



Traffic Engineers and Transport Planners

Traffix Group Pty Ltd

ABN 32 100 481 570

Address

Suite 8, 431 Burke Road

Glen Iris Victoria 3146

Contact

Telephone 03 9822 2888

Facsimile 03 9822 7444

admin@traffixgroup.com.au

www.traffixgroup.com.au

INTEGRATED TRANSPORT PLAN

78 MIDDLEBOROUGH ROAD, BURWOOD EAST

Prepared for

FRASERS PROPERTY GROUP

9 OCTOBER 2018

OUR REFERENCE: 17453R9728F

INTEGRATED TRANSPORT PLAN

78 MIDDLEBOROUGH ROAD, BURWOOD EAST

Study Team:	Jason Walsh B.E. (Civil), B.SC., V.P.E.L.A.	Brent Chisholm B.E. (Civil)
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EXECUTIVE SUMMARY

Council endorsed a Development Plan and Integrated Transport Plan on 28 February 2018. The Development Plan was premised on 950 dwellings and 10,500 square metres of retail floor area.

The agreed access arrangements included:

- A new signalised access to Middleborough Road.
- A new secondary access to Middleborough Road, provided as a left-in / left-out arrangement.
- Modification of the existing signalised intersection of the Burwood Heights Shopping Centre access and Burwood Highway by inclusion of a northern leg to access the subject land.
- Construction of a link road connecting the new signalised access at Middleborough Road and the modified signalised access at Burwood Highway.
- A new roundabout access to Eley Road. (This access only provides for the northern portion of residential dwellings, with no vehicle connection through to the link road).

Additionally, the Development Plan contemplates improvements to the signalised intersection of Middleborough Road and Burwood Highway, including lengthening of the right turn lanes on the northern and eastern approaches.

The agreed access strategy and remedial works were based on 2014 traffic counts and for the primary accesses to the subject land, a 2% compounded annual traffic growth rate (for 10 years) on Middleborough Road and Burwood Highway.

2018 traffic data highlights that there has been no growth on Middleborough Road and Burwood Highway between 2014 and 2018, and accordingly the existing approved traffic assessment is considered conservative.

The amendments to the Development Plan propose the addition of 2,450 square metres of non-retail floor area to provide for a cinema and entertainment, gymnasium, office, medical centre, or child care centre, or a combination of these uses.

There is no proposed change to the agreed access arrangements and external mitigation works.

It is projected that the non-retail floor area will generate 56 movements in the critical Friday afternoon commuter and Saturday peak hours. When spread across the various accesses, no particular movement at an access is projected to increase by more than 14 movements in any one hour. The largest individual increase (14 movements) will be added to the right turn on the south approach of the Middleborough Road signalised site access.

To this end, it is not necessary to undertake a full new analysis for the relatively modest projected increases in traffic generation, particularly considering there has been no growth on Middleborough Road and Burwood Highway in the preceding 4 years, and for the right turn on the south approach at the Middleborough Road signalised access, the approved traffic assessment identified that this movement is not expected to exceed 60% of capacity.

In summary, it is expected that the proposed amendments to the Development Plan will make no material difference to the traffic assessment, and the agreed access strategy and remedial works are appropriate for the proposed level of development, including the additional non-retail floor area.

1 INTRODUCTION

Traffix Group has been engaged by Frasers Property Group to prepare an updated Integrated Transport Plan (ITP) as part of an amended Development Plan for 78 Middleborough Road, Burwood East.

In development of the approved ITP (dated 16/01/18 and endorsed 28/02/2018), Traffix Group provided traffic advice in relation to road network principles, access connections to the main road network, road cross sections, public transport, and traffic impacts of the desired development yield.

This work resulted in an agreed access strategy and level of external mitigation works, and subsequently VicRoads' approval of functional plans.

In preparing this updated report, the subject site and environs have been inspected and updated traffic data has been collected and reviewed, and traffic impacts of the amended development yield have been assessed.

In this regard, this report retains much of the preliminary work completed as part of the approved Integrated Transport Plan of February 2018 and adds Section 8 to address the traffic impacts of the increased development yield contemplated as part of the amended Development Plan.

2 BACKGROUND

The subject land, 78 Middleborough Road Burwood East, has formerly been referred to as the 'Brickworks' site, and is subject to Clause 22.12 of the Whitehorse Planning Scheme.

The Policy aims to guide future development of the subject land as an integrated and integral part of the wider Burwood Heights Major Activity Centre.

The site is identified as a strategic development site and has an approved Indicative Concept Plan that envisages a mixed-use development comprising residential, retail, leisure and commercial uses. The Plan, and associated Movement Systems and Access Policy identifies, amongst others, the following traffic principles.

- *Establishes an internal road link that connects Burwood Highway and Middleborough Road and provides a mixed-use, activated Main Street concept.*
- *Designs the internal road link as a tree-lined boulevard that is pedestrian, bicycle and bus friendly, and contributes positively to the site's character and aesthetic quality.*
- *Provides points of access into the site for pedestrians and cyclists from all adjoining roads and the opportunity for pedestrian and cyclist access to Medhurst and Ramsey Streets, and the retarding basin to the east of the site.*
- *Preserves an appropriate level of amenity in surrounding residential areas by limiting points of access to the site for motorised vehicles.*

Zoned part Residential Growth and part Commercial 1, the land is also subject to a DPO which requires the preparation of a Development Plan and an Integrated Transport Plan (ITP). The ITP must:

- *Document the expected number of trips generated by residents, staff and visitors, and for deliveries and service vehicles to the site.*
- *Estimate each transport mode's share of travel, including public transport's modal share and non-motorised travel, relative to other transport modes.*
- *Specify any works considered necessary for public transport vehicles or passenger facilities within the area covered by the Plan, including improved access to public transport.*
- *Specify the actions and responsibilities for on-going implementation of the Plan, including proposed funding arrangements.*
- *Specify the proposed traffic management and control works on-site and on nearby and adjoining roads.*
- *Specify the means of vehicular ingress and egress to and from the Former Brickworks Site.*
- *Specify the arrangements for internal access and movement including details of the internal road network and indicative cross-sections.*
- *Specify the timing of proposed traffic works relative to the staging program of development.*
- *Specify public transport arrangements and access routes.*
- *Specify the proposed pedestrian and bicycle access to, from and within the Former Brickworks Site and how this integrates with the surrounding street network and the wider Activity Centre.*
- *Specify the location of car parking, bicycle parking, loading and unloading facilities for vehicles and the means of access to them*
- *Document proposed sustainable travel initiatives, including estimated mode share targets and actions to encourage use of public transport and non-motorised travel for trips to local and regional destinations.*
- *Specify how the Plan responds to State government transport objectives.*

Before the plan is approved the Responsible Authority must have regard to the views of the Department of Infrastructure, Vic Roads, Director of Public Transport and any other relevant agencies, to the extent applicable to the precinct or the part of the precinct that is the subject of the Development Plan.

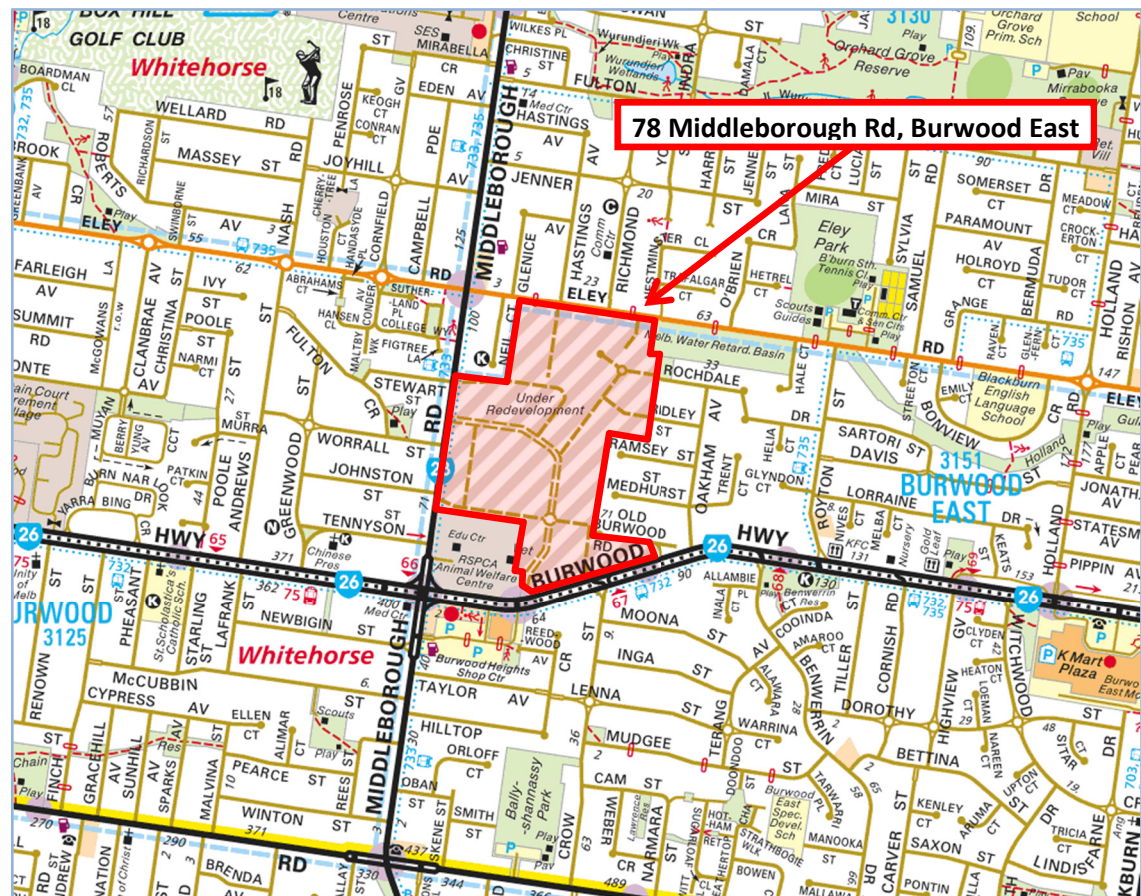
In February 2018, Council endorsed a Development Plan and associated reports including the Integrated Transport Plan. The Integrated transport Plan was premised on a development containing 950 dwellings and 10,500 square metres of retail floor area.

3 EXISTING CONDITIONS

3.1 Subject Land

The subject land, addressed as 78 Middleborough Road Burwood East, is an irregular shaped parcel of land, known as the former 'Brickworks Site'. The site is located in Burwood East approximately 15 kilometres east of Melbourne's CBD, and comprises land contained generally within the block bound by Eley Road to the north, Middleborough Road to the west, Burwood Highway to the south, and an existing residential catchment to the east.

The locality of the site is depicted in Figure 1.



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Figure 1: Locality Plan

The subject land covers a site area of approximately 21 hectares. It is currently vacant, however earthworks have commenced to shape the site in preparation for development.

There is an existing Escrow Agreement, dated 27 November 2012, relating to the construction of the Burwood Highway site access and easement within the land to the immediate east of RSPCA.

The Agreement allows RSPCA to park vehicles within the easement.

The surrounding land use is largely residential in nature with the RSPCA situated at the north east corner of the intersection of Middleborough Road and Burwood Highway.

Burwood Heights Shopping Centre, including a Woolworths Supermarket, is situated on the south-east corner of the Burwood Highway / Middleborough Road intersection.

Figure 2 illustrates the land use zoning for the site and surrounds.

