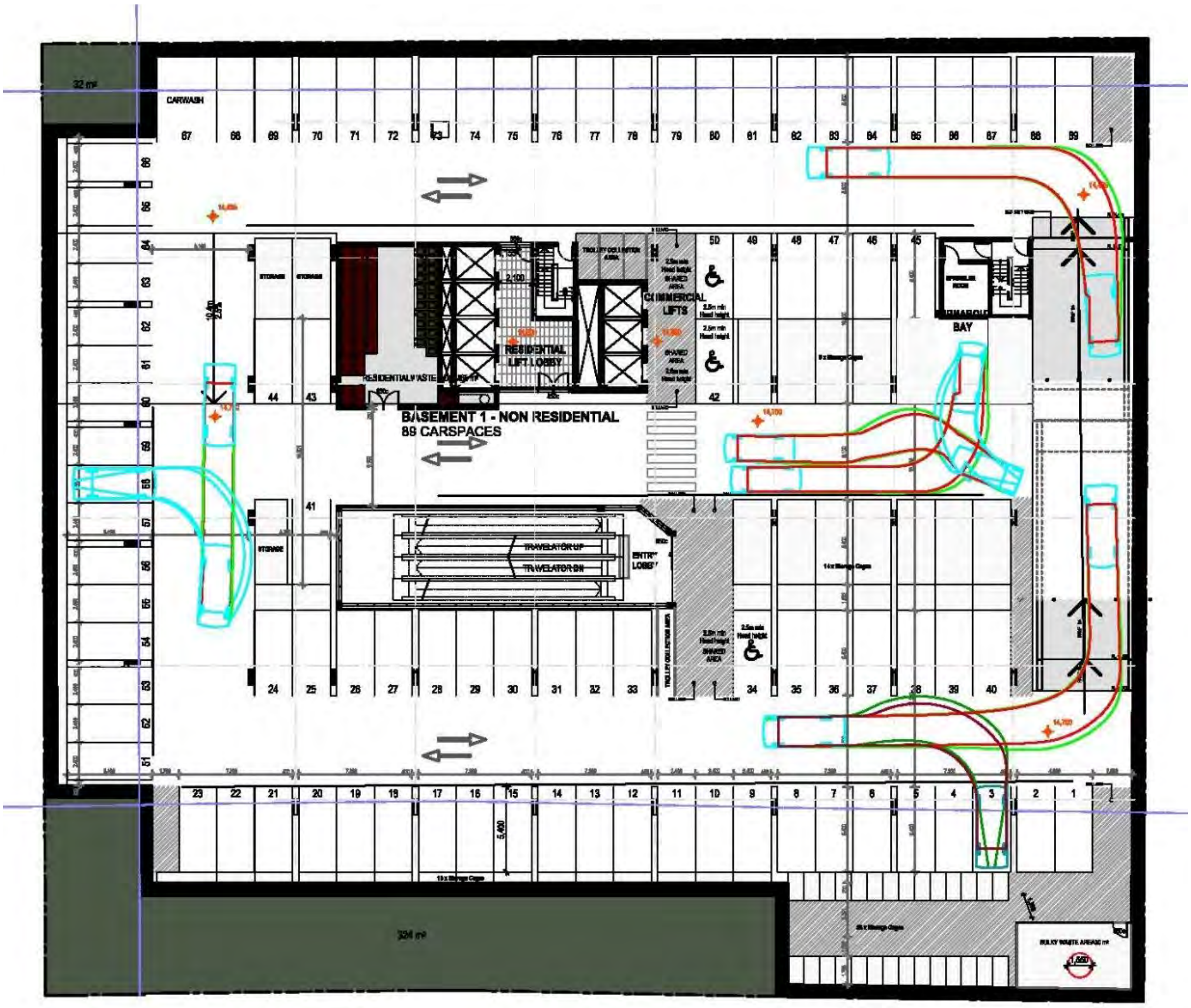


LOADING DOCK INGRESS

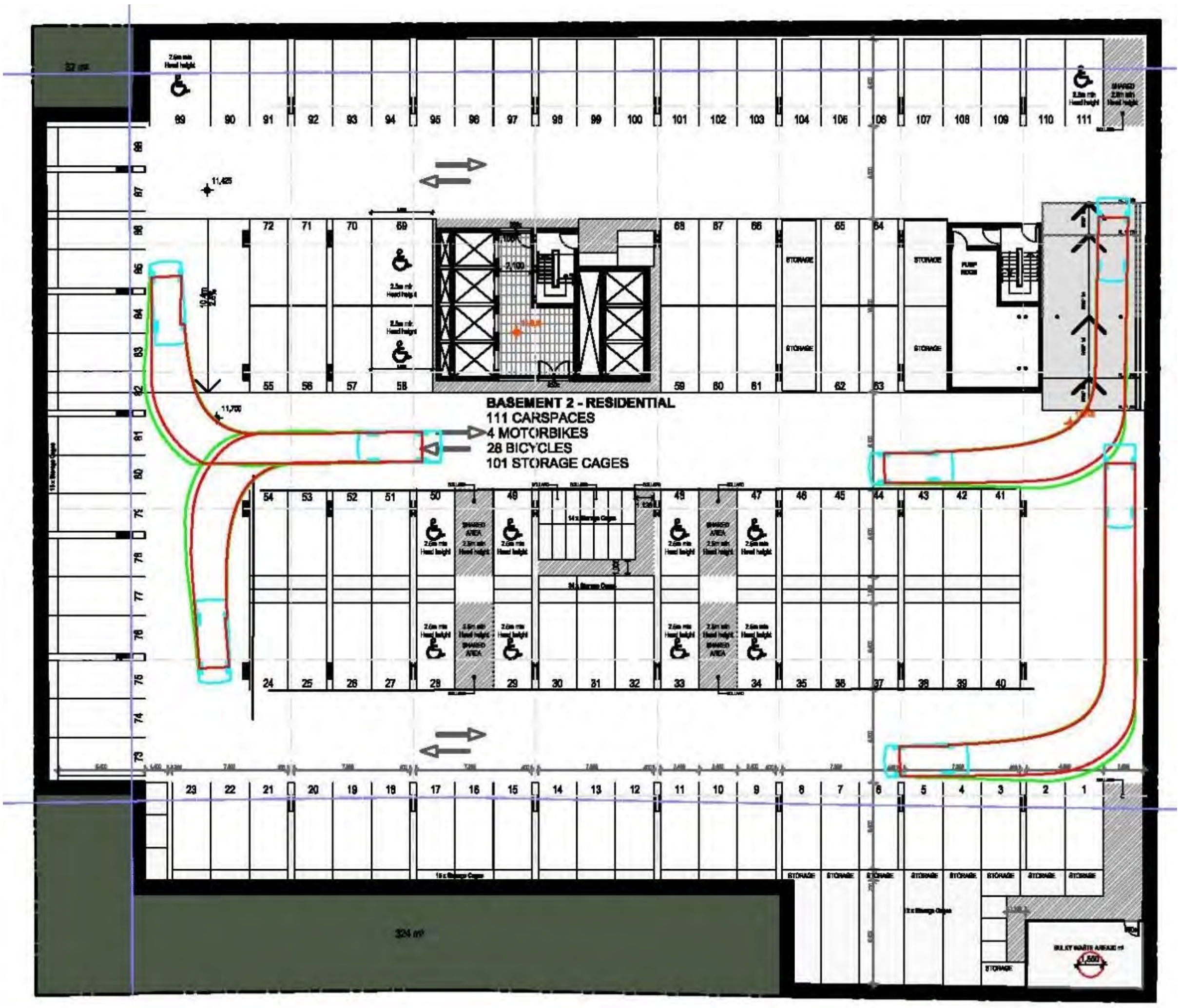


LOADING DOCK EGRESS

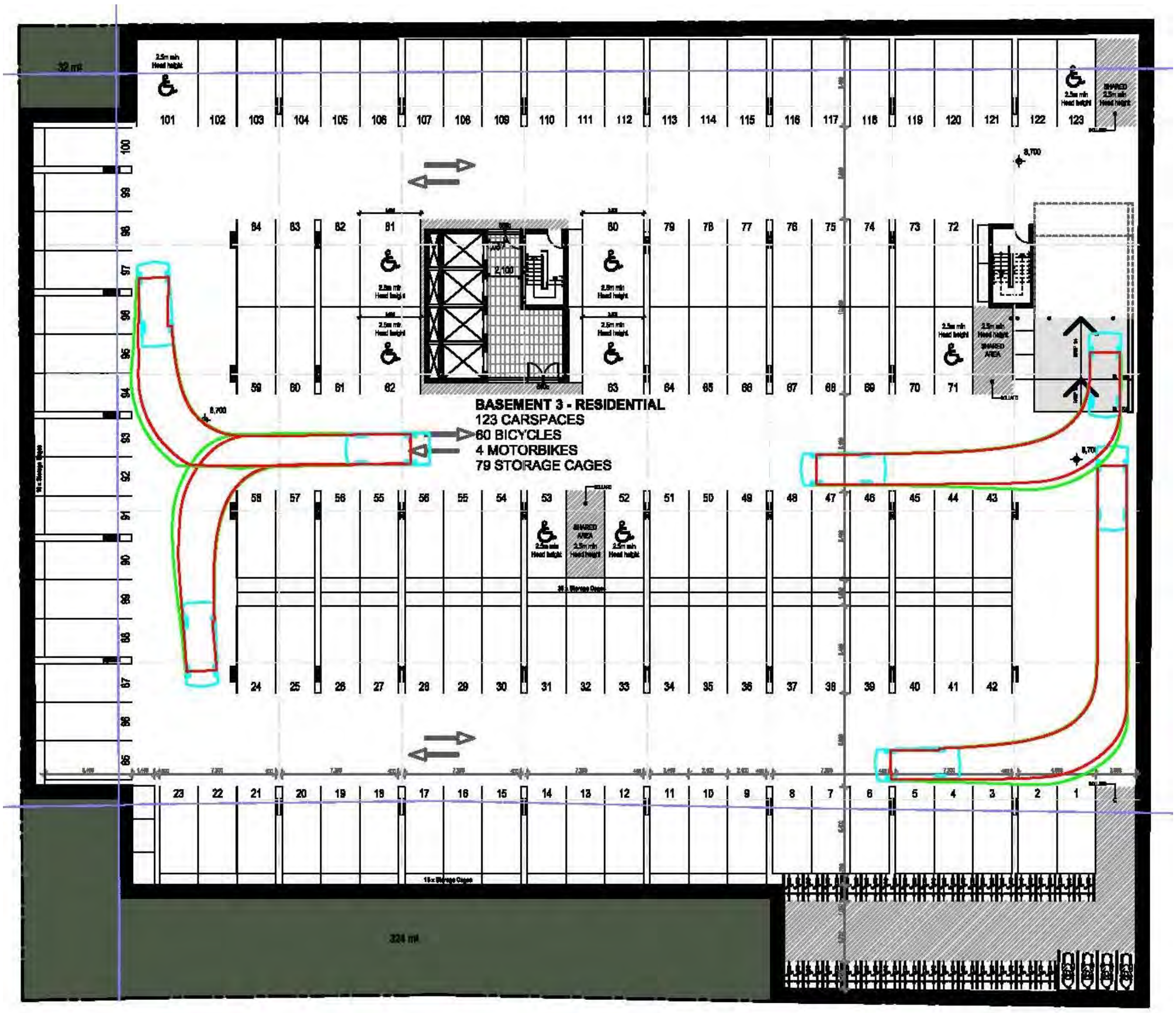
PASSENGER VEHICLE – BASEMENT CAR PARK



AUSTROADS PASSENGER VEHICLE 5.2m
BASEMENT 1



AUSTROADS PASSENGER VEHICLE 5.2m
BASEMENT 2



AUSTROADS PASSENGER VEHICLE 5.2m
BASEMENT 3

ROAD DELAY SOLUTIONS

APPENDIX E – PROPOSED DEVELOPMENT

ROAD DELAY SOLUTIONS

Summary

SITE AREA

4240.6m²

GFA	FSR
14,694 m²	4.95 : 1

COMMERCIAL GROSS FLOOR AREA

6,296 m²

Commercial	1,788.00 m²
Retail	2,438.00 m²
Café / Restaurant	2,070.00 m²

RESIDENTIAL UNITS

179

Studio	0	0%
1Bed	47	26%
2Bed	105	59%
3Bed	27	15%
4Bed	0	0%

TOTAL CARPARKING

344

Residential	201 (0.5 cars/unit)
Residential Visitor	36.0
Commercial	107.0
Commercial Visitor	0.0

Compliance

CONTROL		REQUIREMENT	PROPOSED		COMPLIES
Floor Space Ratio		4.95 : 1 MAX		4.950 : 1	✓
Residential FSR maximum		3.465 : 1 MAX		3.465 : 1	✓
Gross Floor Area		20,991.0 m² MAX		20,990.0 m²	✓
Residential GFA Maximum		14,693.7 m² MAX		14,694.0 m²	✓
Building Height		60.00 m MAX		99m (Clause 4.3)	✓
Car parking					
	Residential	192.5 MIN		201.0	✓
	Residential Visitor	35.8 MIN		36.0	✓
	Commercial	107.3 MIN		107.0	✓
	Commercial Visitor	0.0 MIN		0.0	✓
	Total	336 MIN		344.0	✓
Motorcycle Parking (1/15units)		11.93 MIN		12.0	✓
Bicycle Parking		55.05 MIN		100.0	✓
Solar Access (>3hours)		70% MIN	143	80%	✓
No Solar Access (<15 mins)		15% MAX	0	0%	✓
Cross Ventilation		60% MIN	174	97%	✓
Adaptable Units					
	Adaptable	10% MIN	18	10%	✓
	Livable Housing Silver Level	20% MIN	36	20%	✓
Communal Open Space (DCP)		25% MIN	1,600 m2	37.7%	✓
Unit Storage	1Bed	6 m3 MIN		6m3	✓
(min. half in unit, remaining in	2Bed	8 m3 MIN		8m3	✓
basement)	3Bed+	10 m3 MIN		10m3	✓