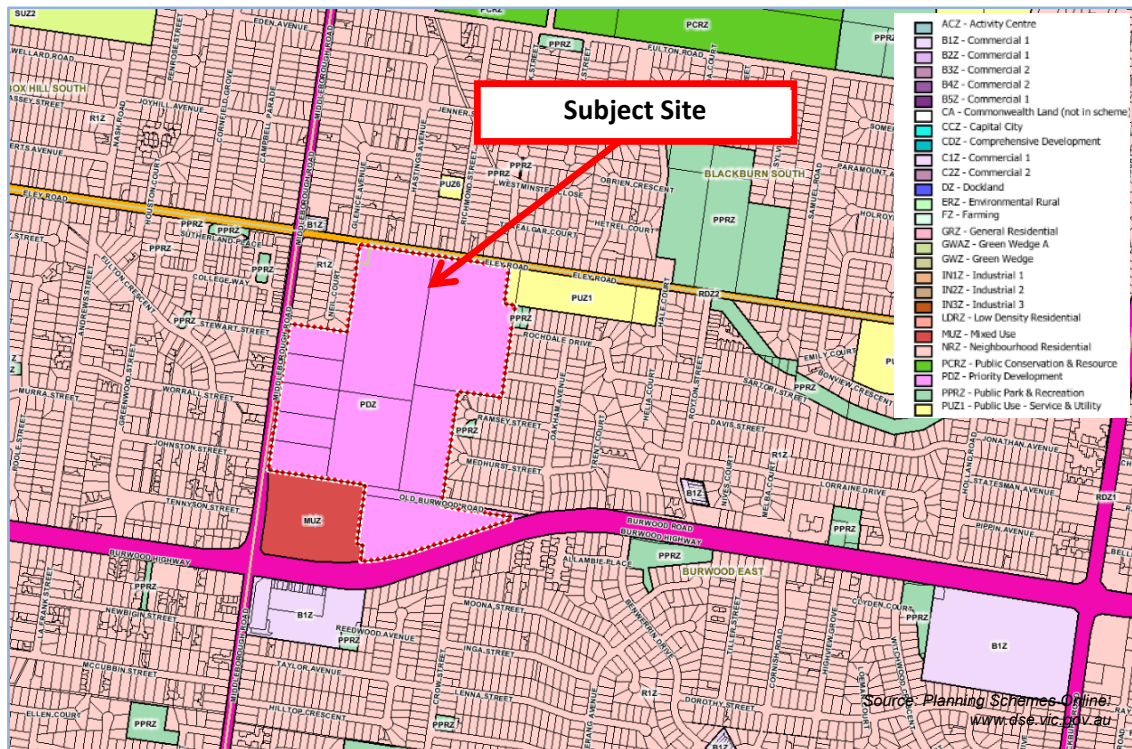


Figure 2: Land Use Zoning Map

3.2 Road Network

Burwood Highway is a declared Road Zone Category 1 under the Planning Scheme. Burwood Highway is generally aligned in an east-west direction and connects Belgrave-Gembrook Road in the east (Belgrave) with Warrigal Road in the west (where it continues as Toorak Road).

In the vicinity of the subject site, Burwood Highway is configured as a dual carriageway providing for a central tram reservation and three (3) through traffic lanes in each direction.

A posted speed limit of 70kmh applies to Burwood Highway.

No stopping restrictions apply outside of Clearway periods, which operate 4pm-7pm Monday to Friday on the eastbound carriageway and 6:30am-9:30am Monday to Friday on the westbound carriageway. A limited number of indented parking bays are located on the westbound approach to Middleborough Road on Burwood Highway, at the frontage to Burwood Heights Shopping Centre.

Middleborough Road is a declared Road Zone Category 1 under the Planning Scheme. Aligned in a north-south direction, Middleborough Road extends north to the Eastern Freeway continuing as Wetherby Road, and south to Highbury Road continuing as Stephensons Road.

In the vicinity of the subject site, Middleborough Road is constructed with a pavement width of 12.7 metres and affords two (2) lanes of through traffic in each direction.

Middleborough Road has a posted speed limit of 60kmh and parking along the site's frontage is unrestricted.

Eley Road is a Road Zone Category 2 collector road providing a connection between Blackburn Road in the east with Station Street in west. Eley Road bounds the subject land to the north and intersects with Middleborough Road north-west of the subject land.

Eley Road has a pavement width of 7.7 metres and provides a through traffic lane in each direction. Eley Road operates with a posted limit of 50kmh which is partly controlled with speed cushions east of the Middleborough Road intersection.

The intersections of Burwood Highway and Middleborough Road, and Middleborough Road and Eley Road are signalised.

The Burwood Heights Shopping Centre is provided with signalised access to Burwood Highway at the eastern boundary of the RSPCA. The RSPCA access falls within the intersection but is not signalised and does not permit right turns from the RSPCA.

3.3 Existing Traffic Volumes

In consideration of the potential development mix, it is expected that the critical times of operation of the road network will be Friday commuter peak hours and Saturday lunch time.

To understand the traffic conditions of the surrounding road network, VicRoads SCATS data for the week 21st – 27th July, 2014 was sourced for the intersections of:

- Burwood Highway / Burwood Heights Shopping Centre.
- Burwood Highway / Middleborough Road.
- Middleborough Road / Eley Road.

The data revealed the following peak hours:

- AM PEAK: Friday 8am – 9am
- PM PEAK: Friday 5.15pm – 6.15pm; and
- PEAK: Saturday 12pm – 1pm.

The SCATS recorded peak hour movements are illustrated in Figure 3 and Figure 4.

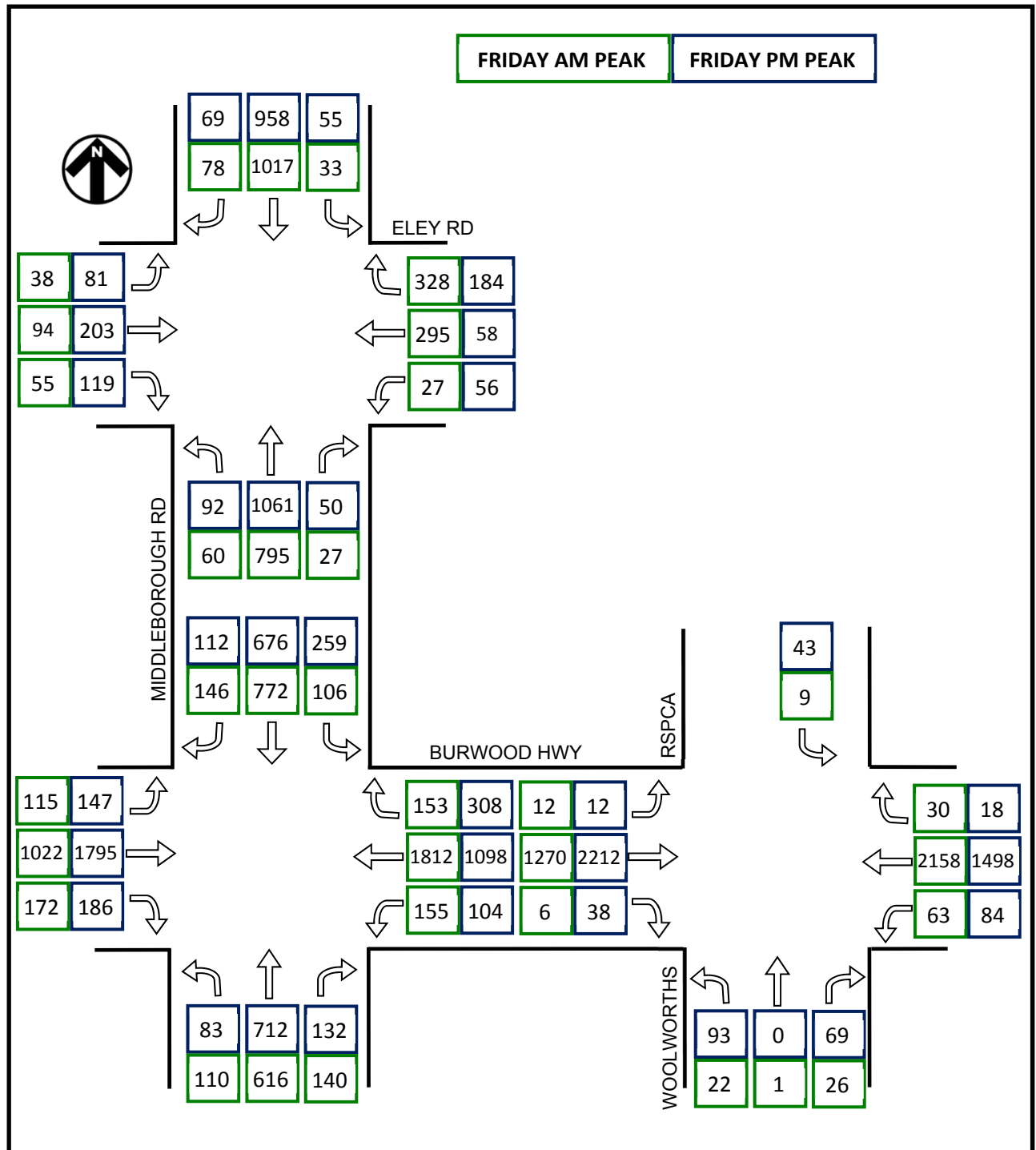


Figure 3: SCATS Peak Hour Traffic Volumes – Friday 25 July 2014

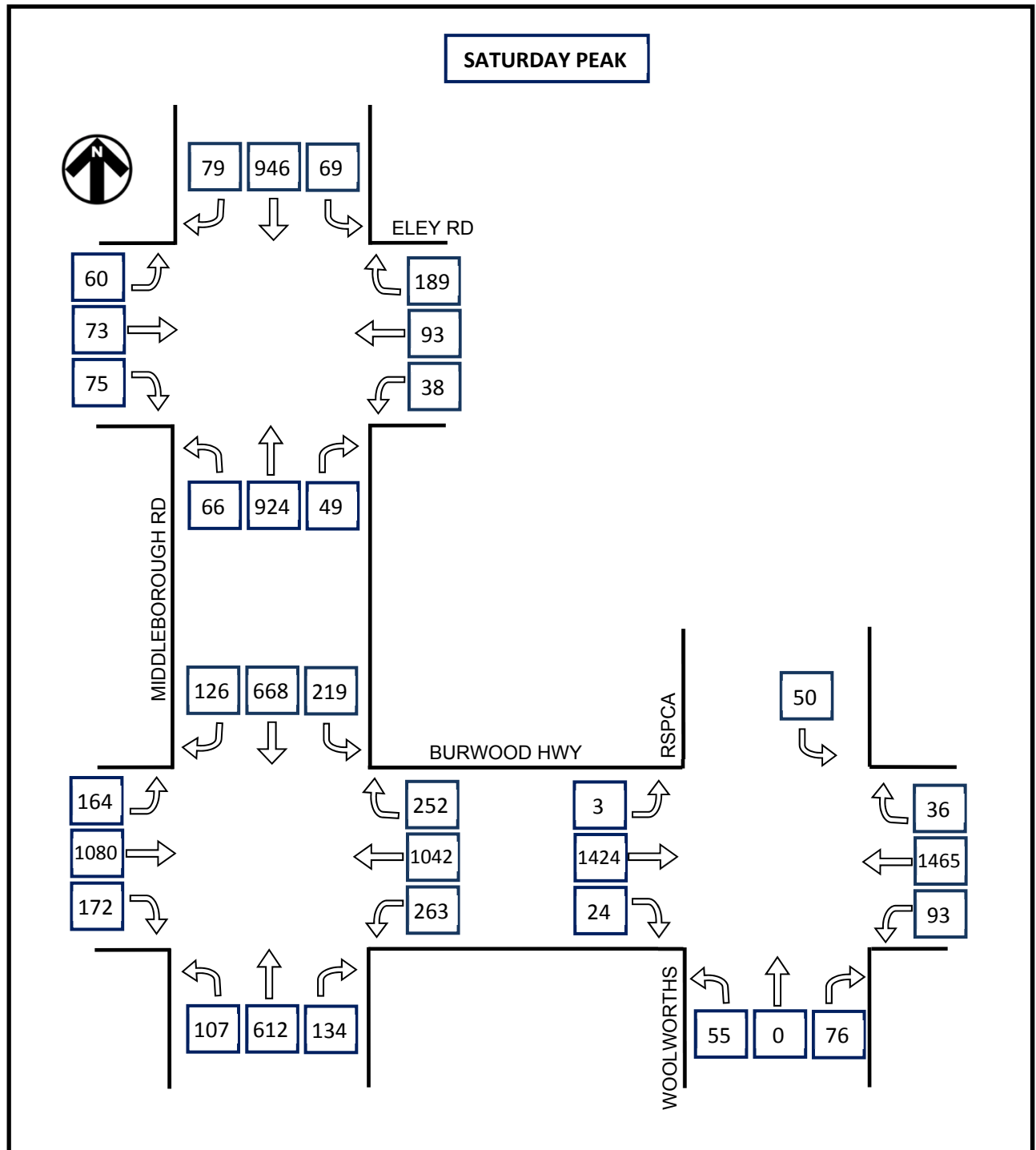


Figure 4: SCATS Peak Hour Traffic Volumes – Saturday 26 July 2014

3.4 Existing Intersection Performance

To understand the existing performance of surrounding intersections, SIDRA analysis has been conducted.

SIDRA is a computer program originally developed by the Australian Road Research Board, which can be used to analyse the operation of intersections. SIDRA provides information about the capacity of an intersection in terms of a range of parameters, described as follows:

Degree of Saturation (D.O.S.) is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement. Various values of degree of saturation and their rating are shown below.

Level of Service		Intersection Degree of Saturation	
		Unsignalised Intersection	Signalised Intersection
A	Excellent	≤ 0.60	≤ 0.60
B	Very Good	0.60 – 0.70	0.60 – 0.70
C	Good	0.70 – 0.80	0.70 – 0.90
D	Acceptable	0.80 – 0.90	0.90 – 0.95
E	Poor	0.90 – 1.00	0.95 – 1.00
F	Very Poor	≥ 1.0	≥ 1.0

The **95th Percentile** Queue represents the maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour.

Average Delay (seconds) is the average delay time that can be expected for all vehicles making a particular movement in the peak hour.

The results of the SIDRA analysis for the primary intersections surrounding the site are summarised and discussed as follows. The detailed SIDRA results are provided at Appendix A.

Key Assumptions

- To accurately model the existing signalised intersections, traffic signal IDM data (Intersection Diagnostic Monitor) was obtained from VicRoads for 7am-9.30am, 3.30pm-6.30pm on Friday 25th July, and 11am-2pm on Saturday 26th July, 2014. This allows for phases and phase times at this intersection to be accurately modelled within SIDRA.
- Where the geometry of an intersection allows, end departures for right turn in movements have been increased to three (3 vehicles).
- Where nearby signals are within proximity, the signal co-ordination of through movements has been upgraded to favourable where appropriate.
- For the simplicity of the model, pedestrian movements have been deleted on the approaches impacting on the green time allocated to right turn movements. This is considered acceptable given that pedestrian movements are not activated in all cycles and SIDRA's modelling of average phase times.
- Commercial traffic percentages were assumed to be 5% for all major through traffic and turning movements.

Burwood Highway / Middleborough Road Intersection

A summary of the Friday and Saturday peak SIDRA results for the Burwood Highway / Middleborough Road intersection is provided at Table 1.

The analysis suggests that the Burwood Highway / Middleborough Road intersection is, as expected, experiencing a level of congestion during commuter peak periods, with lengthening queues and delays in peak directions. This level of congestion is not unusual for intersecting arterial roads within inner suburban areas during peak times.

It is noted that the right turn queues on the Middleborough Road north approach extends to the full length of the available storage during all commuter peak times.

All other movements at this intersection operate within capacity and existing geometry of the intersection.

Burwood Highway / RSPCA / Woolworths Intersection

Table 2 provides a summary of the SIDRA Friday and Saturday peak hour analysis for the intersection of Burwood Highway / Burwood Heights Shopping Centre.

The analysis suggests that the Burwood Highway / Burwood Heights Shopping Centre intersection is generally operating within capacity. It is noted however, that the left and through movements exiting Burwood Heights currently experience some delay in the afternoon peak hour.

This is due to the signal coordination with the Burwood Highway / Middleborough Road intersection, which allocates a significant portion of green time to the critical through movement to allow these movements to continuously travel through at both intersections.

All other movements at this intersection operate within capacity and existing geometry of the intersection.

Middleborough Road / Eley Road Intersection

Table 3 provides summaries of the SIDRA peak hour analyses for the intersection of Middleborough Road and Eley Road. The analysis reveals that the intersection operates with a biased allocation of green time in favour of Middleborough Road.

In this regard, the right turn movement on the east approach can encounter some level of delay and queue beyond the available storage. Due to the geometry of the east approach, the right turn movement can interfere with the westbound through movements.

As a result of the green time allocated to Middleborough Road, northbound and southbound traffic experience relatively little congestion at this intersection.

We are instructed that the intersection has been designed in this manner to deter motorists from using Eley Road as a major east-west connection.

Table 1: Burwood Hwy / Middleborough Rd Existing Peak Conditions SIDRA Results

Leg	Movement	Friday AM Peak			Friday PM Peak			Saturday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Middleborough Rd (S)	Left	0.71	51	150	0.80	58	185	0.70	48	137
	Through	0.71	42	150	0.80	49	185	0.70	39	137
	Right	0.50	37	45	0.57	41	44	0.55	37	38
Burwood Hwy (E)	Left	0.22	11	13	0.18	14	13	0.60	15	41
	Through	0.98	100	434	0.19	32	120	0.68	39	132
	Right	0.36	63	42	0.69	61	84	0.50	53	60
Middleborough Rd (N)	Left	0.18	13	13	0.61	28	68	0.41	15	34
	Through	0.38	37	140	0.68	44	144	0.73	41	132
	Right	0.67	38	44	0.56	42	37	0.57	37	37
Burwood Hwy (W)	Left	0.27	14	15	0.38	15	24	0.36	13	21
	Through	0.56	35	127	1.01	125	488	0.71	40	138
	Right	0.48	67	39	0.41	64	42	0.36	57	34

Table 2: Burwood Hwy / Burwood Heights Shopping Centre Existing Peak Conditions SIDRA Results

Leg	Movement	Friday AM Peak			Friday PM Peak			Saturday Peak		
		DoS	Av. Delay (s)	95 th 'ile Queue (m)	DoS	Av. Delay (s)	95 th 'ile Queue (m)	DoS	Av. Delay (s)	95 th 'ile Queue (m)
Burwood Heights Shopping Centre (S)	Left	0.26	68	10	1.00	63	41	0.55	58	22
	Through	0.26	62	10	1.00	57	41	0.55	52	22
	Right	0.23	67	12	0.31	61	29	0.38	57	30
Burwood Hwy (E)	Left	0.11	10	3	0.18	11	5	0.21	11	6
	Through	0.10	3	64	0.43	11	112	0.44	12	106
	Right	0.75	83	15	0.43	82	9	0.58	73	16
RSPCA (N)	Left	0.18	7	1	0.14	7	3	0.11	6	4
Burwood Hwy (W)	Left	0.31	13	55	0.56	11	39	0.37	15	76
	Through	0.31	4	55	0.56	2	39	0.37	6	76
	Right	0.21	81	3	0.39	54	15	0.17	46	8

Table 3: Middleborough Rd / Eley Rd Existing Peak Conditions SIDRA Results

Leg	Movement	Friday AM Peak			Friday PM Peak			Saturday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Middleborough Rd (S)	Left	0.45	15	49	0.59	16	71	0.50	14	52
	Through	0.45	9	49	0.59	8	72	0.50	7	52
	Right	0.11	20	4	0.18	19	6	0.17	18	6
Eley Rd (E)	Left	0.83	32	69	0.37	26	22	0.40	26	20
	Through	0.83	25	69	0.37	19	22	0.40	19	20
	Right	1.00	30	59	1.01	81	57	0.80	32	35
Middleborough Rd (N)	Left	0.55	16	65	0.52	15	59	0.51	14	54
	Through	0.55	8	65	0.52	8	59	0.51	7	54
	Right	0.26	19	10	0.30	21	10	0.27	18	9
Eley Rd (W)	Left	0.32	25	20	0.75	30	52	0.41	26	20
	Through	0.32	18	20	0.75	22	52	0.41	19	20
	Right	0.43	33	10	0.81	33	23	0.51	28	12

4 SUSTAINABLE TRANSPORT

4.1 Public Transport

The subject land is well serviced by public transport, with tram routes on Burwood Highway, and bus routes on Middleborough Road and Burwood Highway. The available services include:

- Tram route 75 operates on the Burwood Highway frontage and provides services between Etihad Stadium / Bourke Road Docklands and Vermont South via the CBD, Richmond, Hawthorn and Burwood.

Services operate 5am-1am the following day Monday to Thursday and Sunday, and **all day** on Friday and Saturday at 10-20 minute intervals.

The closest tram stops are at the intersection of Burwood Highway and Middleborough Road. There are also stops immediately to the east of the site near to the intersection of Old Burwood Road.

- Bus route 733 operates on Middleborough Road between Oakleigh and Box Hill via Clayton, Monash University and Mt Waverley, Monday to Sunday from 6am till 10pm at approximately 15 minute intervals during peak times.

Major nodes include Box Hill, Mt Waverley, Clayton and Oakleigh Railway Stations, Burwood East and Clayton Shopping Centres and Monash University (Clayton). The nearest stop is located on the Middleborough Road frontage, near to Worrall Street.

- Bus route 732 provides a connecting service between Box Hill and Upper Ferntree Gully via Vermont South, Knox City and Mountain Gate. This service operates Monday to Sunday from 5am till 10pm.

Route 732 runs services to Upper Ferntree Gully and Box Hill Railway Stations, Deakin University (Burwood), Vermont South, Knox City and Mountain Gate Shopping Centres and operates past the Burwood Highway frontage. The nearest stop is situated at the RSPCA frontage.

- Bus route 735 provides a service between Box Hill and Nunawading via Station Street, Eley Road and Fulton Road. This service operates Monday to **Friday** commencing at 6am and ceasing at 10pm. **On Saturday the services starts at 8am and on Sunday at 9am.**

This service operates through Forest Hill Chase Shopping Centre, Nunawading and Box Hill Railway Stations and Deakin University (Burwood). The nearest stop to the site is located on Royton Street.

The above bus services provide direct connections to Box Hill, Laburnum and / or Mt Waverley Railway Stations.

4.2 Bicycle Network

The subject site has convenient access to the Principal Bicycle Network (PBN) with on / off-road and informal bicycle routes providing convenient access to nearby activity centres and businesses.

Notably, an informal on-road bicycle route on Eley Road provides a connection into the Gardiners Creek Trail to the west and the Dandenong Creek Trail via Hawthorn Road to the east.

There are also wide kerbside lanes on Burwood Highway to the east of the Burwood Heights Shopping Centre. The kerb side lanes have frequent bicycle symbols advising motorists that the lanes are shared with cyclists.

The key public transport services and local bicycle routes are illustrated in Figure 5.

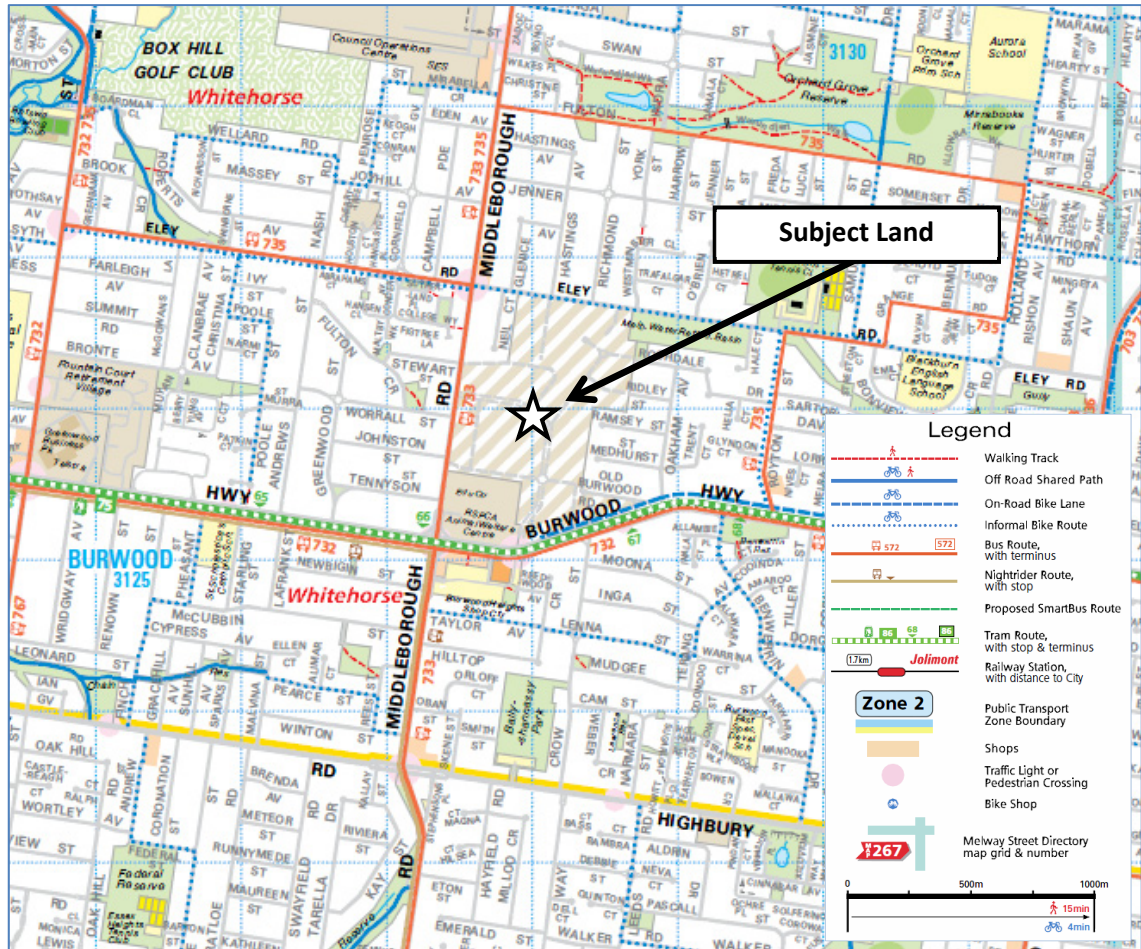


Figure 5: TravelSmart Map

Source: Whitehorse City Council

5 DEVELOPMENT PLAN

5.1 Approved Development Plan

The approved Development Plan for 78 Middleborough Road, Burwood East establishes a framework to direct future development of the land. The approved Development Plan envisages in the order of 950 dwellings, and approximately 10,500 square metres of retail floor space.