Detailed Calculations

	GROSS FLOOR AREA: Commercial	Retail	Café / Restaurant	Residential	UNITS QTY: 1Bed	1Bed + Study	2Bed	2 Bed + Study	3Bed	TOTAL Units per Floor	CARPARKING PROVIDED	ADG CALCULATIONS: Solar Access (2 hrs)	Solar Access (< 15mins)	Cross Ventilated
Basement 3											123.00			
Basement 2											115.00			
Basement 1											106.00			
Ground		457.0m²	1,396.0m²	98.0m²						0				
Level 1		1,981.0m²	674.0m²							0				
Level 2	1,700.0m²									0				
Level 3				640.0m²	2	2	3		1	8		6	0	7
Level 4				651.0m²	1	1	5		1	8		6	0	7
Level 5				651.0m²	1	1	5		1	8		6	0	7
Level 6				651.0m²	1	1	5		1	8		6	0	7
Level 7				651.0m²	1	1	5		1	8		6	0	7
Level 8				651.0m²	1	1	5		1	8		6	0	7
Level 9				651.0m²	1	1	5		1	8		6	0	8
Level 10				651.0m²	1	1	5		1	8		6	0	8
Level 11				651.0m²	1	1	5		1	8		6	0	8
Level 12				649.0m²	1	1	5		1	8		6	0	8
Level 13				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 14				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 15				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 16				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 17				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 18				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 19				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 20				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 21				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 22				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 23				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 24				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 25				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 26				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 27				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 28				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Level 29				[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
	1,700.0m²	2,438.0m²	2,070.0m²	14,694.0m²	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	344.00	143	0	174
			Total	20,990.0 m²						Total 179		80%	0%	97%

CAR PARKING

Commercial per DCP

Residential per DCP

Residential per ADG

BICYCLES

Staff/Residents

Visitors

NOTES

[illegible]

18-113 DA RESIDENTIAL SCHEDULE

URBAN LINK

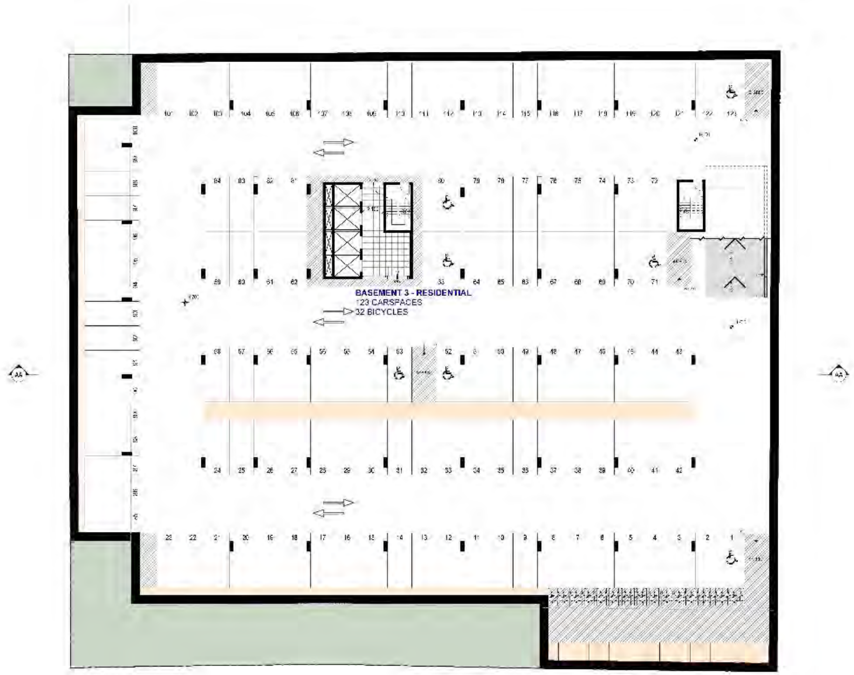
MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOODNSW Australia