The Development Plan proposes a boulevard that connects Middleborough Road and Burwood Highway, and in essence defines the development in to three (3) precincts.

The south western precinct is to contain the retail centre and apartment style housing.

The northern precinct will provide for traditional housing, and the eastern precinct a blend of housing typologies increasing in density towards the southern boundary (Burwood Road frontage).

5.2 Amended Development Plan

The proposed amendment to the Development Plan is to add approximately 2,450 square metres of non-retail floor space to the commercial precinct. The non-retail commercial floor space may comprise of a cinema and entertainment, gymnasium, child care centre, office and / or medical centre.

5.3 Access Strategy

The access strategy for the Development Plan includes:

- A link road (Boulevard) between Middleborough Road and Burwood Highway.
- A new set of traffic signals that provides access to Middleborough Road.
- A left-in / left-out access to Middleborough Road at the southern boundary. This road is at the boundary of the RSPCA and is intended to service parking and loading for the retail precinct. It will remain a private road, managed by the retail development.
- Limited access to Eley Road. Access is proposed opposite Richmond Terrace and will be constructed with a roundabout to control vehicle speeds and movement.
- Provision of a northern leg at the Burwood Highway / Burwood Heights Shopping Centre traffic signals, and improvement works to provide for a double right turn lane on the east approach, an auxiliary left turn lane on the west approach of Burwood Highway.
- Implementation of 'No Stopping' restrictions on the south side of Eley Road between Westminster Close and Middleborough Road to facilitate Eley Road through movements.

The amended Development Plan does not propose to change the access strategy.

5.4 Bicycle and Pedestrian Strategy

The Development Plan will aim to:

- Provide a legible pedestrian and cycle network, conveniently connecting the site to all forms of sustainable travel modes.
- Provide attractive and permeable access for pedestrians and cyclists through and into / out of the site.
- Promote walking and cycling trips through the design of active frontages to and from community facilities, open spaces and retail uses within the site.
- Encourage walking and cycling trips through high quality urban design, placing an emphasis on non-motorised travel and prioritising trips made on foot and bicycles.

6 TRAFFIC CONSIDERATIONS (APPROVED DEVELOPMENT PLAN)

6.1 Travel Patterns

Burwood East is located in the south west portion of the local municipality of Whitehorse.

To understand travel patterns for the suburb of Burwood East, Journey to Work data collected by the 2011 Census has been sourced.

The data demonstrates that the suburb is largely dependent on the motor vehicle as a mode of travel. Nonetheless, it is considered that the subject land is well situated in relation to public transport, and the development of the site for both residential and retail presents the opportunity to target greater use of alternative modes of transport.

The Development Plan endeavours to promote walking and cycling through the incorporation of connective and legible bicycle and footpath networks within the site that also connect to existing services at the site's boundaries. Specifically, the urban plaza and retail is effectively sited centrally within the site, allowing a comfortable walk to these services from anywhere within the subject land.

Table 4 summarises the existing Journey to Work data for Burwood East and target modal splits for trips for future residents.

Table 4: Method of Travel to Work – Burwood East

Mode	%	Target %
Car (driver & passenger)	65.5%	54%
Public Transport	16%	20%
Bicycle	0.5%	5%
Walked	1.6%	5%
Motorcycle	0.3%	16%
Taxi	0.1%	
Worked at Home	3.7%	
Did not go to Work	9.3%	
Method of travel Not Stated	1.4%	
Other	1.2%	

6.2 Traffic Generation

The approved ITP adopted the following peak hour traffic generation rates for the uses contemplated on the site. The rates are inclusive of visitor / customer and service vehicle movements.

Residential 0.5 movements per dwelling.

Retail 4.6 movements per 100 square metres for the PM and Saturday peak, and 1.15 movements (25% of the peak rate) per 100 square metres for the AM peak.

These rates were selected with reference to the Road Traffic Authority (RTA) of New South Wales Guide to Traffic Generating Developments; Institute of Transportation Engineers 'Trip generation'; and the Inner Metropolitan Regional Association 'Inner Municipalities Parking Study'.

It is noted that the approved rates adopted a blanket rate for the residential, irrespective of the housing typology. It is acknowledged that there may be some variation in the rates, with apartments generating at marginally lower rates and the larger dwelling types generating at marginally higher rates.

For assessment purposes of the Planning Scheme Amendment, the average rate of 0.5 movements per dwelling is considered acceptable.

The above rates applied to the potential development yield is summarised in Table 5.

Table 5: Projected Peak Hour Traffic Volumes (Ultimate)

Trip Type	Units / Area	AM Peak	PM & SAT Peak
Residential	950 dwellings	475 vph	475 vph
Retail	10,500sqm	121 vph	483 vph
Total		596 vph	958 vph

It is projected that development of the subject land could generate 596 vehicle movements in the morning peak hour, and 958 vehicle movements in the afternoon and Saturday peak hours.

In relation to daily movements, it is typical for the peak hours to represent 10% of the daily traffic generation, and therefore the following daily rates have been adopted.

Residential 5 movements per dwelling – 4,750 movements (950 dwellings x 5).

Retail 46 movements per 100 square metres – 4,830 movements (10,500 square metres x 46 / 100)

Based on the above rates, it is projected the development could generate 9,580 movements on a daily basis. The retail movements are expected to incorporate in the order of 50 movements associated with service vehicles per day.

6.3 Traffic Distribution

To provide greater detail on traffic projections within the site and how traffic might be distributed, Traffix Group prepared a traffic model which segments the site in to five (5) blocks as illustrated in Figure 6.

Block 1 is provided with access only to Eley Road.

The uses and projected traffic generation from each block is summarised in Table 6.

Table 6: Projected Traffic Volumes (by Block)

Component	Dwellings / Area	AM Peak	PM / SAT Peak	Daily
Block 1	175 dwellings	88	88	875*
Block 2	215 dwellings	108	108	1,075
Block 3	235 dwellings	118	118	1,175
Block 4	325 dwellings	163	163	1,625
Block 5	10,500sqm	121	483	4,830
TOTAL		596	958	9,580

* Dwellings in Block 1 are likely to be more traditional housing and could potentially generate traffic at marginally higher rates. Presuming dwellings in this Block generate traffic at a rate of 6 movements per dwelling, then the upper limit traffic generated to Eley Road could be 1,050 vehicles per day.

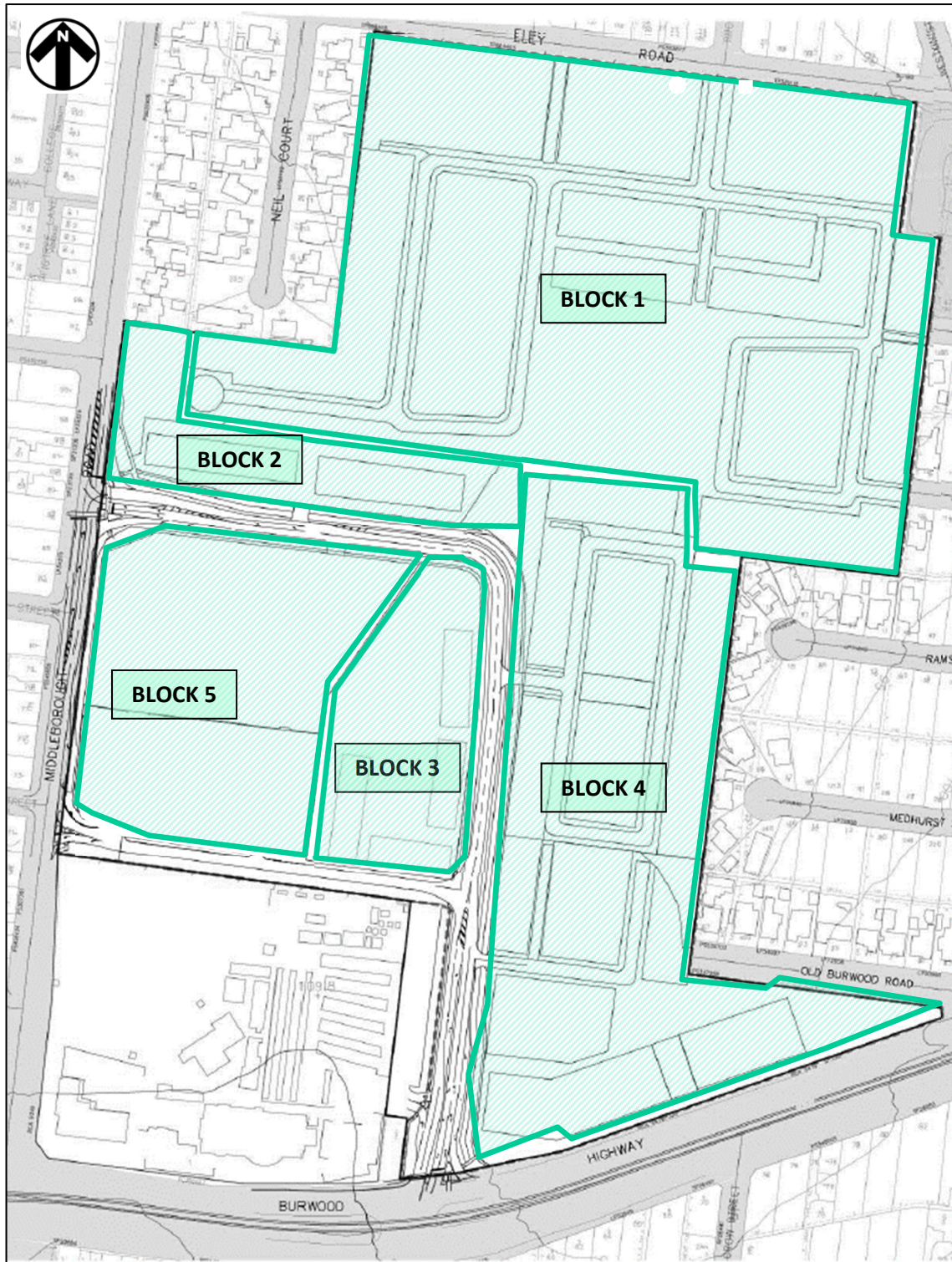


Figure 6: Traffic Model – Block Segments

Upon review of the surrounding land uses, major traffic attractors and locality of the subject land, the distribution illustrated in Figure 7 and Figure 8 has generally been adopted for residential and retail traffic, incorporating the following key considerations:

- The Melbourne CBD located west of the site.
- Eastern Freeway connections situated to the north of the site.
- Box Hill Activity Centre located north of the site.
- Burwood One (K-Mart Plaza) located east of the site; and
- Forest Hill Chase Shopping Centre located north-east of the site.

It is also typical to adopt the following splits in relation to the uses contemplated in the proposed development.

- Residential traffic - 20% arrivals / 80% departures and 60% arrivals / 40% departures in the morning peak and afternoon peak hours respectively.
- Retail traffic will be split 50% arrivals / 50% departures in both the morning and afternoon peak hours and Saturday.