#Client Company
#Client Full Name

18-113

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

URBAN LINK

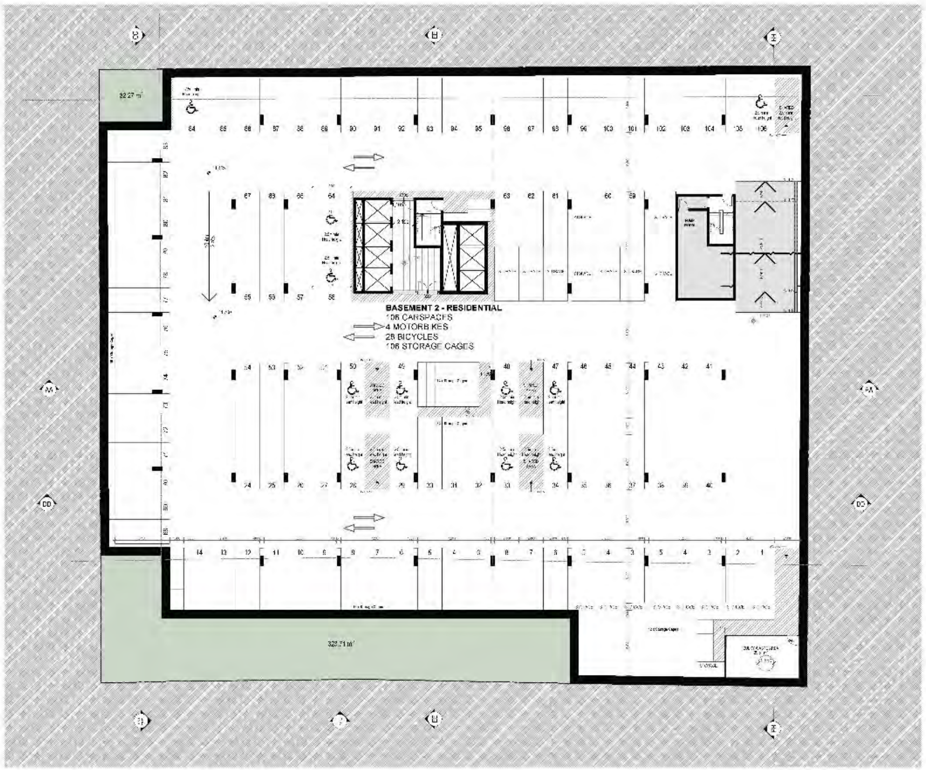
FLOOR PLANS
BASEMENT 03

1:200

18-113

DA-101

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

URBAN LINK

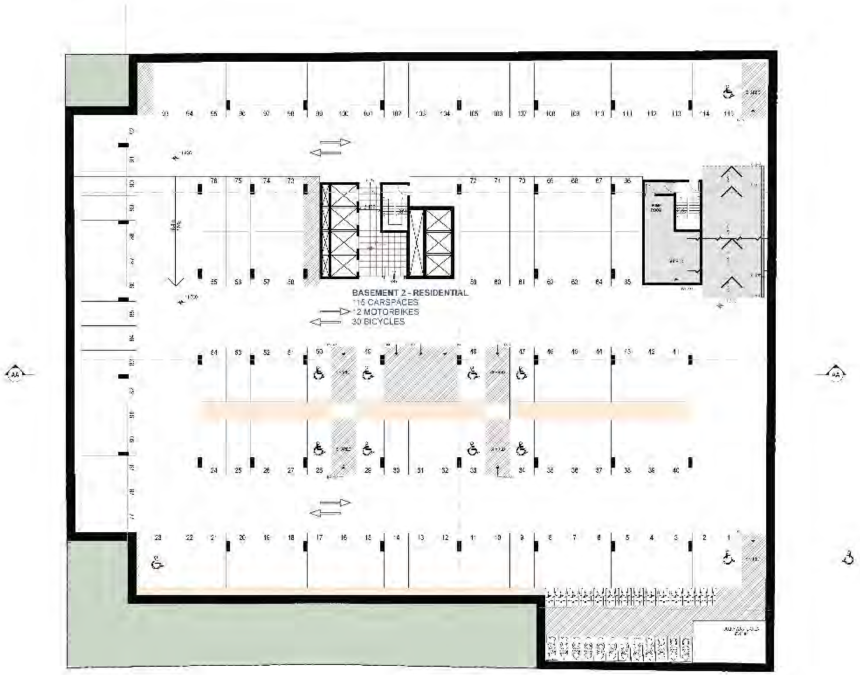
FLOOR PLANS
BASEMENT 02

1:200

18-113

DA-102

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

URBAN LINK

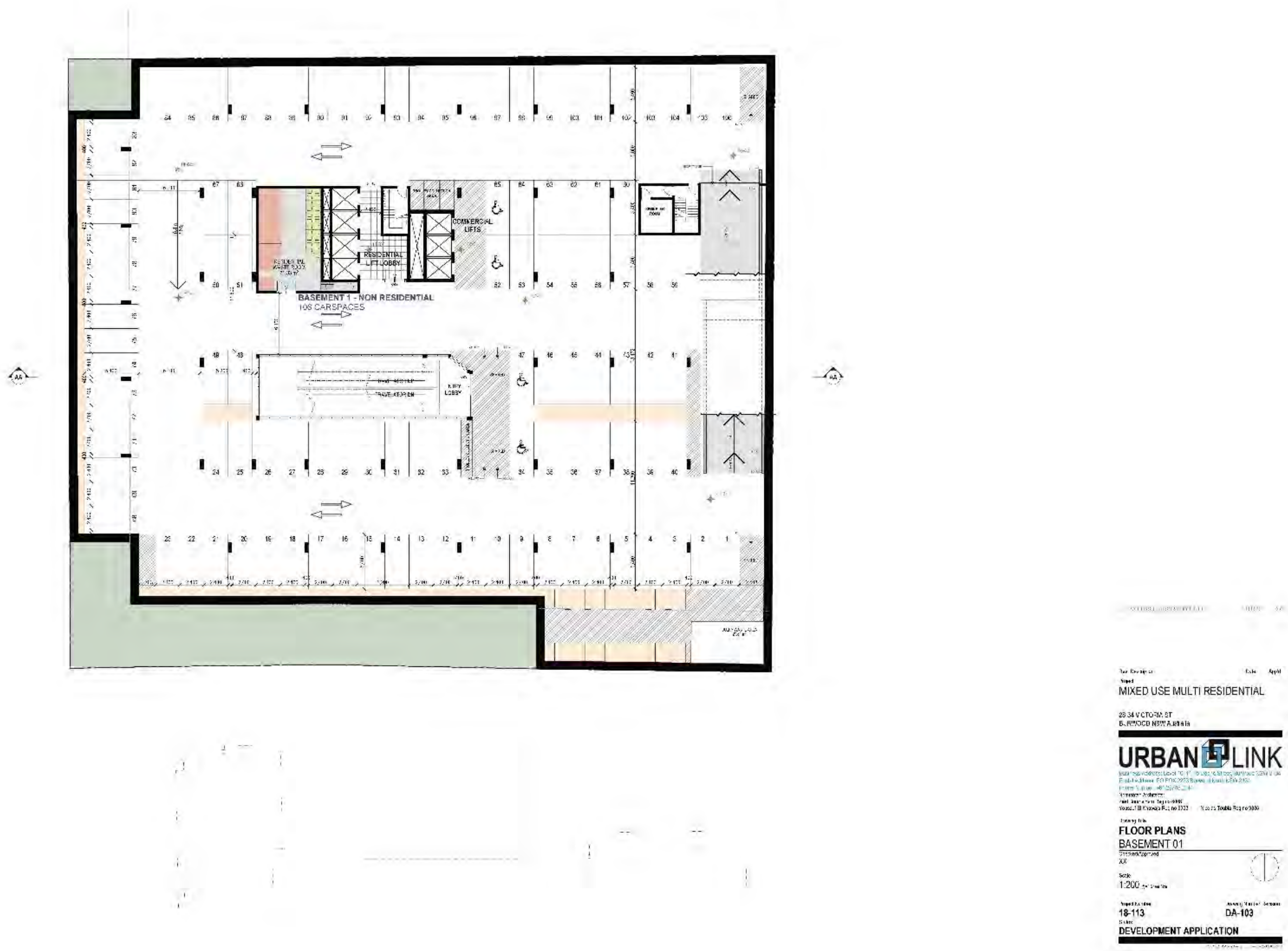
FLOOR PLANS
BASEMENT 02

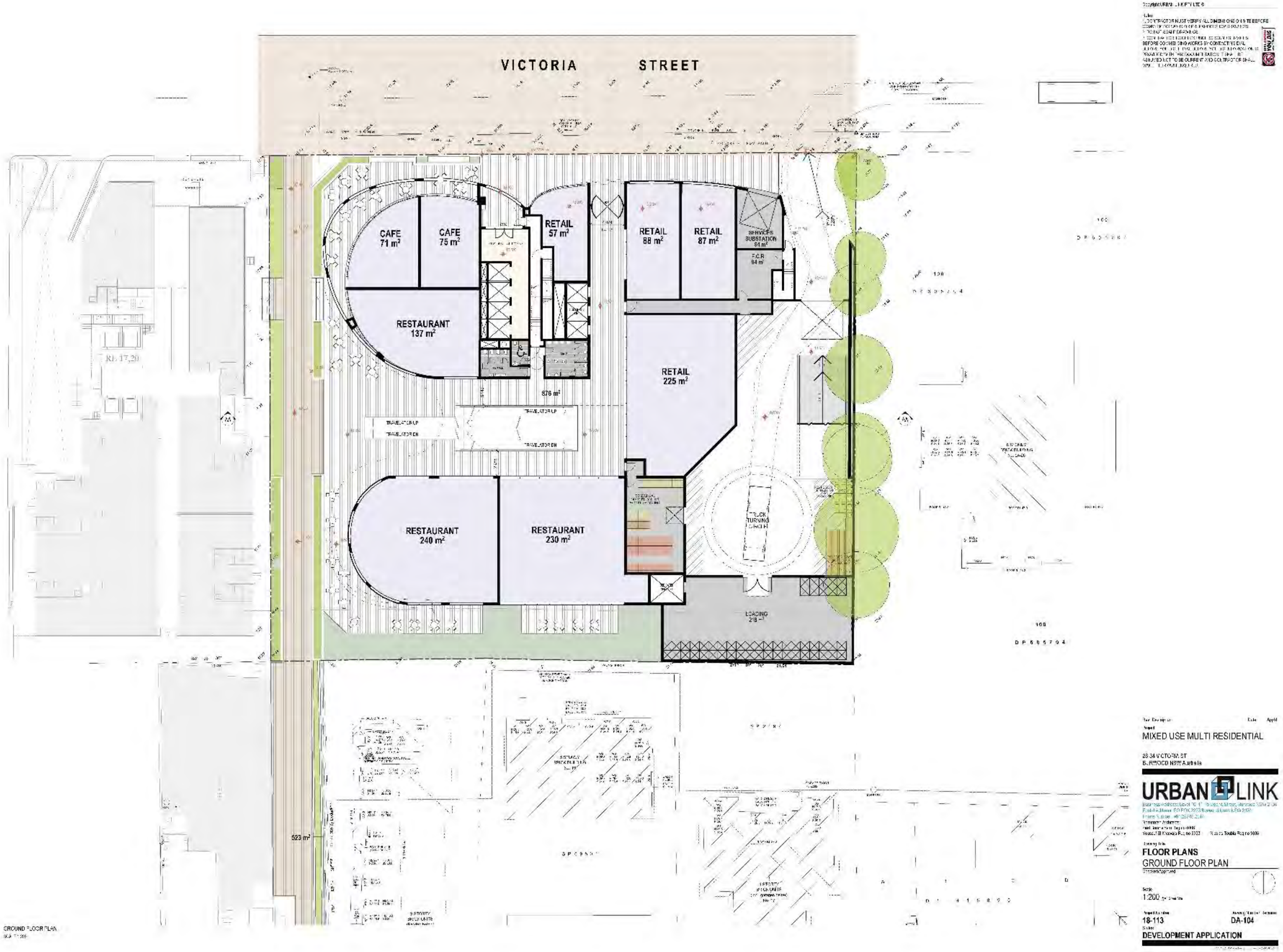
Scale
1:200

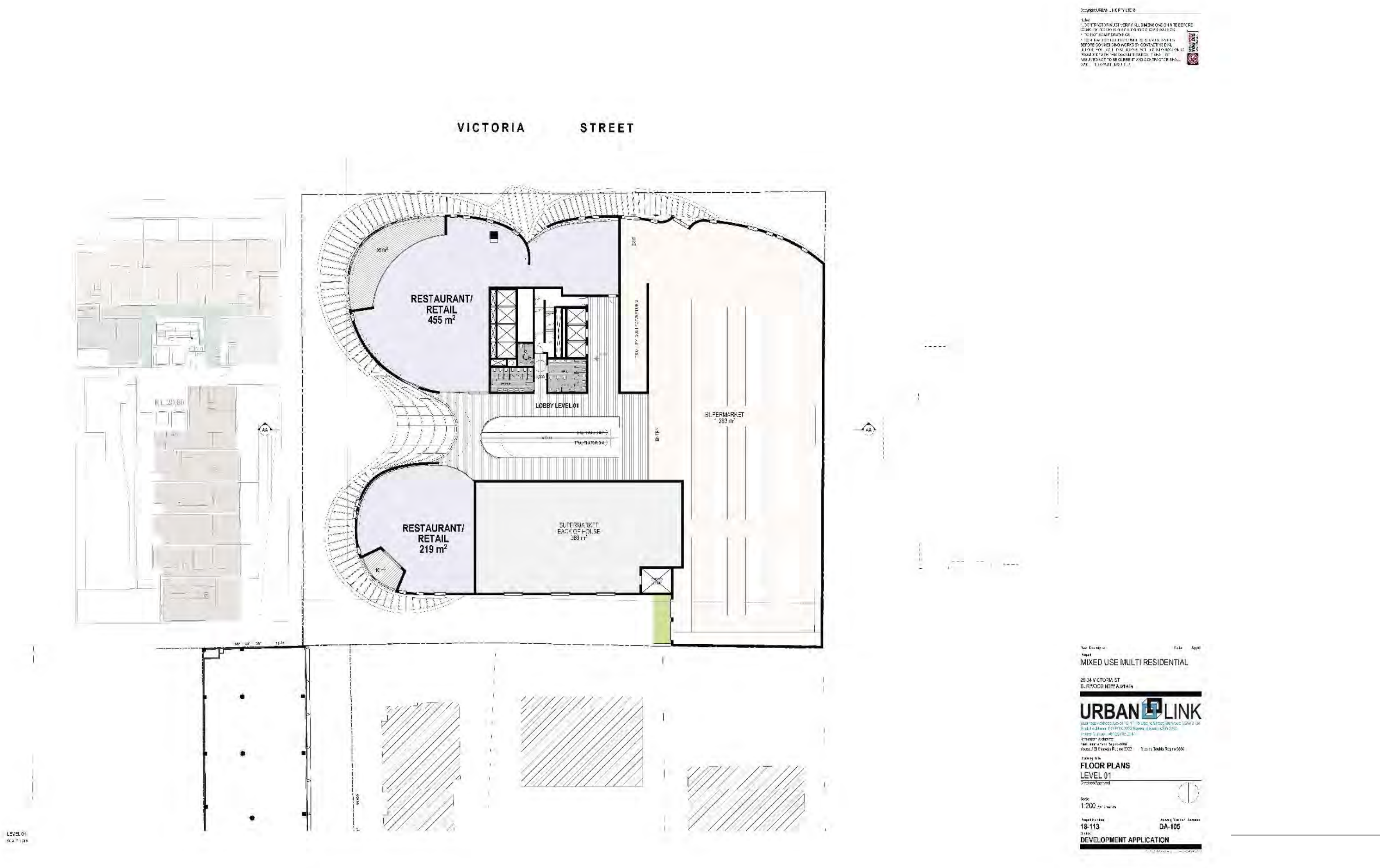
18-113
DA-102

DEVELOPMENT APPLICATION

ROAD DELAY SOLUTIONS




VICTORIA STREET
CAFE
71 m²
CAFE
75 m²
RETAIL
57 m²
RETAIL
88 m²
RETAIL
87 m²
SERVICE SUBSTATION
RESTAURANT
137 m²
RETAIL
225 m²
TRAVELATOR UP
TRAVELATOR DN
RESTAURANT
240 m²
RESTAURANT
230 m²
LOADING
MIXED USE MULTI RESIDENTIAL
URBAN LINK
FLOOR PLANS
GROUND FLOOR PLAN
18-113
DA-104
DEVELOPMENT APPLICATION


VICTORIA STREET
RESTAURANT/
RETAIL
455 m2
LOBBY LEVEL 01
SUPERMARKET
RESTAURANT/
RETAIL
219 m2
SUPERMARKET
BACK OF HOUSE
MIXED USE MULTI RESIDENTIAL
URBAN LINK
FLOOR PLANS
LEVEL 01
1:200
18-113
DA-105
DEVELOPMENT APPLICATION


VICTORIA STREET
OFFICES/CO CIAL
LOBBY LEVEL 02
COMMERCIAL
565.03 m²
COMMERCIAL OPEN SPACE
MIXED USE MULTI RESIDENTIAL
URBAN LINK
FLOOR PLANS
LEVEL 02
1:200
18-113
DA-106
DEVELOPMENT APPLICATION

ROAD DELAY SOLUTIONS

MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

FLOOR PLANS
LEVEL 03

1:200

18-113
DA-107

DEVELOPMENT APPLICATION

MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

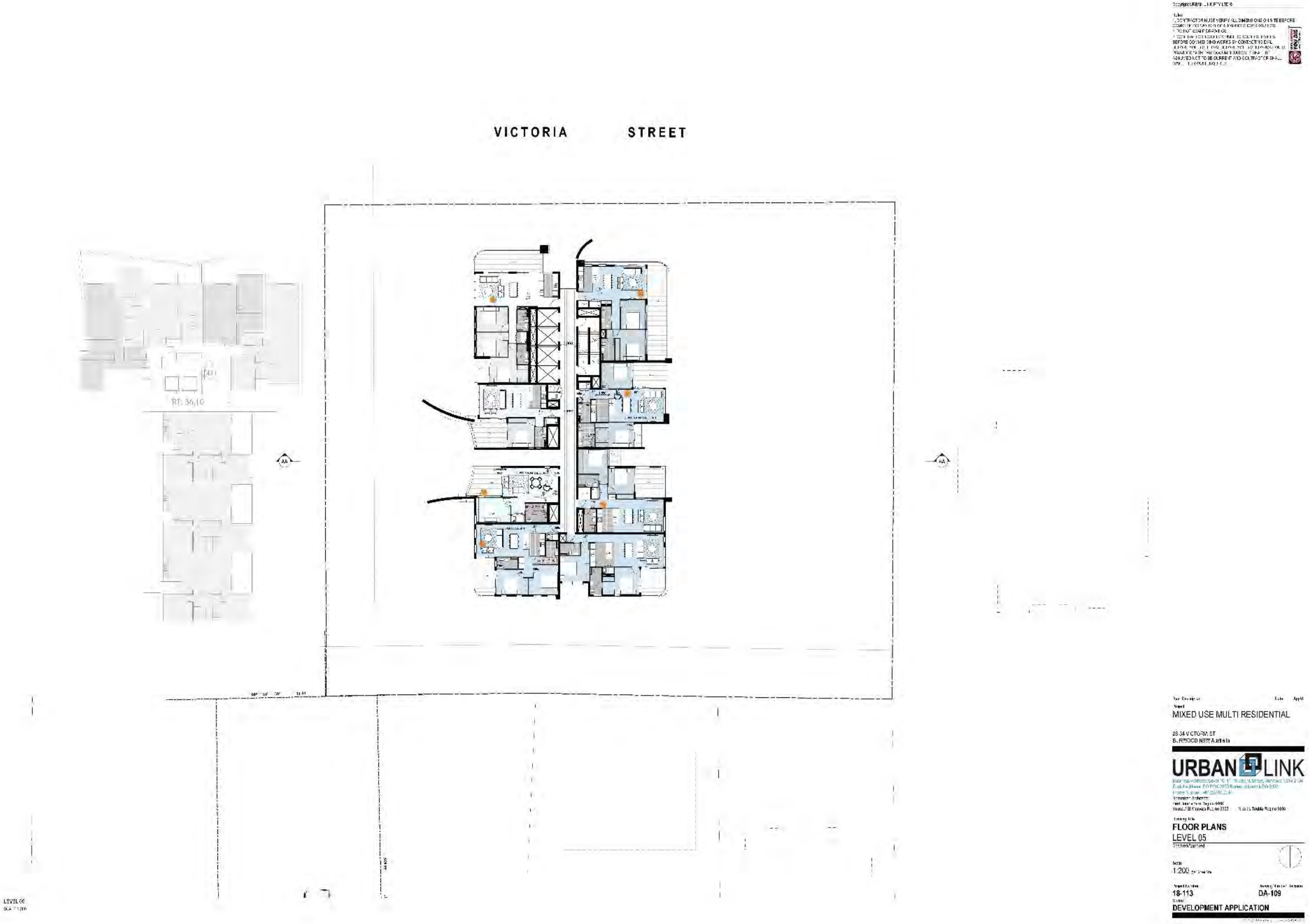
FLOOR PLANS
LEVEL 04

1:200

18-113

DA-108

DEVELOPMENT APPLICATION


VICTORIA STREET
RL 36.10
MIXED USE MULTI RESIDENTIAL
28-34 VICTORIA ST
BURWOOD NSW Australia
URBAN LINK
FLOOR PLANS
LEVEL 05
Scale
1:200
18-113
DA-109
DEVELOPMENT APPLICATION

MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

FLOOR PLANS
LEVEL 06

Scale
1:200

18-113
DA-110

DEVELOPMENT APPLICATION

MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

FLOOR PLANS
LEVEL 07

Scale
1:200

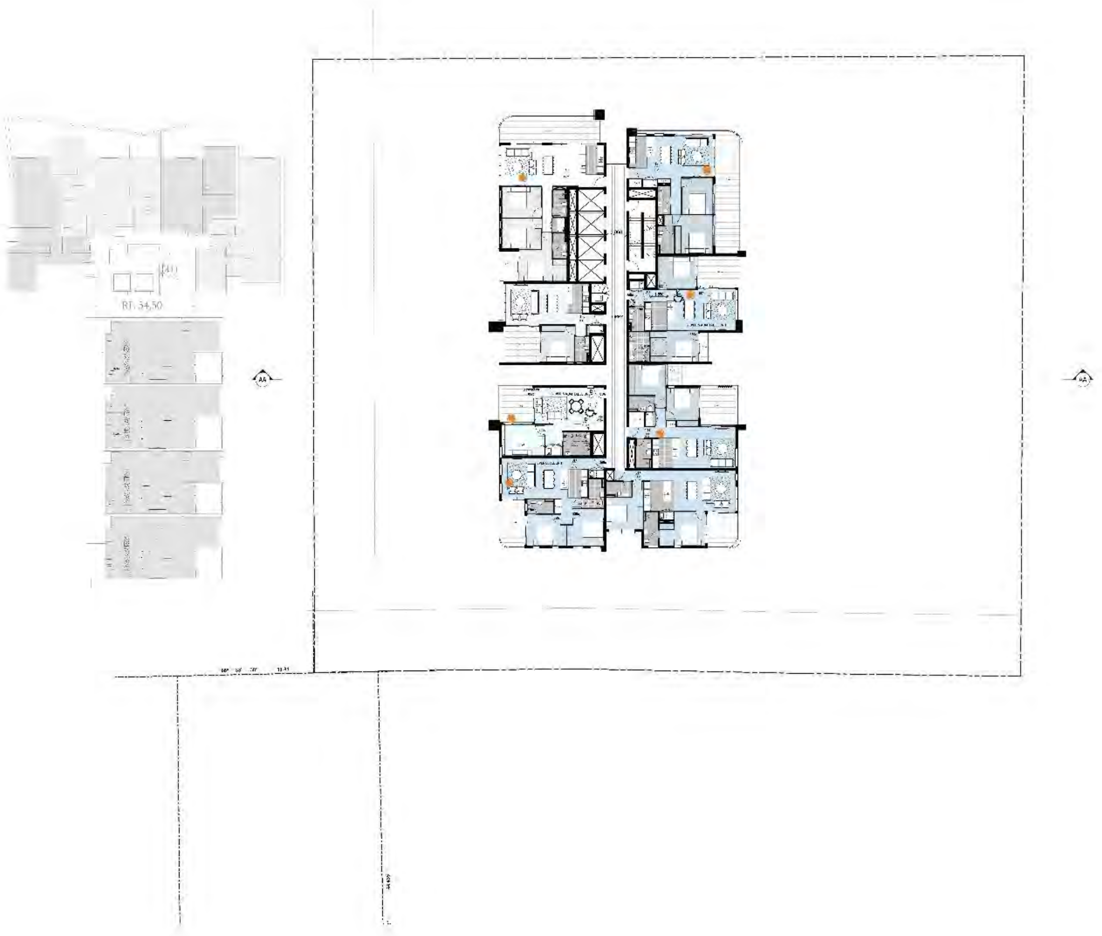
Project Number
18-113

Drawing Number
DA-111

DEVELOPMENT APPLICATION

ROAD DELAY SOLUTIONS

ROAD DELAY SOLUTIONS



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

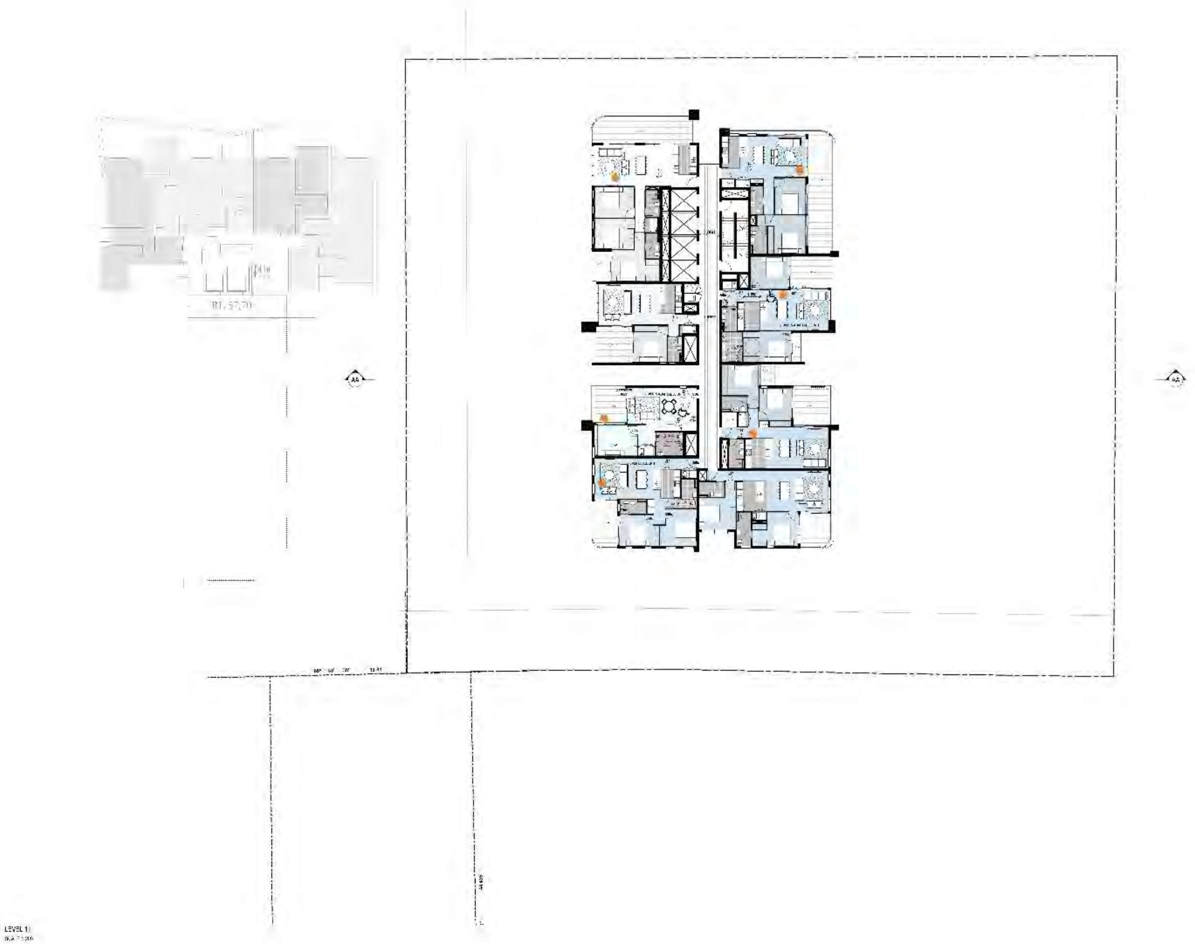
URBAN LINK

FLOOR PLANS
LEVEL 10

Scale
1:200

18-113
DA-114

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

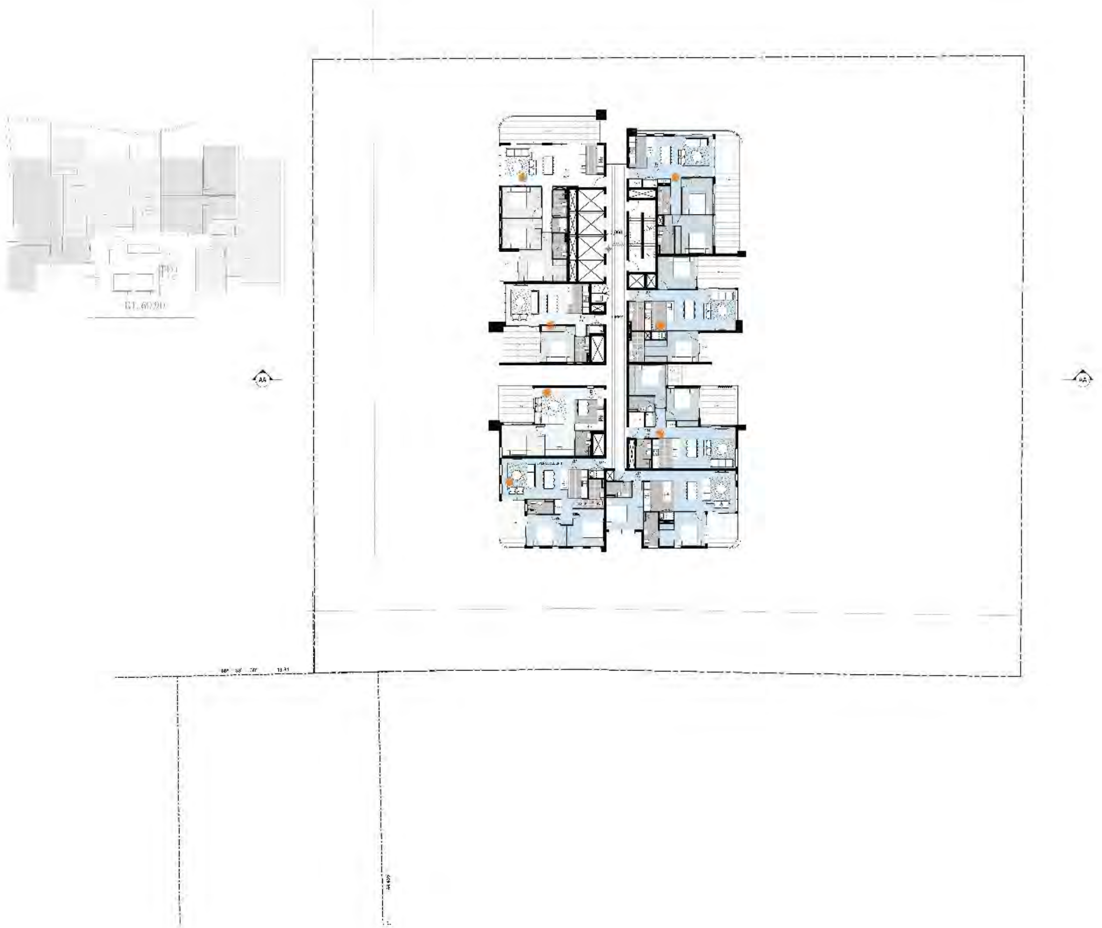
Drawing title
FLOOR PLANS
LEVEL 11

Scale
1:200

Project Number
18-113

Drawing Number
DA-115

Status
DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

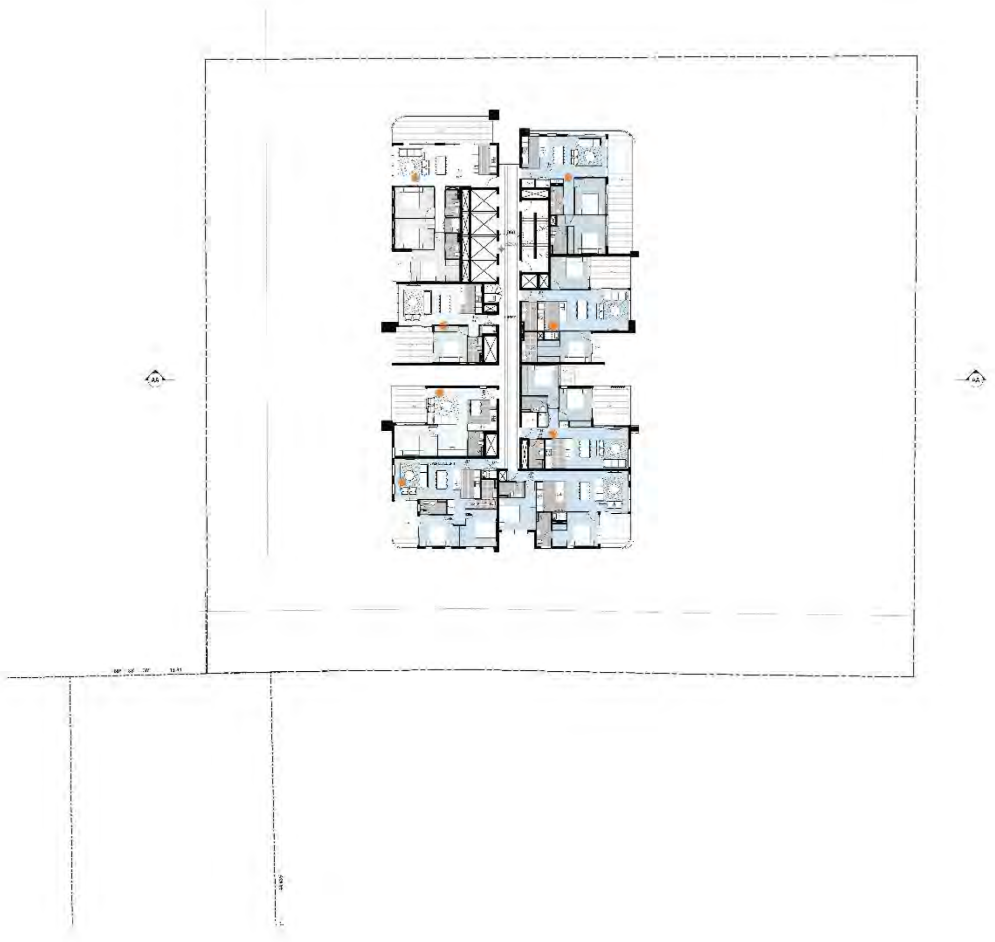
FLOOR PLANS
LEVEL 12

Scale
1:200

18-113

DA-116