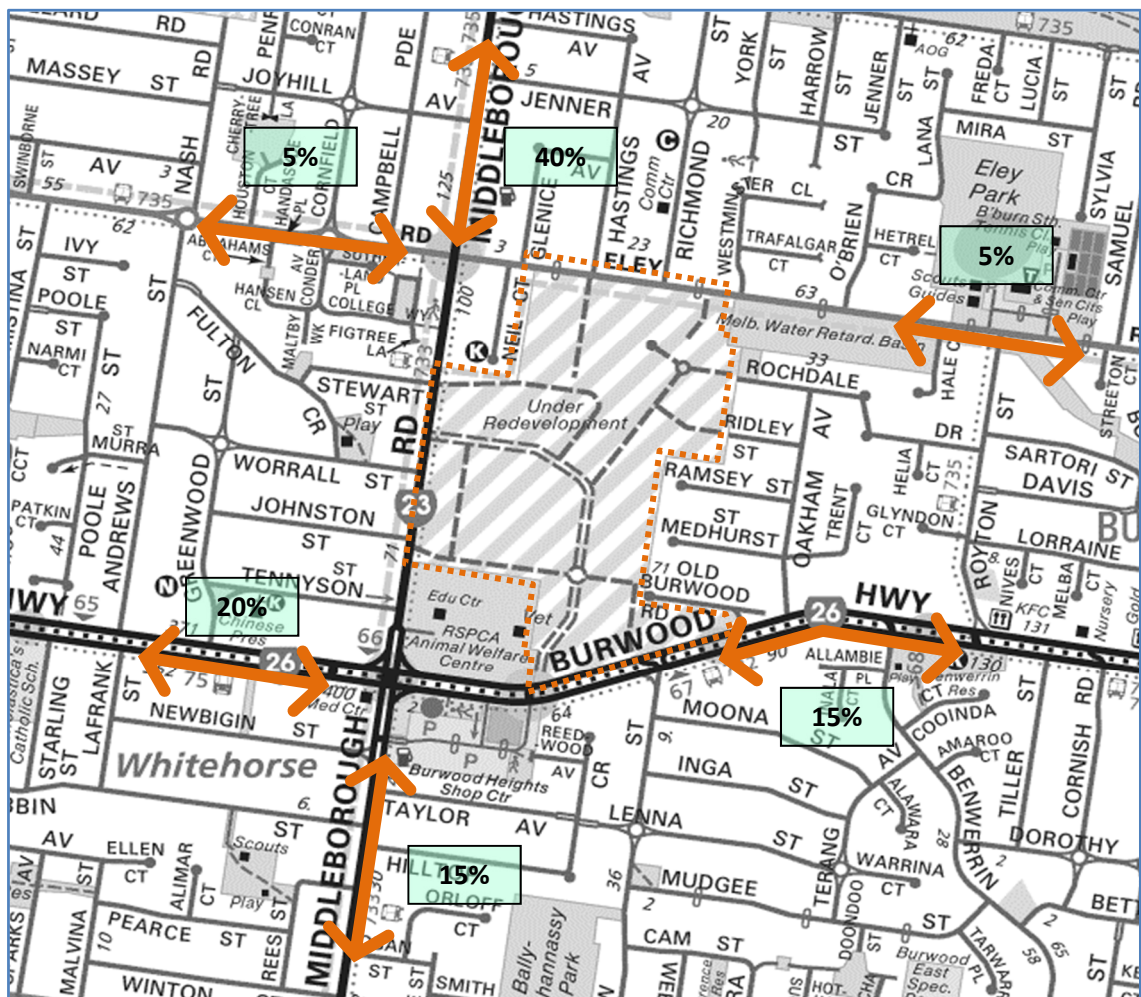


Figure 7: Adopted Traffic Distribution (Residential)

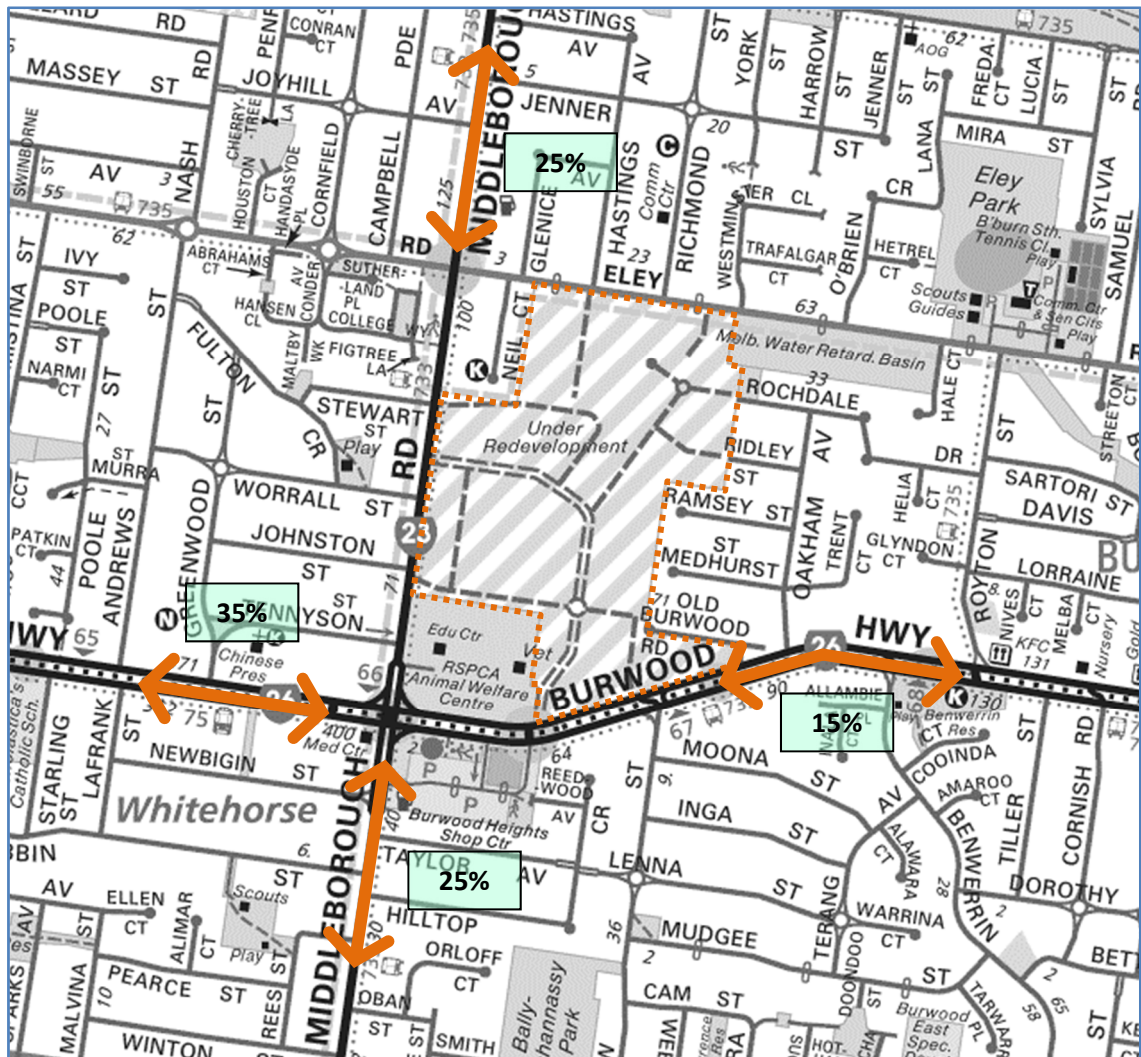


Figure 8: Adopted Traffic Distribution (Retail)

Based on the above, the external distribution route likely to be selected by each block for trip destinations is summarised in Table 7.

Table 7: Distribution Matrix

Component	Intersection Distribution %								
	Eley Rd / Northern Access			Middleborough Rd Site Access		Middleborough Rd / Private Access		Burwood Hwy / RSPCA	
	N	E	W	N	S	N	S	E	W
Block 1	5	40	55	-	-	-	-	-	-
Block 2	-	-	-	50	30	-	-	20	-
Block 3	-	-	-	40	-	-	15	20	25
Block 4	-	-	-	30	-	-	20	20	30
Block 5 (Retail)	-	-	-	20 (in) 25 (out)	50 (in) 20 (out)	5 (in)	40 (out)	15 (in) 15 (out)	10 (in)

Based on the above and the approved access arrangements, Figure 9 and Figure 10 been prepared to illustrate the development generated peak hour traffic movements, and daily traffic movements respectively.

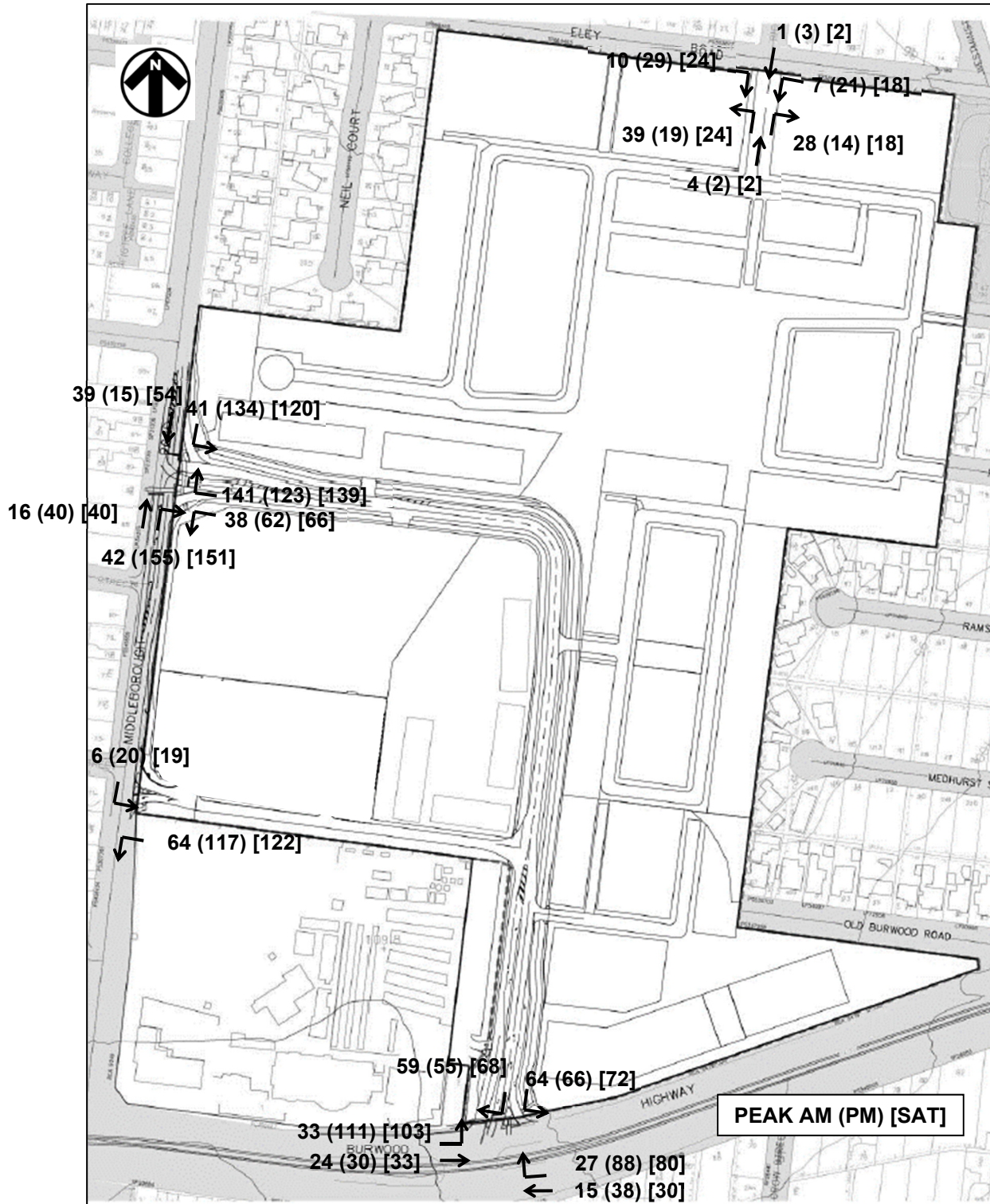


Figure 9: Forecast Peak Hour Development Traffic Distribution

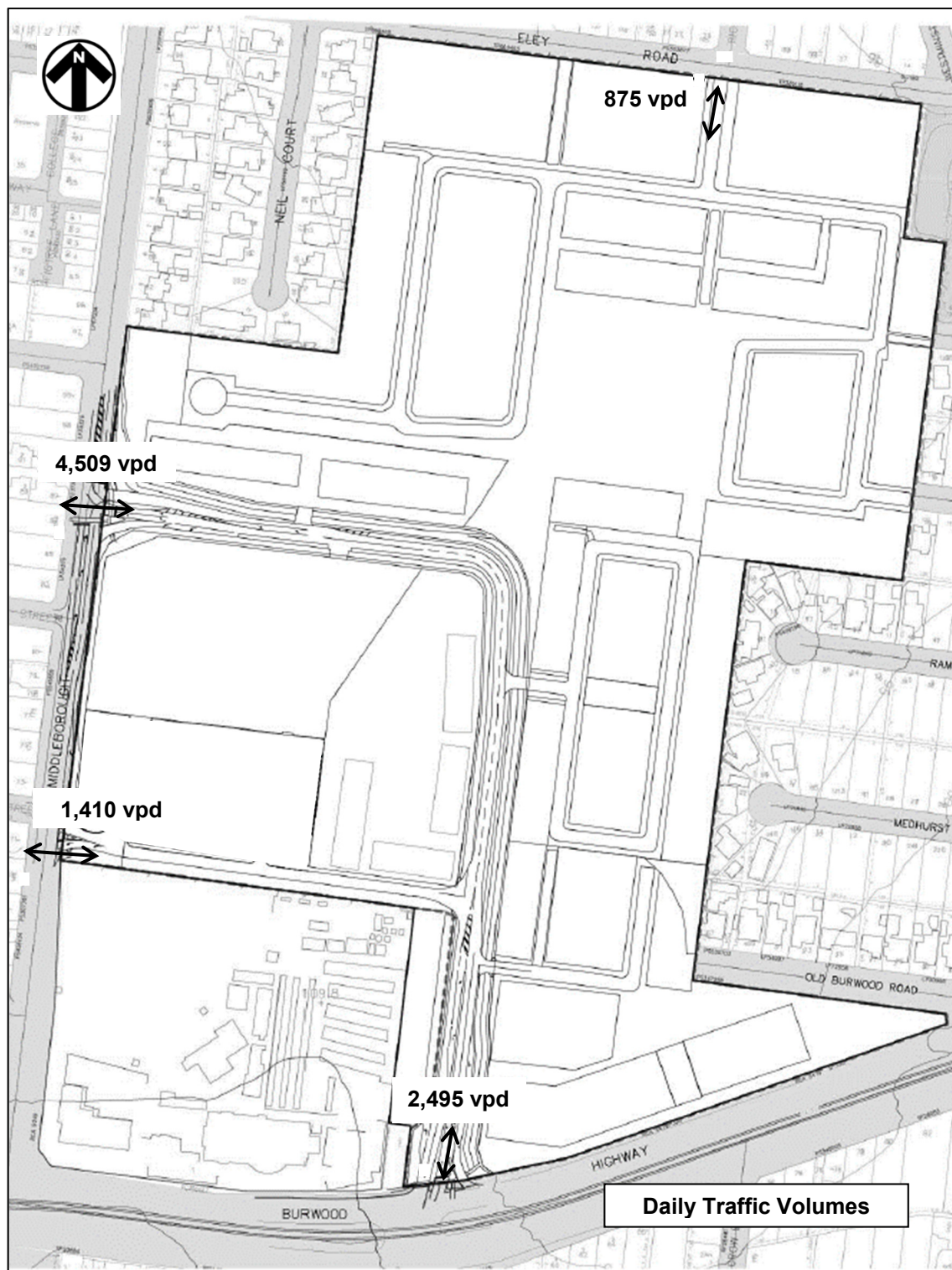


Figure 10: Forecast Daily Development Traffic Distribution

7 INTERSECTION CONSIDERATIONS

7.1 Site Access Intersections

To accommodate the projected levels of traffic, an iterative assessment was undertaken resulting in functional approval from VicRoads for the site access arrangements. The approved functional layout plans for the site accesses are attached as Appendix B.

Middleborough Road / Site Access Intersection

The intersection will be a signalised T-intersection and will incorporate localised widening of Middleborough Road to facilitate auxiliary turn lanes. This widening will necessitate approximately a 3 - 4 metre width along the Middleborough Road site frontage to be transferred to road reservation.

It is also noted that the widening will necessitate the relocation of existing electrical services within the eastern verge of Middleborough Road.

The intersection arrangement is to include:

- A 75 metre right turn auxiliary lane on the Middleborough Road south approach.
- A left turn slip lane on the Middleborough Road north approach.
- A left turn slip lane (55 metres) and two (2) right turn lanes on the east approach, reducing to a single lane approximately 70 metres east of Middleborough Road.
- Bus stops to the satisfaction of PTV and VicRoads.

Figure 11 illustrates the proposed layout for the intersection of Middleborough Road with the link road.

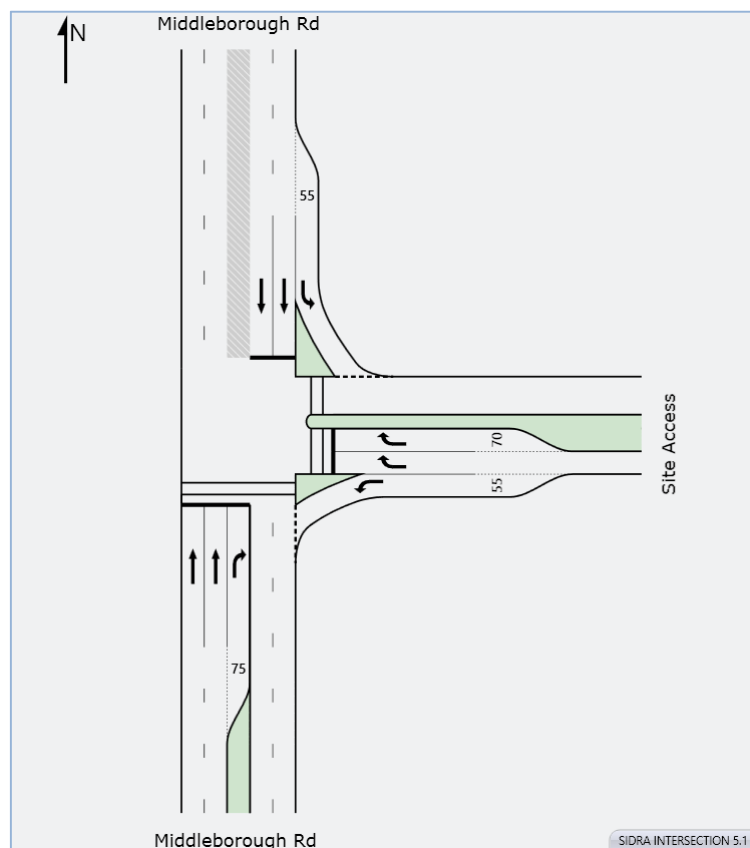


Figure 11: Middleborough Rd / Link Rd Proposed Intersection Configuration

The right turn lane on the south leg will extend beyond Worrall Street, situated on the west side of Middleborough Road. To mitigate risks associated with right turn movements, Worrall Street will be reconfigured to restrict movements to left-in / left-out,

Motorists currently turning right in to Worrall Street are likely to divert to Stewart Street and Johnston Street. Similarly, existing motorists turning right from Worrall Street are likely to divert to Johnston Street.

There is no proposed change to other local streets in the vicinity of this access.

Burwood Highway / Site Access / Burwood Heights Shopping Centre Intersection

A fourth (northern) leg to the existing signalised intersection of Burwood Highway and Burwood Heights Shopping Centre **will be provided to access the subject land**. Additionally, improvement works are proposed to minimise changes to existing 'green time' afforded to Burwood Highway. Specifically, it is proposed to widen the southern carriageway of Burwood Highway to provide for a 2nd right turn lane in to the site link road. The northern carriageway of Burwood Highway will be locally widened on the approach to the intersection to accommodate a left turn lane.

The intersection arrangement **will** include:

- A second 60 metre right turn auxiliary lane on the Burwood Highway east approach.
- A 75 metre left turn auxiliary lane on the Burwood Highway west approach.
- Three departure lanes on the northern leg, comprising a right turn lane; a shared through and right turn lane; and a left turn slip lane.
- Reconfiguration of traffic signalling to include, bonus left turns on the Burwood Highway west approach, and an additional phase to serve movements on the north approach. That is, the north and south approaches will operate under a split phase arrangement.
- Pedestrian facilities will be upgraded to provide signalised pedestrian crossings on all approaches, conveniently linking the site to the Burwood Heights Shopping Centre.

The widening will be to the southern side of Burwood Highway. The widening will impact on two (2) trees on the westbound approach to the intersection. The trees will be replaced by new trees.

Figure 12 illustrates the proposed layout for the intersection of Burwood Highway, the link road and Burwood Heights Shopping Centre access.

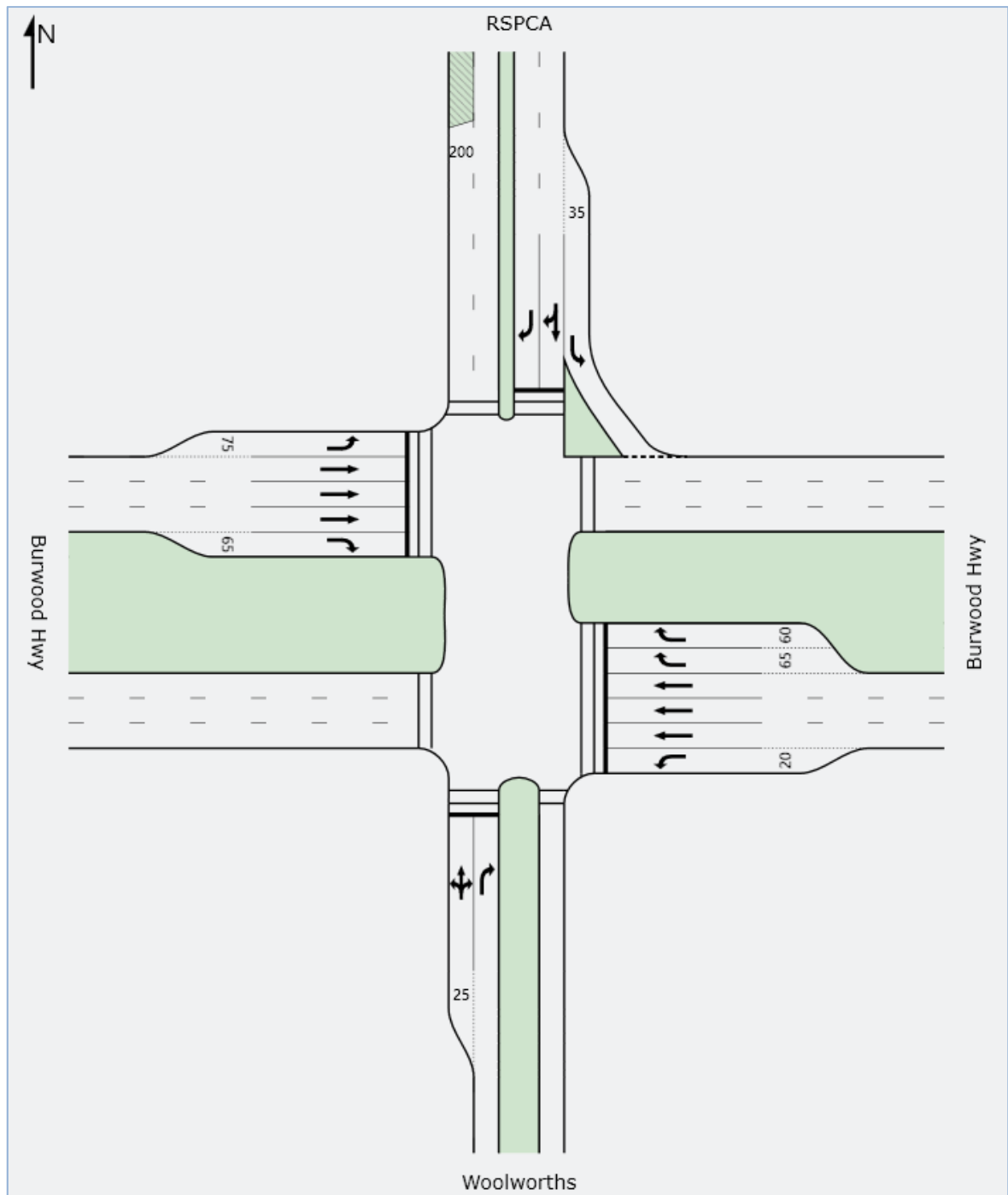


Figure 12: Burwood Hwy / Burwood Heights Shopping Centre / Link Rd Proposed Intersection Configuration

Middleborough Road / Retail Access Intersection

The intersection **has been** designed as a T-intersection and **will** be restricted to left-in / left-out. The intersection will be provided with a left turn deceleration lane and the inclusion of a splitter island to facilitate exit movements onto Middleborough Road and pedestrian movements across the retail access.

The access has been designed to accommodate the swept path of a 19 metre semi-trailer.

Eley Road / Northern Access Intersection

The access to Eley Road is sited opposite Richmond Street and will form a cross intersection that is proposed to be constructed with a roundabout to manage vehicle speeds and movement.

The proposed roundabout has been designed with an annulus of 8.8 metres diameter, including a centre annulus of 4.8 metres diameter. These dimensions are similar to the dimensions as the existing roundabout at Bronte Avenue and Clanbrae Avenue to the west of the site.

It is noted that Council's January 2015 report proposes the implementation of 'No Stopping / Parking' restrictions on the south side of Eley Road between Westminster Close and Middleborough Road.

7.2 Site Access Assessment

To account for future growth on the surrounding road network at the proposed signalised site intersections **the analysis adopted** a 2% compounded growth **rate** (for **a design year of 2024**) for Burwood Highway and Middleborough Road.

Figure 13 has been prepared to illustrate the 2024 traffic volumes, including development traffic.

To determine the intersection performance, the projected post development 2024 traffic volumes and proposed intersection arrangements have been input to SIDRA and analysed.

The results of the analysis are summarised in Table 8 and Table 9, and discussed as follows. The detailed SIDRA results are provided at Appendix A.

Middleborough Road / Site Access

It is projected that the development traffic will be readily accommodated by the proposed access arrangements, with the modelling predicting the intersection will operate in the 'very good' category during both the Friday and Saturday peak periods.

Burwood Highway / Burwood Heights Shopping Centre / Site Access Intersection

The intersection is projected to operate in the 'very good' and 'excellent' categories in the Friday AM and Saturday peak periods respectively.