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

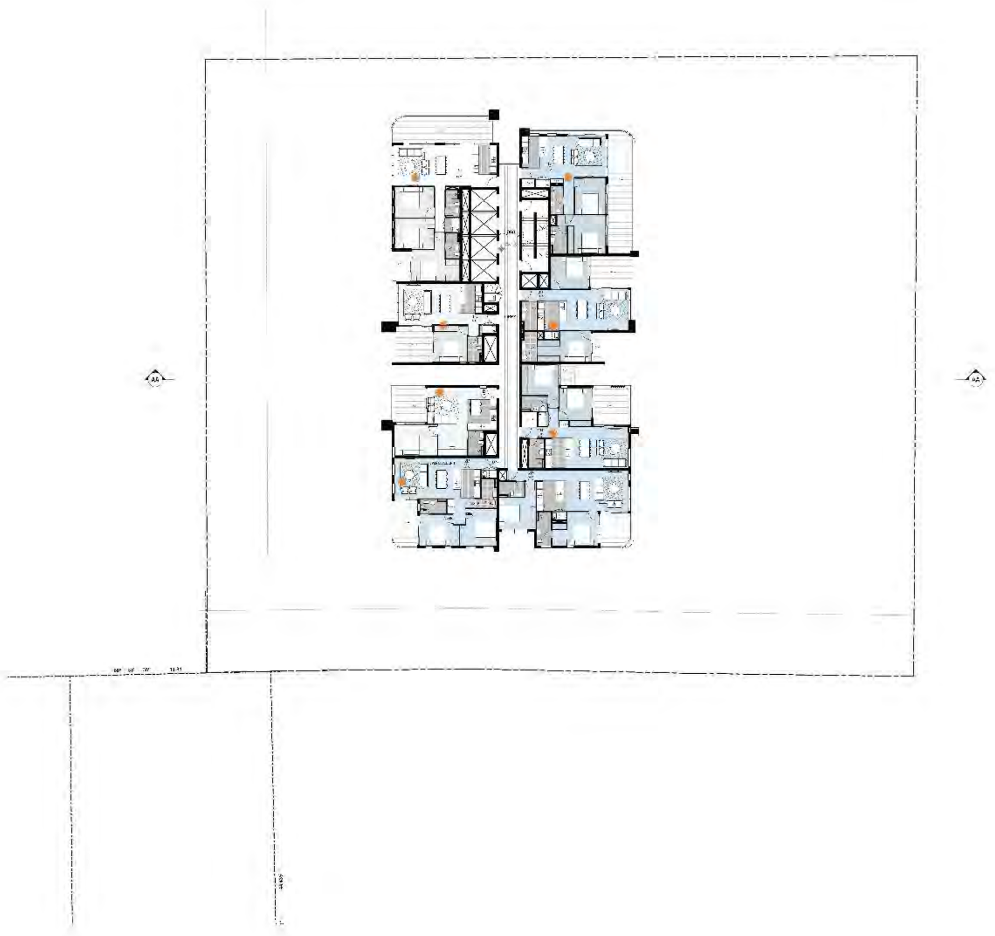
URBAN LINK

FLOOR PLANS
LEVEL 13

Scale
1:200

18-113
DA-117

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

FLOOR PLANS
LEVEL 14

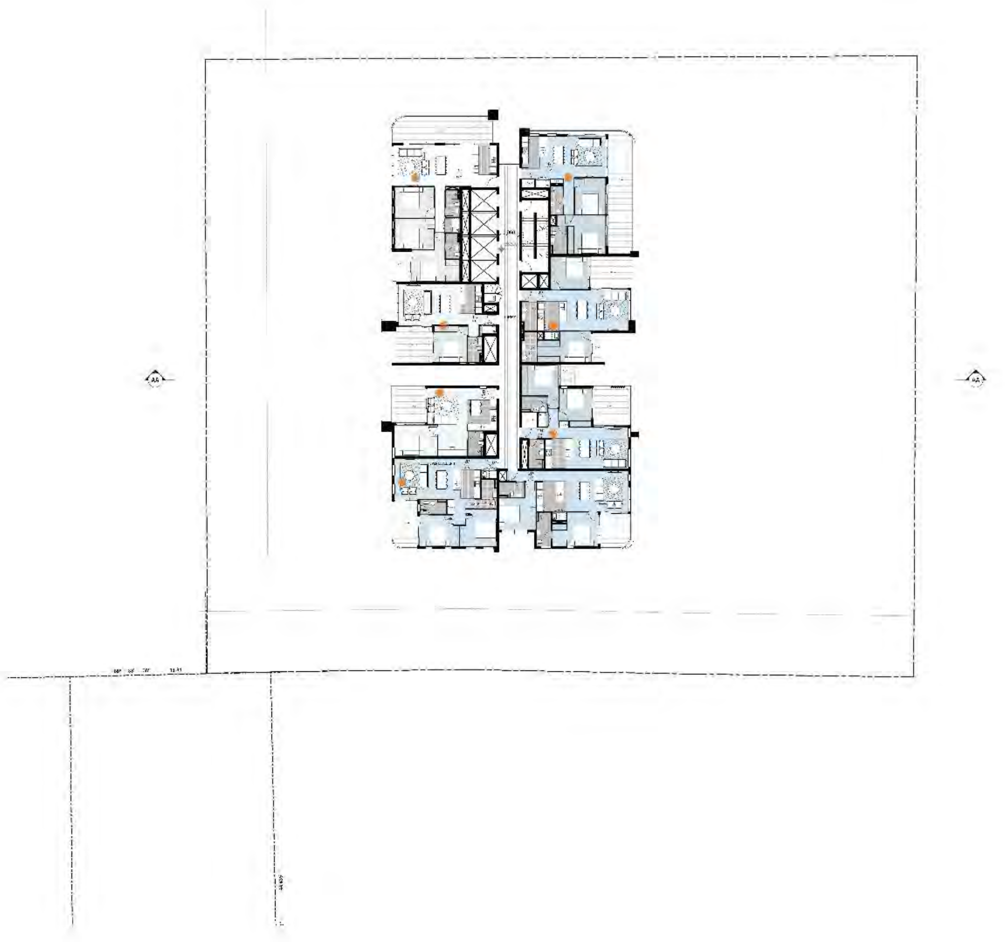
Scale
1:200

Project Number
18-113

Drawing Number
DA-118

Status
DEVELOPMENT APPLICATION

ROAD DELAY SOLUTIONS



MIXED USE MULTI RESIDENTIAL

URBAN LINK

FLOOR PLANS
LEVEL 15

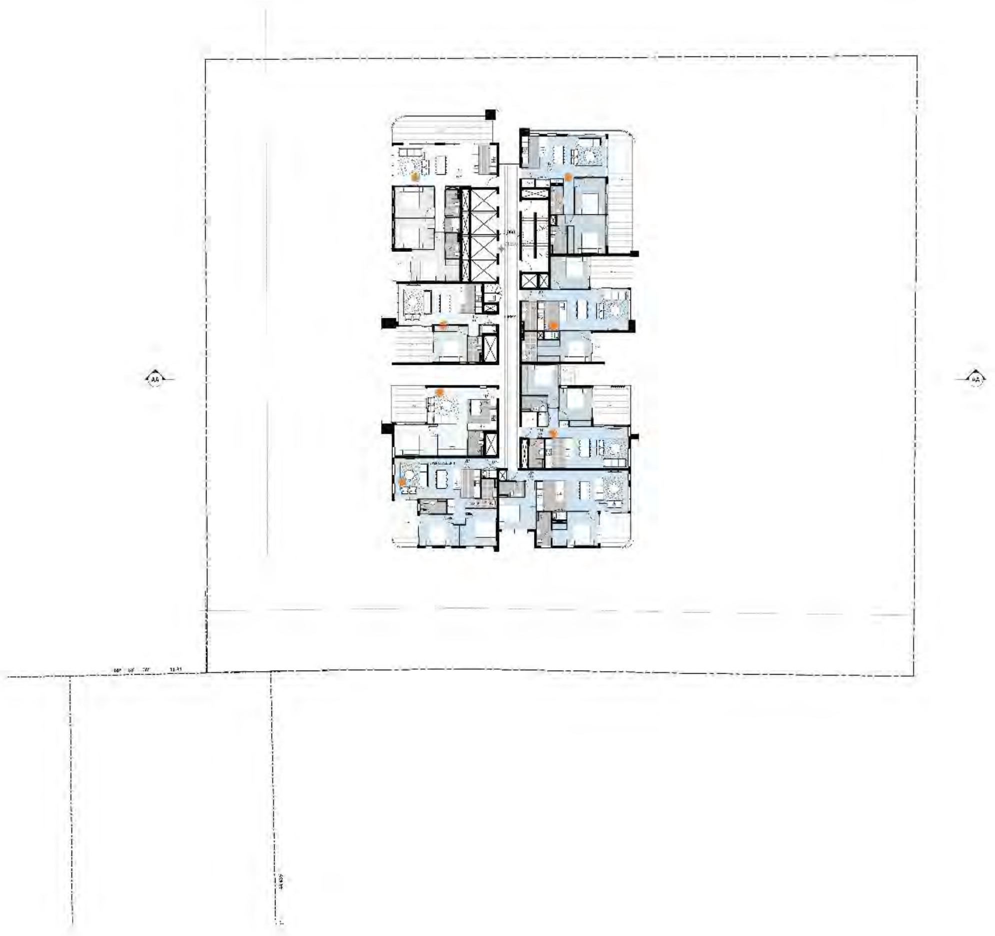
Scale
1:200

18-113

DA-119

DEVELOPMENT APPLICATION

ROAD DELAY SOLUTIONS



MIXED USE MULTI RESIDENTIAL

URBAN LINK

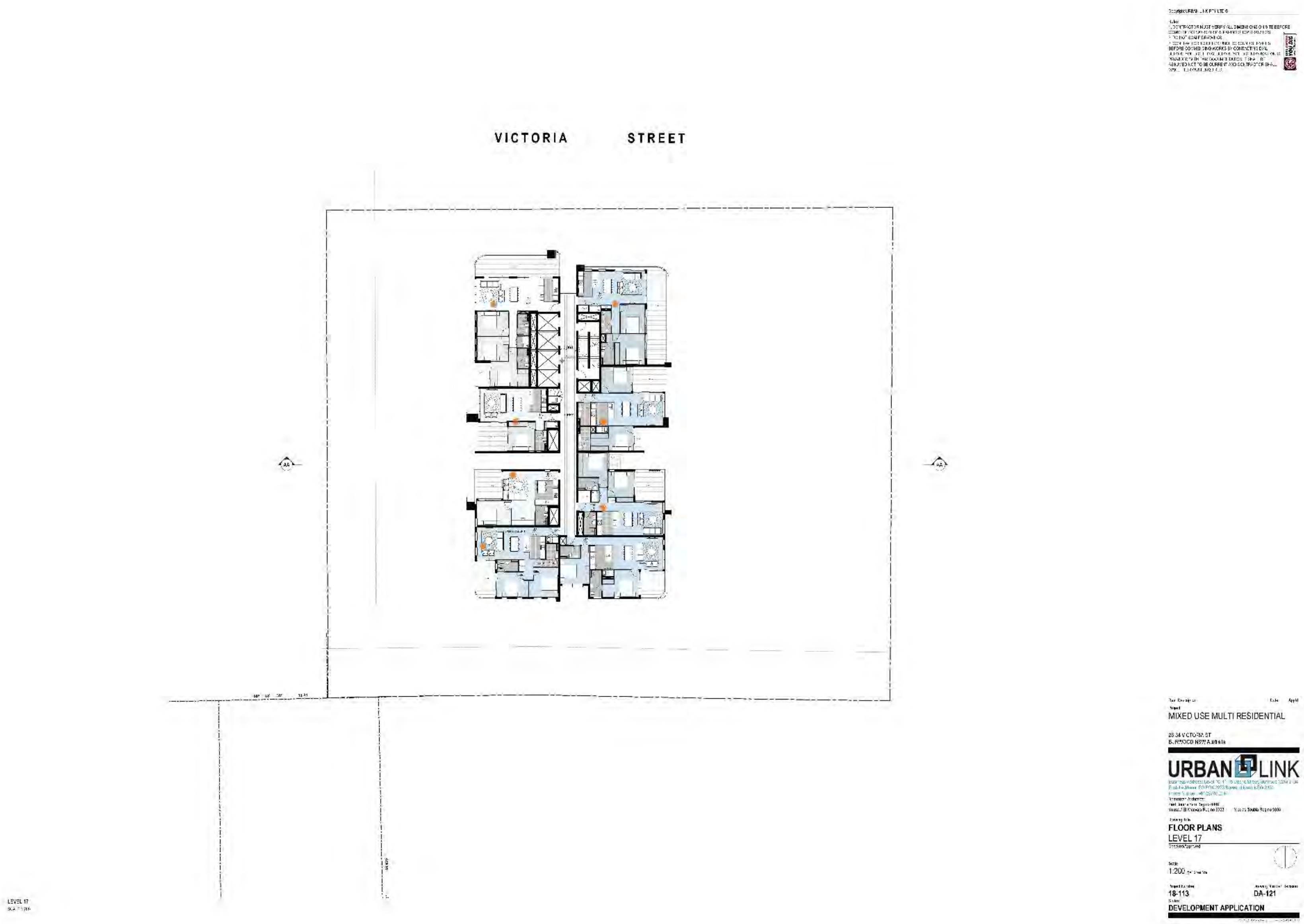
FLOOR PLANS
LEVEL 16

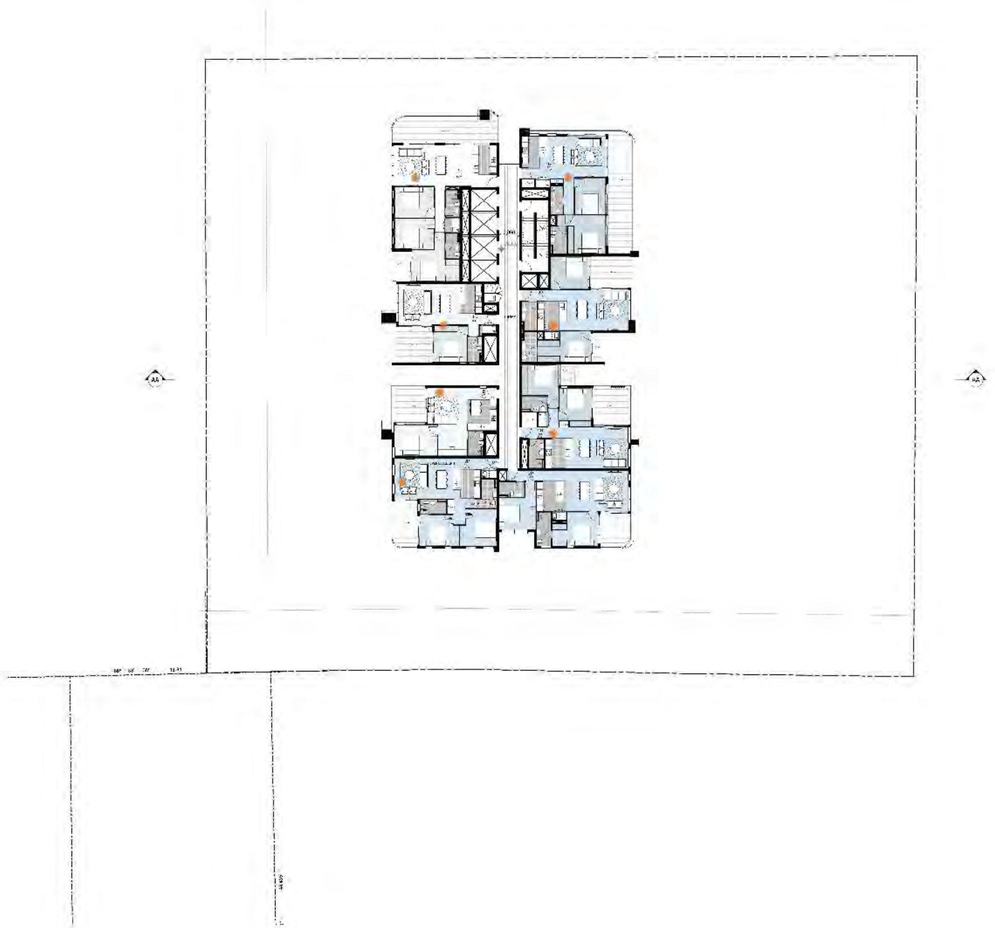
Scale
1:200

18-113

DA-120

DEVELOPMENT APPLICATION


VICTORIA STREET
MIXED USE MULTI RESIDENTIAL
URBAN LINK
FLOOR PLANS
LEVEL 17
1:200
18-113
DA-121
DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST

BURWOOD NSW Australia

URBAN LINK

FLOOR PLANS

LEVEL 18

Scale

1:200

Project Number

18-113

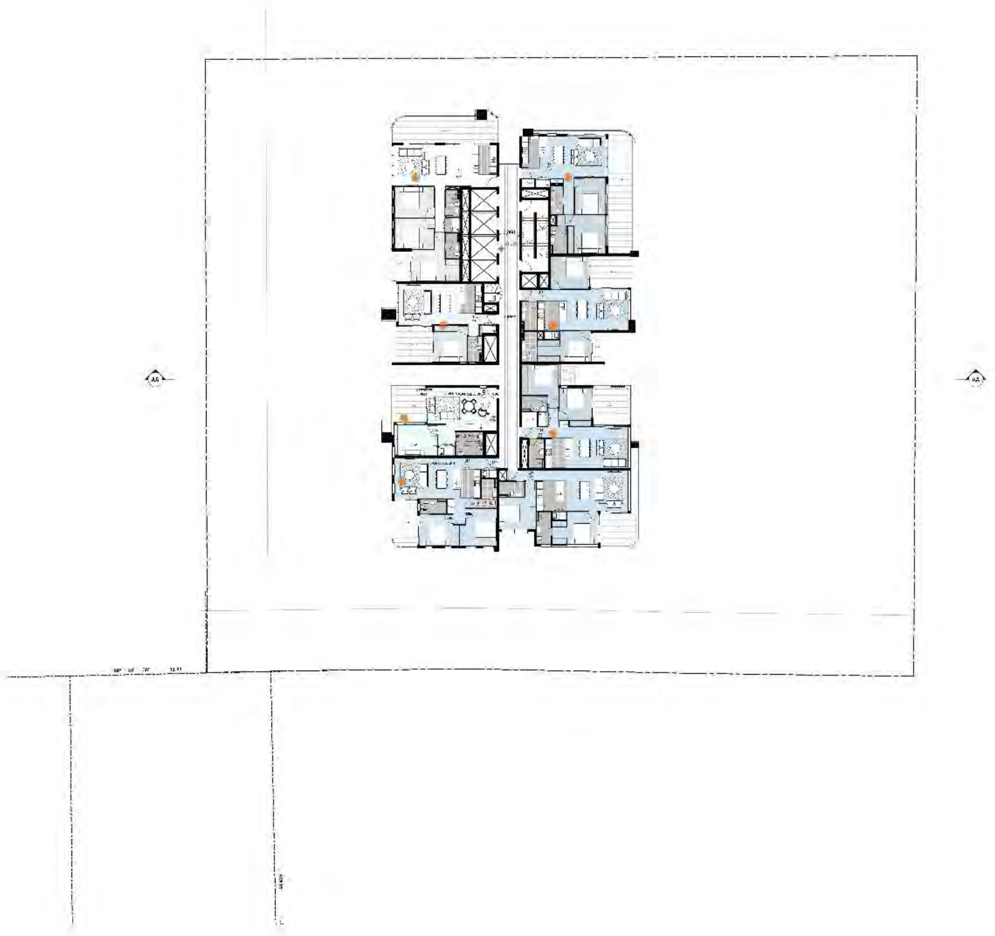
Drawing Number

DA-122

Status

DEVELOPMENT APPLICATION

ROAD DELAY SOLUTIONS



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

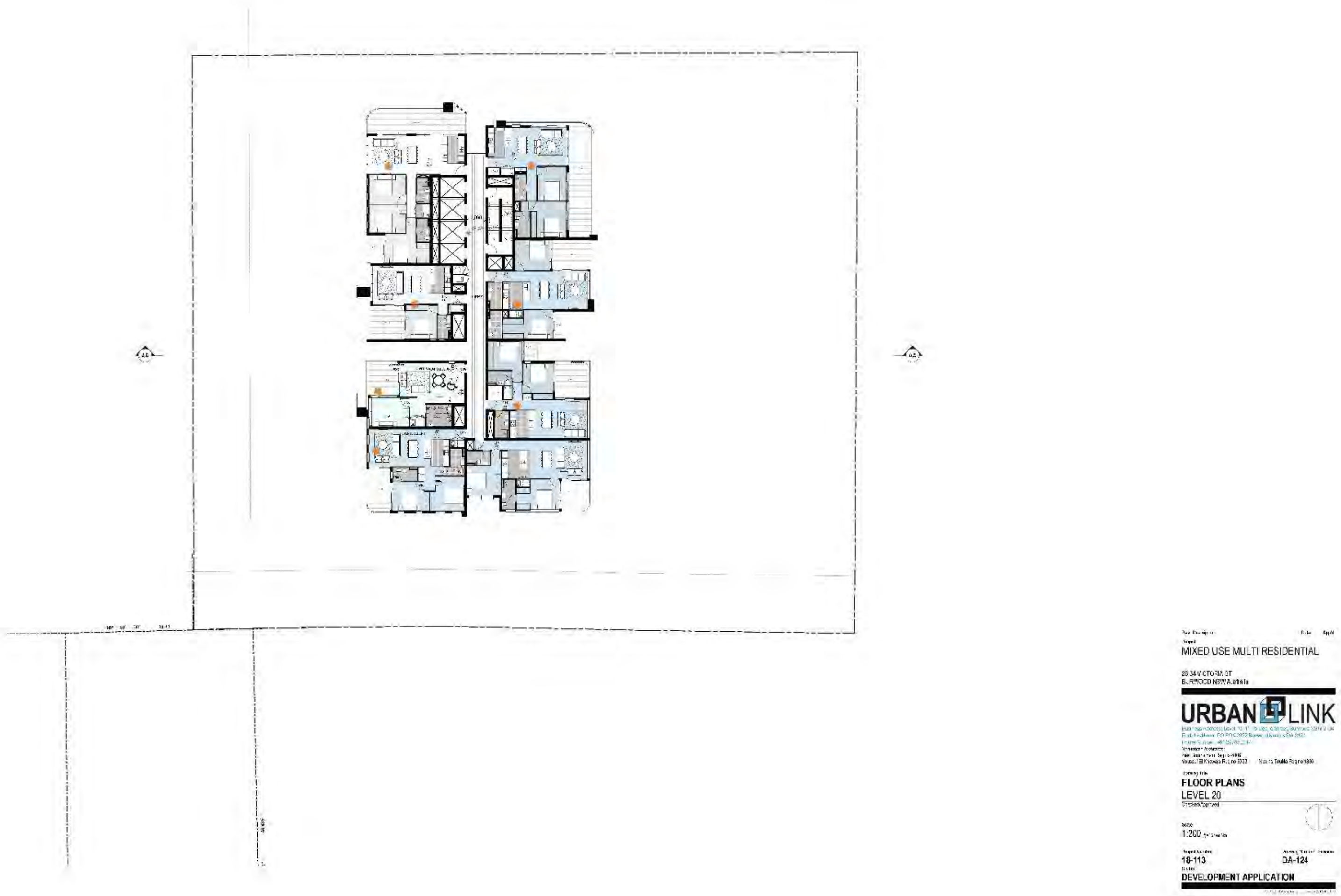
FLOOR PLANS
LEVEL 19

Scale
1:200

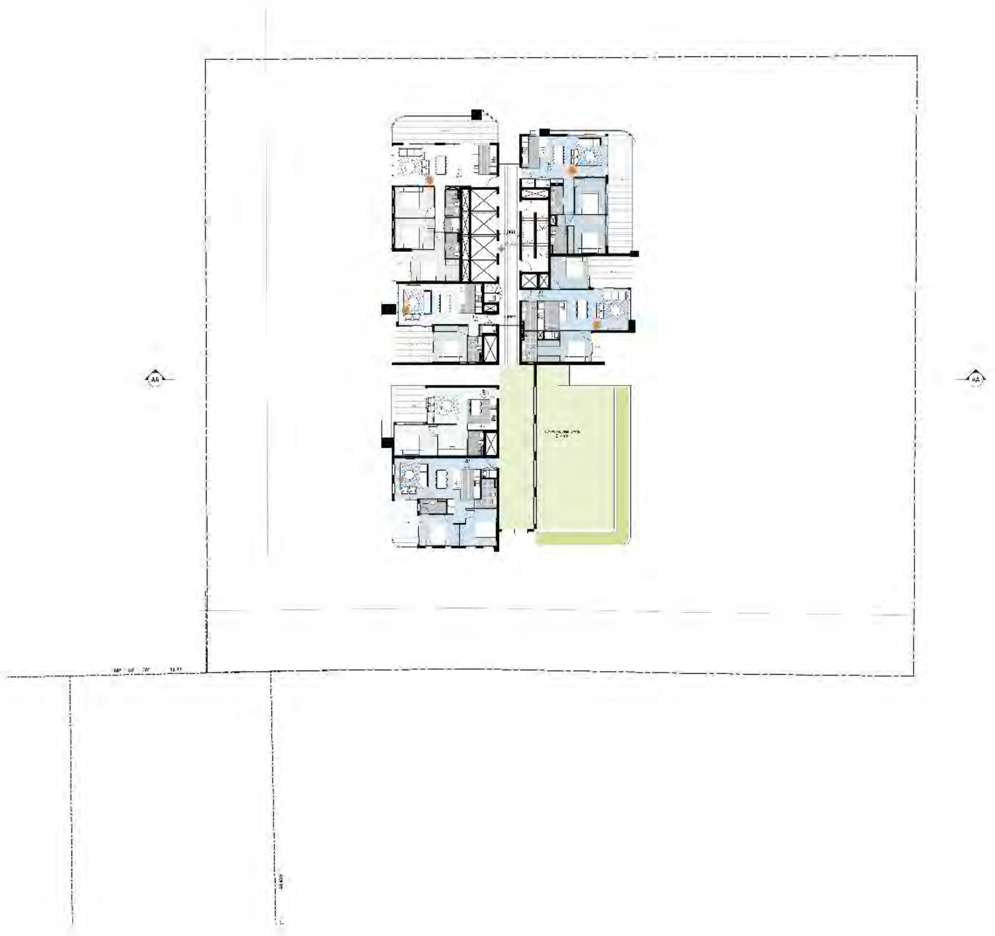
Project Number
18-113

Drawing Number
DA-123

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL
FLOOR PLANS
LEVEL 20
1:200
18-113
DA-124
DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