In the Friday afternoon peak period, the intersection is projected to operate in the 'poor' category, governed by the limited time afforded to the Burwood Heights Shopping Centre access. This is the same as existing conditions.

During the Friday afternoon peak period, the critical movements along Burwood Highway are suitably provided for and have sufficient 'green' time to accommodate the projected levels of traffic and maintain co-ordination with the traffic signals at Middleborough Road.

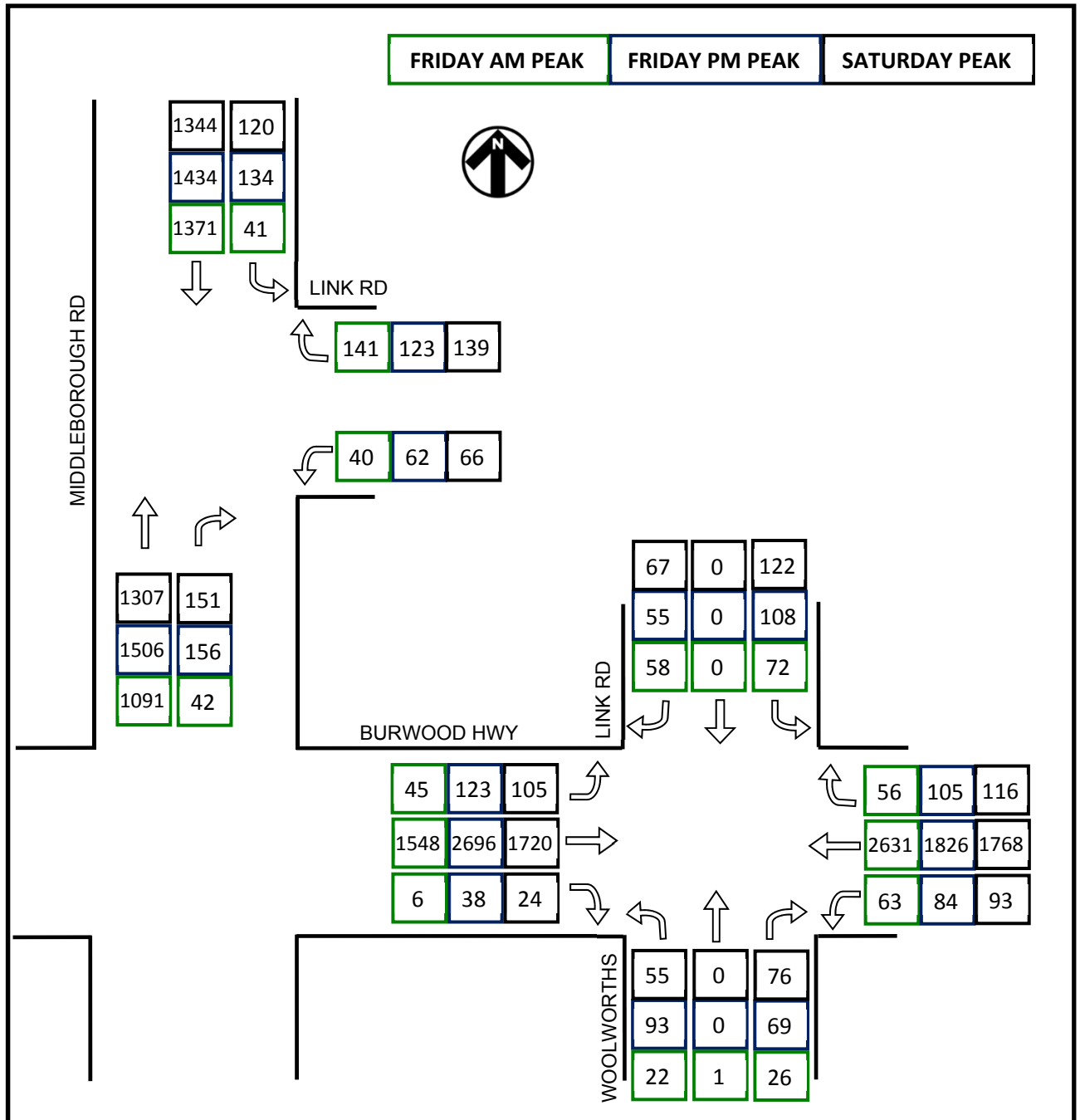


Figure 13: Peak Hour Traffic Volumes with Annual Growth

Table 8: Middleborough Rd / Site Access – Projected 2024 Peak Intersection Performance

Leg	Movement	Projected Friday AM Peak			Projected Friday PM Peak			Projected Saturday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Middleborough Rd (S)	Through	0.41	1	20	0.56	2	37	0.50	2	26
	Right	0.16	15	4	0.61	18	27	0.54	18	22
The Boulevard (E)	Left	0.13	12	5	0.21	13	10	0.19	12	9
	Right	0.26	57	29	0.24	59	26	0.24	52	26
Middleborough Rd (N)	Left	0.04	7	1	0.14	7	5	0.12	7	4
	Through	0.59	13	176	0.60	13	189	0.61	14	171

Table 9: Burwood Hwy / Burwood Heights – Projected 2024 Peak Intersection Performance

Leg	Movement	Projected Friday AM Peak			Projected Friday PM Peak			Projected Saturday Peak		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Burwood Heights Shopping Centre (S)	Left	0.26	68	10	0.99	63	41	0.55	58	22
	Through	0.26	62	10	0.99	57	41	0.55	52	22
	Right	0.23	67	12	0.31	61	29	0.38	57	30
Burwood Hwy (E)	Left	0.14	11	4	0.22	11	6	0.22	11	6
	Through	0.69	2	65	0.54	14	159	0.53	12	138
	Right	0.52	78	14	0.54	75	25	0.75	73	26
Site Access (N)	Left	0.22	7	6	0.38	12	17	0.35	7	14
	Through	0.73	74	16	0.67	73	14	0.73	68	16
	Right	0.73	81	16	0.67	83	14	0.73	76	16
Burwood Hwy (W)	Left	0.06	12	4	0.20	15	18	0.16	14	13
	Through	0.41	8	96	0.80	9	203	0.51	12	132
	Right	0.11	75	3	0.39	74	18	0.31	70	10

7.3 Mitigation Works

The analysis conducted as part of the approved Integrated Transport Plan resulted in an agreed set of mitigation works at the intersection of Burwood Highway and Middleborough Road.

The approved functional layout plan for these works is attached as Appendix B.

A summary of the analysis of the impact to the intersection of Burwood Highway and Middleborough Road, and the intersection of Middleborough Road and Eley Road is set out as follows, and the detailed SIDRA results are provided at Appendix A.

7.3.1 Burwood Highway / Middleborough Road Intersection

The intersection of Burwood Highway and Middleborough Road is presently operating under stressed conditions during peak periods due to heavy traffic volumes in the peak direction on Burwood Highway.

In this regard, and following discussions with VicRoads, it is considered that a base year of 2014 will provide the most suitable analysis to determine the level of impact from the proposed development.

The projected post development volumes are illustrated in Figure 14.

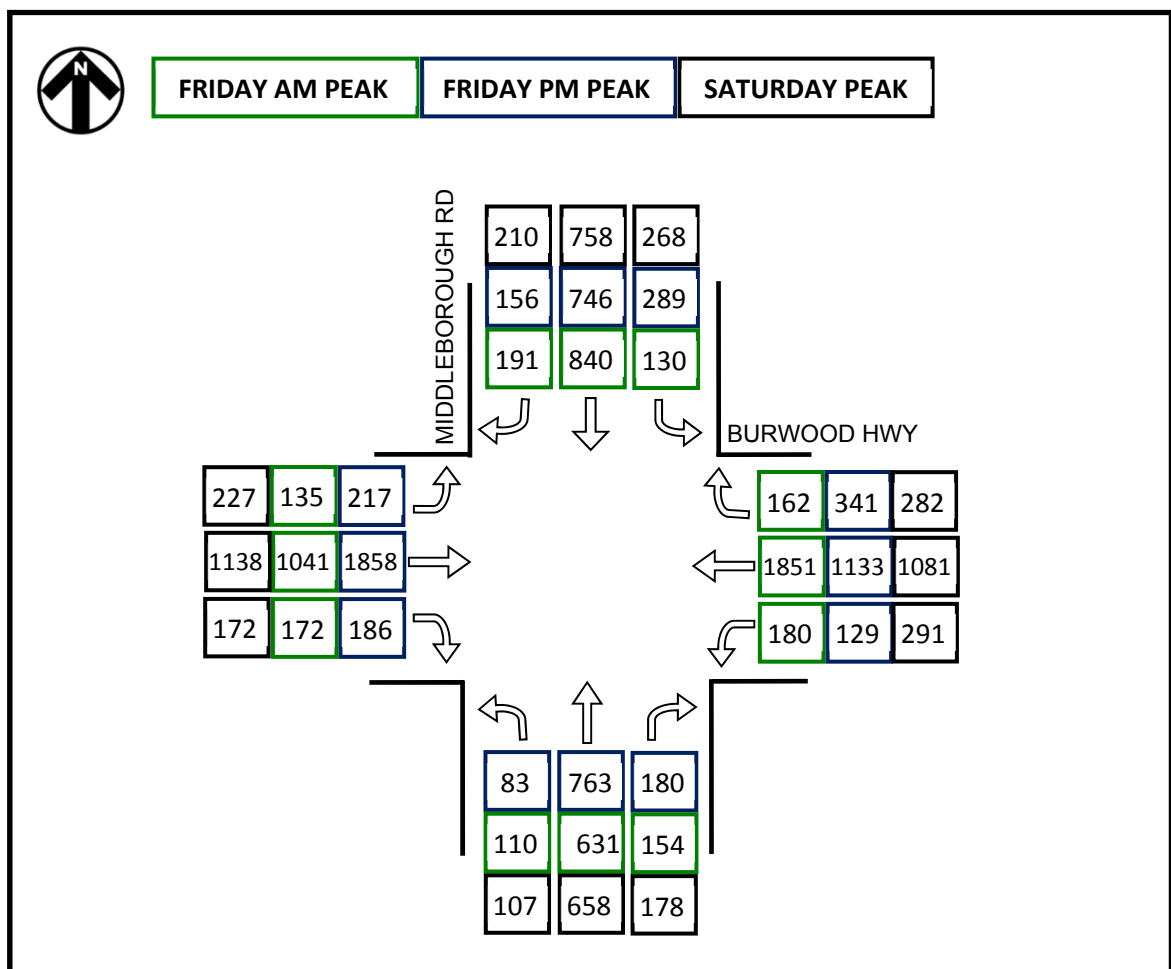


Figure 14: Middleborough Rd / Burwood Hwy Post Development Traffic Volumes

It is important to recognise that the intent of the mitigation works is to offset the impact of the development traffic, it is not to resolve existing issues, which in this case primarily relate to through movements in the peak direction along Burwood Highway.

The level of works should also be reflective of the quantum of traffic that the development may add. That is, if the percentage increase of intersection traffic is relatively small, then the level of mitigation works should also be relatively inexpensive.

Overall, the development is projected to add 467 movements in the PM peak hour, when the intersection already accommodates 6,080 vehicles. This relates to approximately an 8% increase, which is relatively minor, and accordingly the levels of mitigation works should be reflective of such a modest increase.

A review of the intersection reveals that there is limited scope to provide additional capacity for through movements, however there is an opportunity to lengthen the right turn storage capacity on both the north and east approaches, allowing greater storage, and the ability for turning motorists to enter the turn lanes earlier (in effect allowing better access from the back of developing through queues).

Specifically, it is proposed to lengthen the right turn storage on the east approach from 75 metres to 100 metres, and on the north approach from 40 metres to 60 metres.

The proposed improvements have been modelled in SIDRA.

The results of the peak hour analysis and comparison to existing conditions is summarised in Table 10 and Table 11. In short, the results reveal that there will be lengthening queues for the Burwood Highway through movements, but there will be no material change to the operation of the intersection, and right turn movements will continue to be contained within the provided storage capacities.

The distance of the proposed site access points to Middleborough Road and Burwood Highway to the Middleborough Road / Burwood Highway intersection is approximately 350 metres and 215 metres, respectively.

The SIDRA analyses projects a 95th percentile queue from the Burwood Highway / Middleborough Road intersection as follows.

Leg	Movement	Existing 95thile queue (m)	Projected Peak 95thile queue (m)
Middleborough Rd (N)	Through	144 (PM Peak)	166
Burwood Highway (E)	Through	434 (AM Peak)	491

Based on the above, the projected queues on the north approach of the Middleborough Road / Burwood Highway intersection is not expected to extend beyond the proposed Middleborough Road site access.

The intersection of Middleborough Road and Burwood Highway generates queues that extend past the Burwood Highway site access under existing conditions.