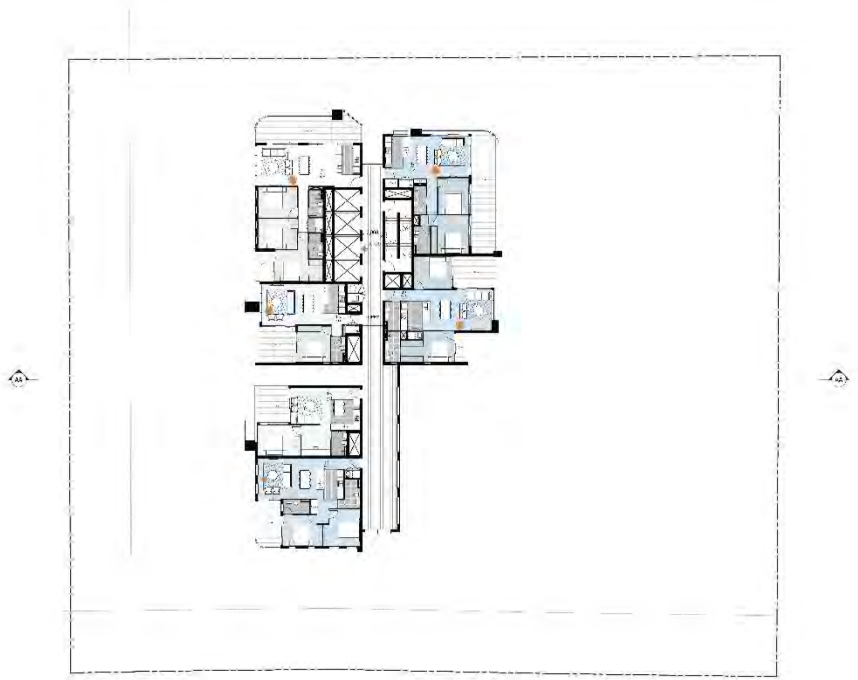
URBAN LINK

FLOOR PLANS
LEVEL 21

Scale
1:200

18-113
DA-125

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

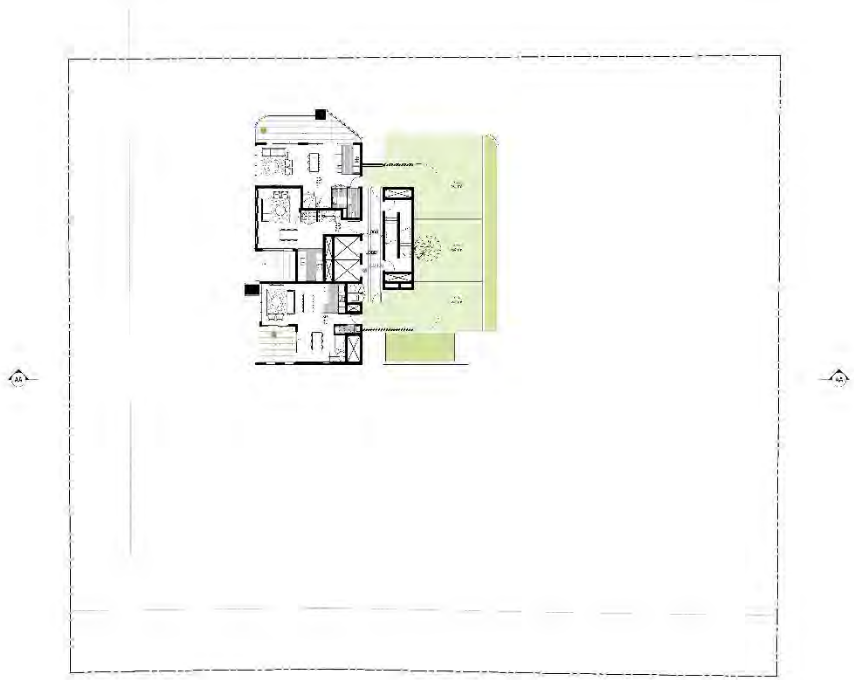
FLOOR PLANS
LEVEL 22

Scale
1:200

Project Number
18-113

Drawing Number
DA-126

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

URBAN LINK

FLOOR PLANS
LEVEL 28

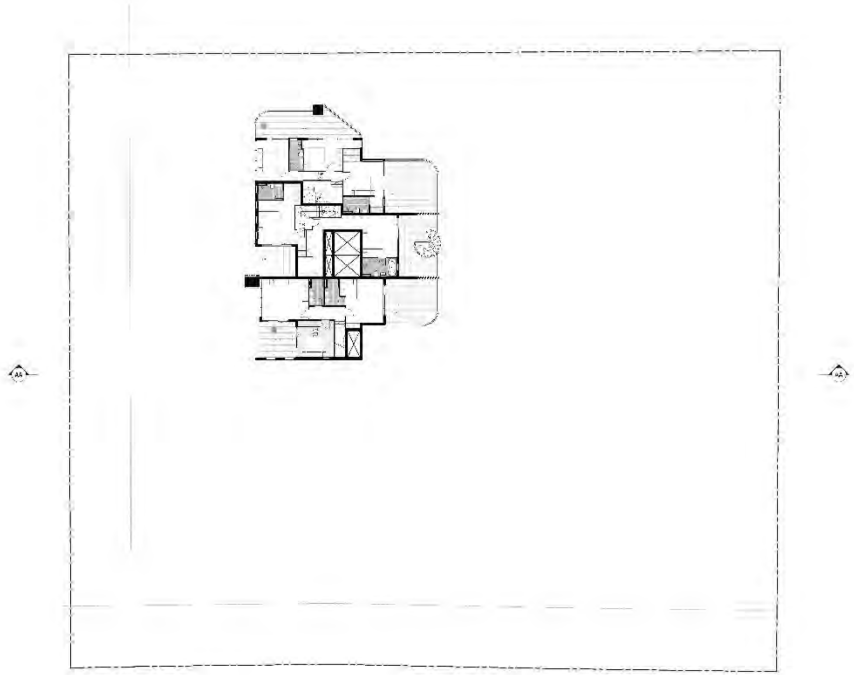
Scale
1:200

18-113

DA-132

DEVELOPMENT APPLICATION

ROAD DELAY SOLUTIONS



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

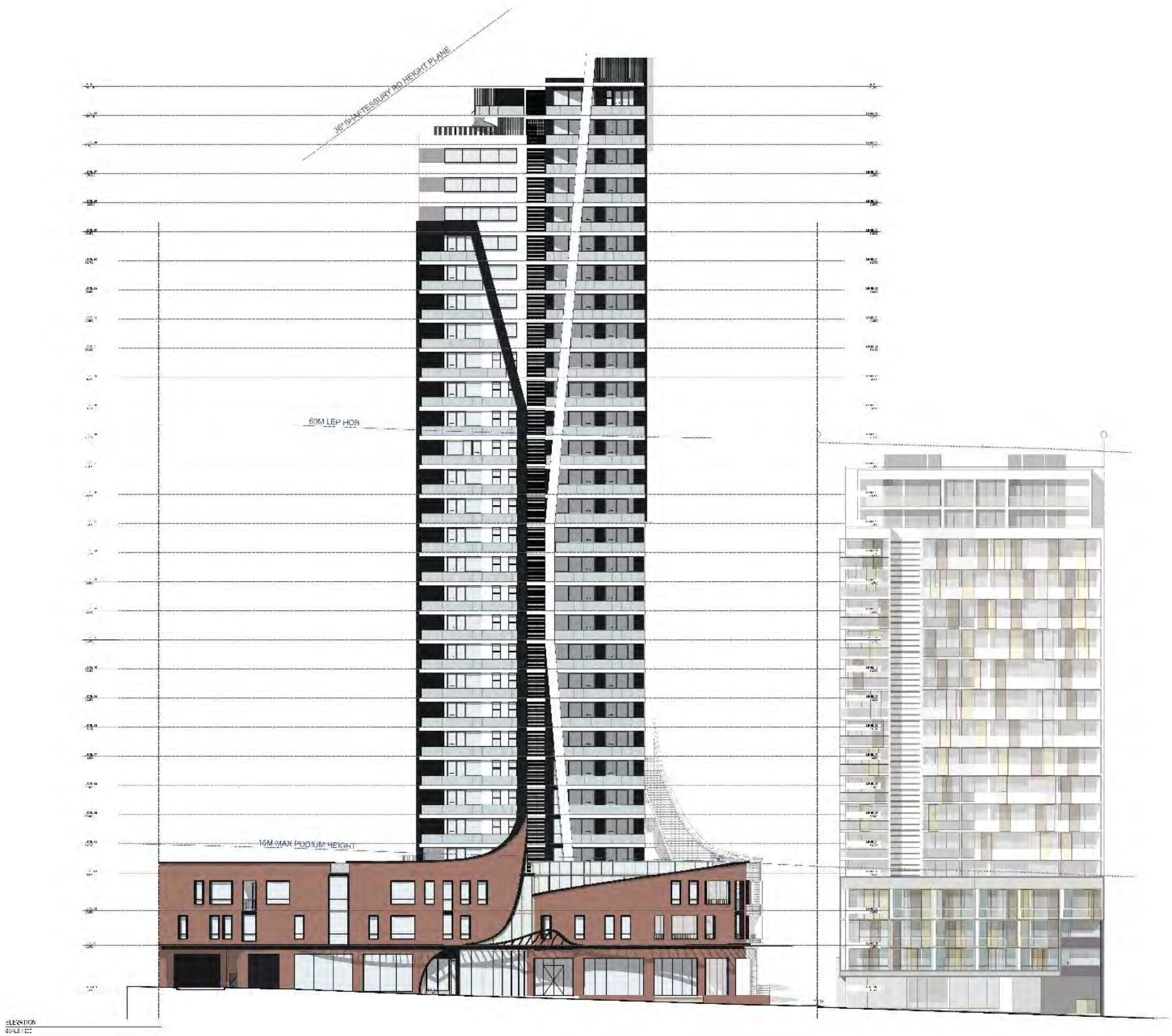
FLOOR PLANS
LEVEL 29

Scale
1:200

18-113

DA-133

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

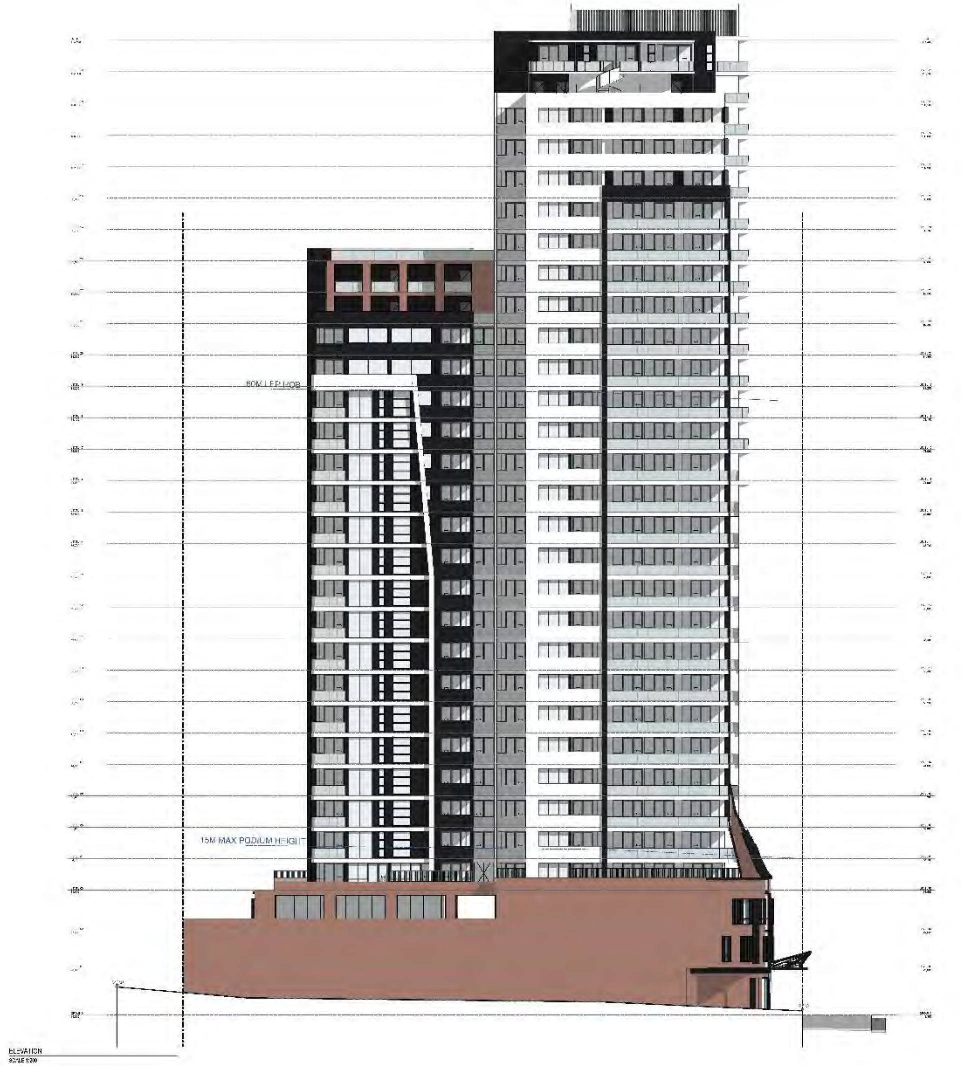
ELEVATIONS
NORTH

Scale
1:200

Project Number
18-113

Drawing Number
DA-201

DEVELOPMENT APPLICATION



MIXED USE MULTI RESIDENTIAL

BURWOOD NSW Australia

URBAN LINK

ELEVATIONS
EAST

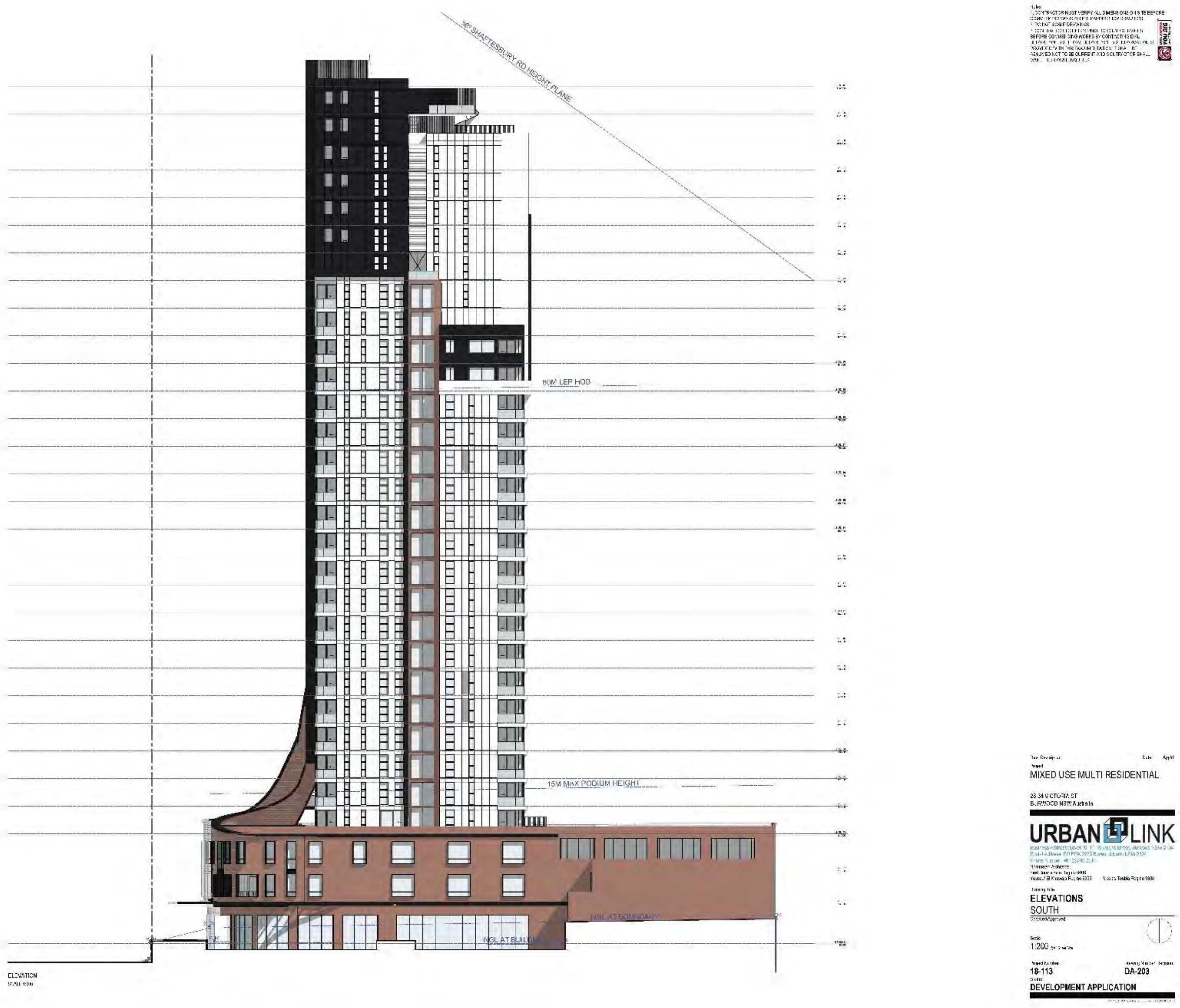
1:200

18-113

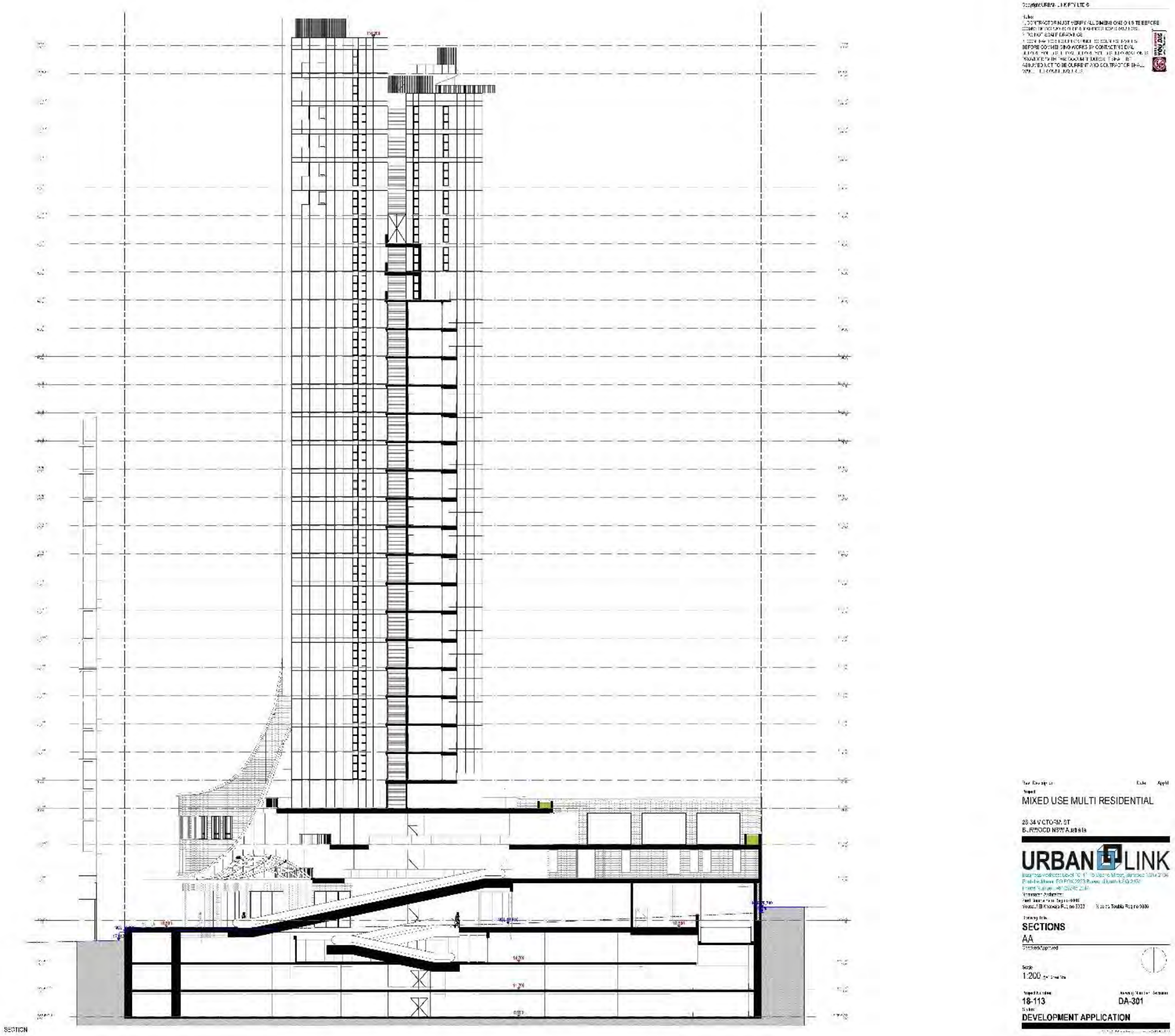
DA-202

DEVELOPMENT APPLICATION

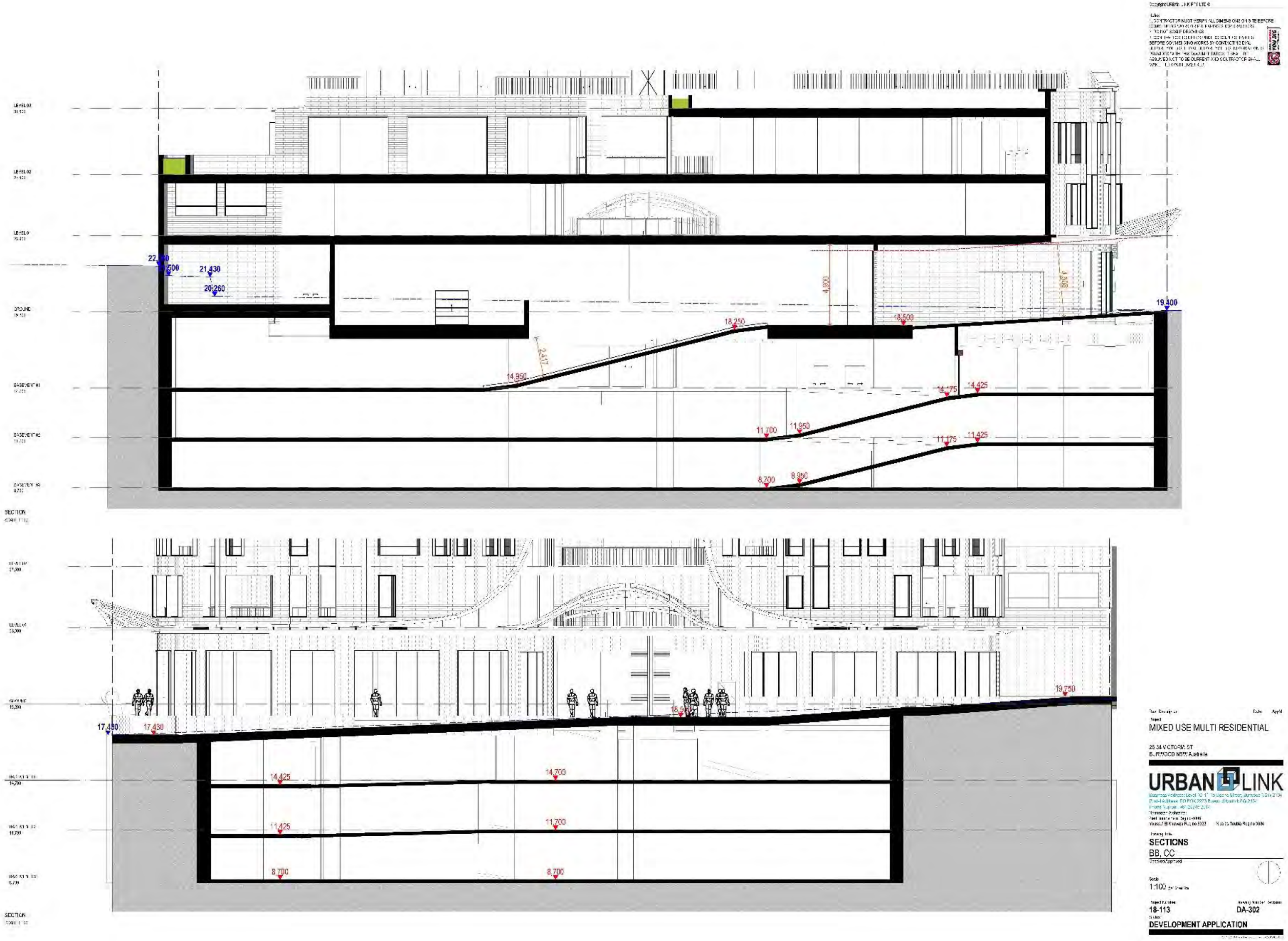
ROAD DELAY SOLUTIONS

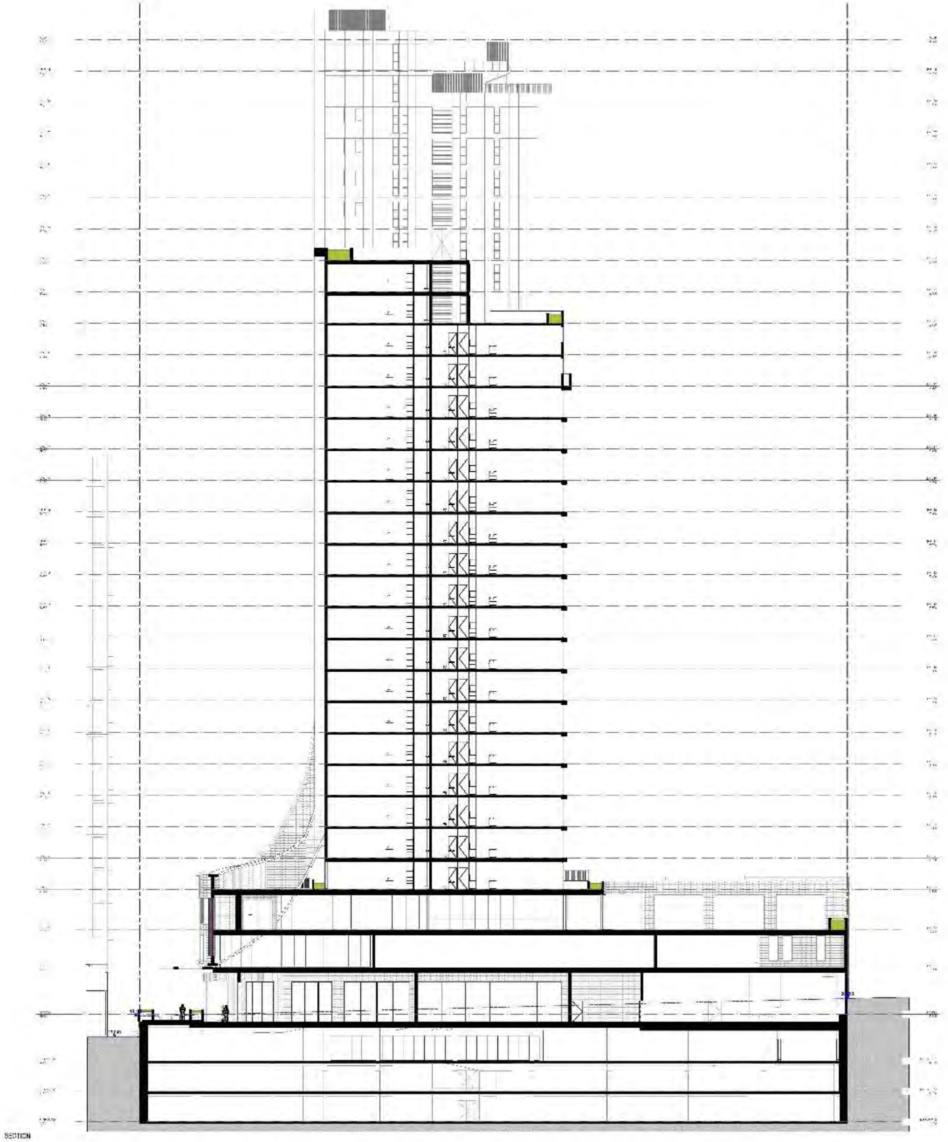



30M LEP HOB
15M MAX PODIUM HEIGHT
MIXED USE MULTI RESIDENTIAL
28-34 VICTORIA ST
BURWOOD NSW Australia
URBAN LINK
ELEVATIONS
WEST
1:200
18-113
DA-204
DEVELOPMENT APPLICATION


MIXED USE MULTI RESIDENTIAL
URBAN LINK
SECTIONS
AA
1:200
18-113
DA-301
DEVELOPMENT APPLICATION
SECTION

ROAD DELAY SOLUTIONS





MIXED USE MULTI RESIDENTIAL

28-34 VICTORIA ST
BURWOOD NSW Australia

URBAN LINK

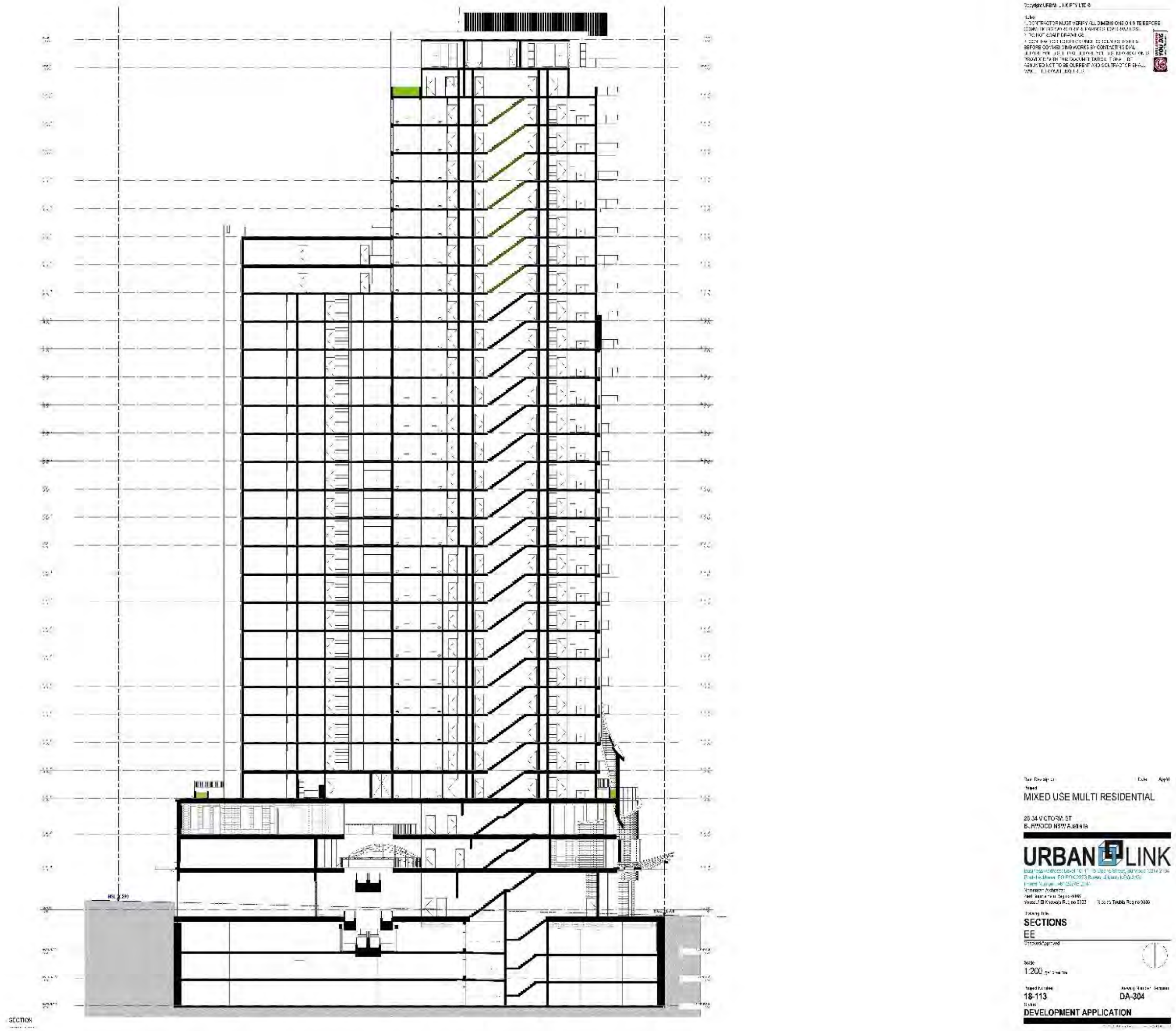
SECTIONS
DD

Scale
1:200

18-113

DA-303

DEVELOPMENT APPLICATION


MIXED USE MULTI RESIDENTIAL
28-34 VICTORIA ST
BURWOOD NSW Australia
URBAN LINK
SECTIONS
EE
1:200
18-113
DA-304
DEVELOPMENT APPLICATION
SECTION

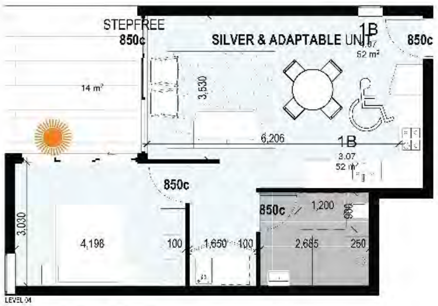

CAFE 71 m²
CAFE 75 m²
RETAIL 57 m²
RETAIL 68 m²
RETAIL 87 m²
RESTAURANT 137 m²
RETAIL 225 m²
1,853 m²
RESTAURANT 240 m²
RESTAURANT 230 m²
RESTAURANT/ RETAIL 455 m²
2,655 m²
RESTAURANT/ RETAIL 219 m²
OFFICES/COMMERCIAL
1,788 m²
COMMERCIAL 585 m²
COMMERCIAL OPEN SPACE
RESIDENTIAL COMMUNAL OPEN SPACE
MIXED USE MULTI RESIDENTIAL
URBAN LINK
OPTIONS - COMPLIANCE
GFA DIAGRAMS
1:250
18-113
DA-1401
DEVELOPMENT APPLICATION


MIXED USE MULTI RESIDENTIAL
URBAN LINK
OPTIONS - COMPLIANCE
GFA DIAGRAMS
1:250
18-113
DA-1402
DEVELOPMENT APPLICATION


MIXED USE MULTI RESIDENTIAL
URBAN LINK
OPTIONS - COMPLIANCE
SOLAR ACCESS DIAGRAMS
Scale
1:250
18-113
DA-1403
DEVELOPMENT APPLICATION

ROAD DELAY SOLUTIONS

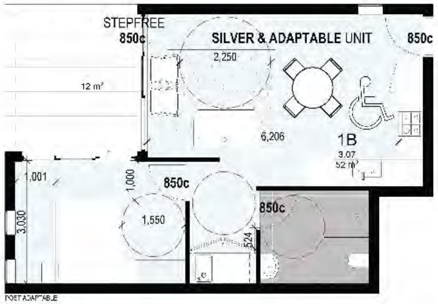
PRE ADAPTABLE & SILVER
UNITS 3.03, 4.03, 5.03, 6.03, 7.03, 8.03, 9.03, 10.03, 11.03



PRE ADAPTABLE & SILVER
UNITS 3.07, 4.07, 5.07, 6.07, 7.07, 8.07, 9.07, 10.07, 11.07

SILVER LEVEL
UNITS 3.06, 4.06, 5.06, 6.06, 7.06, 8.06, 9.06, 10.06, 11.06, 12.06, 13.06, 14.06, 15.06, 16.06, 17.06, 18.06, 19.06, 20.06

POST ADAPTABLE
UNITS 3.03, 4.03, 5.03, 6.03, 7.03, 8.03, 9.03, 10.03, 11.03



PRE ADAPTABLE & SILVER
UNITS 3.07, 4.07, 5.07, 6.07, 7.07, 8.07, 9.07, 10.07, 11.07

MIXED USE MULTI RESIDENTIAL

URBAN LINK

OPTIONS - COMPLIANCE
ADAPTABLE UNITS

1:50

18-113
DA-1405
DEVELOPMENT APPLICATION