In the critical AM peak, the proposed development is projected to generate 59 right turn movements out of the Burwood Highway access. IDM data reveals that this intersection has a total cycle time of 123 seconds in the AM peak period, equating to a total of approximately 30 cycles within the hour. In this regard, on average, approximately two (2) westbound traffic movements would be exiting the site per cycle. This is a small level of traffic by engineering standards and in this regard, is expected to join the back of the Burwood Highway queue without material impact to the operation of the intersection.

The phasing and sequencing of the signalised Boulevard intersections to Middleborough Road and Burwood Highway will be linked to the 'master' control signals at the critical Burwood Highway / Middleborough Road intersection to optimise throughput of traffic movements. The linking of traffic signals is the responsibility of VicRoads, and signal plans with phasing information will require approval prior to the development of the site.

In view of the foregoing, it is considered the proposed mitigation works offer a level of improvement commensurate with the modest increase of traffic volumes to the intersection.

7.3.2 Middleborough Road / Eley Road Intersection

To account for future growth on the surrounding road network at the proposed signalised intersection of Middleborough Road and Eley Road, a 2% compounding annual growth factor has been applied for 10 years (2024) to all through movements on Middleborough Road.

Figure 15 has been prepared to illustrate the 2024 traffic volumes, including development traffic.

The post development traffic volumes have been input to SIDRA, with the results and comparison to existing conditions summarised in Table 12 and Table 13.

Review of the results shows that the additional traffic volumes can be accommodated with no material change to the operation of the intersection. The Eley Road east approach will continue to experience a level of congestion, and this may result in some motorists, albeit in our view an insignificant number, electing to cut through the side streets to avoid the Eley Road / Middleborough Road intersection.

Notwithstanding the above, we understand that there has been a historical limitation of 'green time' on the east approach to discourage through traffic.

To this end, remedial works at this intersection are not proposed.

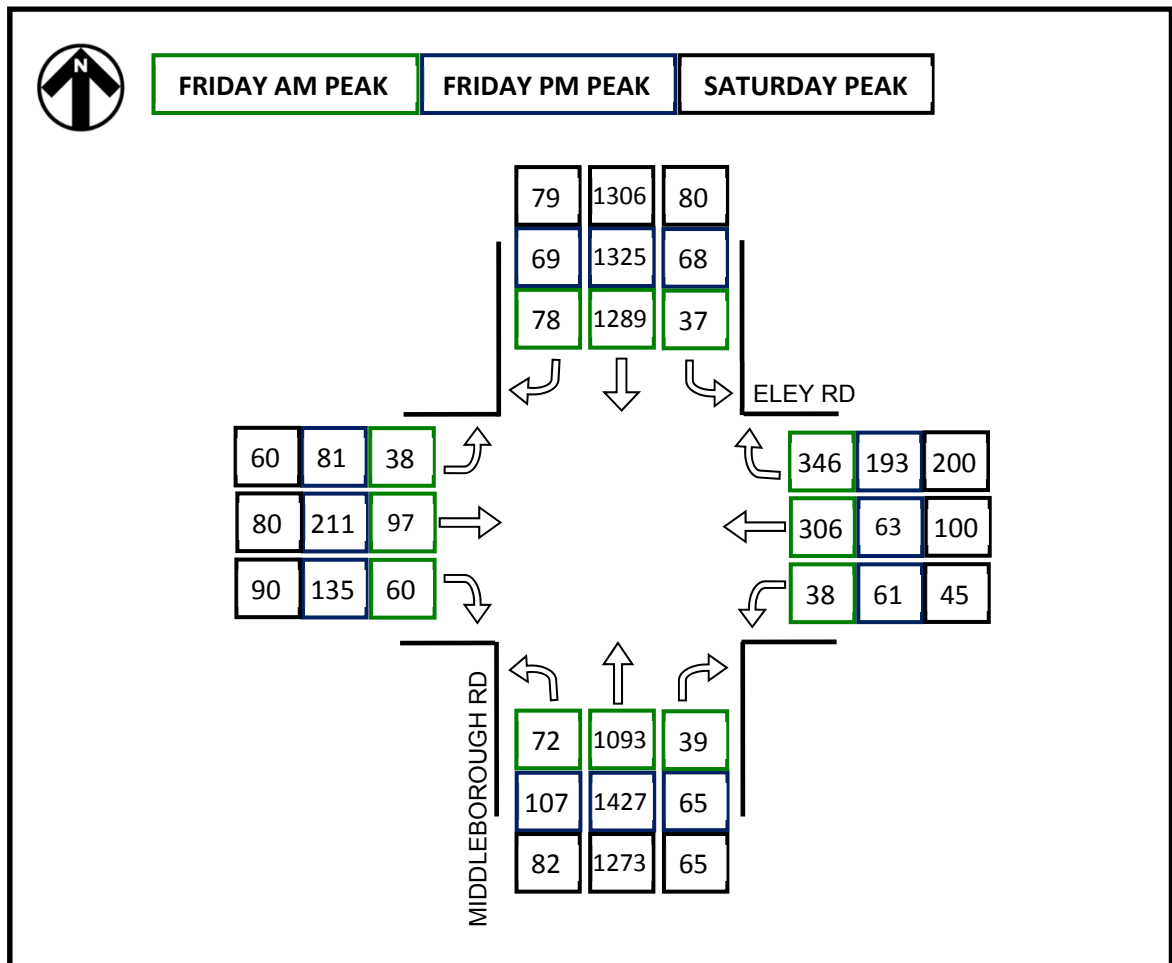


Figure 15: Middleborough Rd / Eley Rd Post Development Traffic Volumes (2024)

7.4 Staging

The Development Plan includes an indicative staging plan, developed in response to preliminary investigations and market conditions. Consistent with the vision to promote early activation of the site and engagement with the surrounding community, the development of the retail centre will be undertaken as part of the first stage.

The retail development will include construction of The Boulevard, incorporating the signal works at both Middleborough Road and Burwood Highway.

The timing of the remedial works at the intersection of Burwood Highway and Middleborough Road will be negotiated with VicRoads but are planned to be undertaken as the residential stages progress.

Development of the Eley Road / Richmond Street roundabout will be completed as part of stage MD03. The installation of the Eley Road bicycle facility treatment, including the 'headstart' bicycle area at the intersection of Middleborough will also be installed in this stage.

Table 10: Burwood Hwy / Middleborough Rd – Friday Peak Hours Existing Conditions & Post Development SIDRA Comparison

Leg	Movement	Existing Friday AM Peak			Projected Friday AM Peak (2014)			Existing Friday PM Peak			Projected Friday PM Peak (2014)		
		DoS	Av. Delay (s)	95 th 'ile Queue (m)	DoS	Av. Delay (s)	95 th 'ile Queue (m)	DoS	Av. Delay (s)	95 th 'ile Queue (m)	DoS	Av. Delay (s)	95 th 'ile Queue (m)
Middleborough Rd (S)	Left	0.71	51	150	0.72	51	155	0.80	58	185	0.85	63	211
	Through	0.71	42	150	0.72	43	155	0.80	49	185	0.85	54	211
	Right	0.50	37	45	0.58	37	49	0.57	41	44	0.84	52	70
Burwood Hwy (E)	Left	0.22	11	13	0.27	11	16	0.18	14	13	0.24	14	18
	Through	0.98	100	434	1.01	122	491	0.19	32	120	0.20	32	124
	Right	0.36	63	42	0.23	63	34	0.69	61	84	0.45	61	71
Middleborough Rd (N)	Left	0.18	13	13	0.22	13	16	0.61	28	68	0.68	29	76
	Through	0.38	37	140	0.41	38	154	0.68	44	144	0.75	47	166
	Right	0.67	38	44	0.60	38	57	0.56	42	37	0.82	49	57
Burwood Hwy (W)	Left	0.27	14	15	0.31	14	18	0.38	15	24	0.58	16	39
	Through	0.56	35	127	0.57	36	130	1.01	125	488	1.04	172	595
	Right	0.48	67	39	0.48	67	39	0.41	64	42	0.41	64	42

Table 11: Burwood Hwy / Middleborough Rd - Saturday Peak Existing Conditions & Post Development SIDRA Comparison

Leg	Movement	Existing Saturday PM Peak			Projected Saturday PM Peak (2014)		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Middleborough Rd (S)	Left	0.70	48	137	0.75	50	152
	Through	0.70	39	137	0.75	41	152
	Right	0.55	37	38	0.79	43	57
Burwood Hwy (E)	Left	0.60	15	41	0.70	18	53
	Through	0.68	39	132	0.71	40	138
	Right	0.50	53	60	0.33	54	51
Middleborough Rd (N)	Left	0.41	15	34	0.48	16	44
	Through	0.73	41	132	0.82	46	160
	Right	0.57	37	37	0.83	46	59
Burwood Hwy (W)	Left	0.36	13	21	0.52	14	32
	Through	0.71	40	138	0.75	41	150
	Right	0.36	57	34	0.36	57	34

Table 12: Middleborough Rd / Eley Rd – Friday Peak Hours Existing Conditions & Post Development SIDRA Comparison

Leg	Movement	Existing Friday AM Peak			Projected Friday AM Peak (2024)			Existing Friday PM Peak			Projected Friday PM Peak (2024)		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Middleborough Rd (S)	Left	0.45	15	49	0.61	16	75	0.59	16	71	0.79	20	128
	Through	0.45	9	49	0.61	10	76	0.59	8	72	0.79	13	129
	Right	0.11	20	4	0.20	24	6	0.18	19	6	0.34	24	10
Eley Rd (E)	Left	0.83	32	69	0.93	45	99	0.37	26	22	0.42	26	25
	Through	0.83	25	69	0.93	38	99	0.37	19	22	0.42	19	25
	Right	1.00	30	59	1.00	31	58	1.01	81	57	1.01	82	57
Middleborough Rd (N)	Left	0.55	16	65	0.70	17	94	0.52	15	59	0.72	17	100
	Through	0.55	8	65	0.70	10	94	0.52	8	59	0.72	10	100
	Right	0.26	19	10	0.35	23	12	0.30	21	10	0.39	27	11
Eley Rd (W)	Left	0.32	25	20	0.33	25	21	0.75	30	52	0.77	30	55
	Through	0.32	18	20	0.33	18	21	0.75	22	52	0.77	23	55
	Right	0.43	33	10	0.47	33	11	0.81	33	23	0.93	32	25

Table 13: Middleborough Rd / Eley Rd - Saturday Peak Existing Conditions & Post Development SIDRA Comparison

Leg	Movement	Existing Saturday PM Peak			Projected Saturday PM Peak (2024)		
		DoS	Av. Delay (s)	95 th ile Queue (m)	DoS	Av. Delay (s)	95 th ile Queue (m)
Middleborough Rd (S)	Left	0.50	14	52	0.68	16	84
	Through	0.50	7	52	0.68	8	84
	Right	0.17	18	6	0.32	22	9
Eley Rd (E)	Left	0.40	26	20	0.45	26	22
	Through	0.40	19	20	0.45	19	22
	Right	0.80	32	35	0.87	35	39
Middleborough Rd (N)	Left	0.51	14	54	0.70	16	88
	Through	0.51	7	54	0.70	8	89
	Right	0.27	18	9	0.38	23	11
Eley Rd (W)	Left	0.41	26	20	0.43	26	22
	Through	0.41	19	20	0.43	19	22
	Right	0.51	28	12	0.62	30	15

8 TRAFFIC CONSIDERATIONS (AMENDED DEVELOPMENT PLAN)

8.1 Updated Traffic counts

To supplement the traffic volume data in the approved ITP, Traffix sourced recent SCATS traffic volume data for Friday the 22nd of June and Saturday the 23rd of June, 2018. This data revealed the following peak hours:

- AM PEAK: Friday 7:45am – 8:45am
- PM PEAK: Friday 4:45pm – 5:45pm; and
- PEAK: Saturday 12:30pm – 1:30pm.

The recorded peak hour movements are illustrated in Figure 16 and Figure 17.

Based on a comparison of the 2014 and 2018 peak hour traffic volumes, there has been no material change to traffic volumes along Middleborough Road or Burwood Highway. In fact, there has been a slight decrease in peak hour volumes on both roads. That is, there has not been any traffic growth during peak hours along this road. The length of the peak periods was also found to be generally consistent with those recorded during the 2014 traffic counts. It is further noted that the peak hour periods observed during the 2018 traffic counts are relatively comparable to the 2014 traffic counts with the PM and Saturday Peaks shifting by only 30 minutes and the AM peak period shifting by 15 minutes.

Specifically, the following two-way average (of AM and PM) peak hour volumes are noted.

- Middleborough Road, immediately south of Eley Road – 2,159 vehicles (2014) and 2,090 vehicles (2018).
- Burwood Highway, immediately west of the RSPCA access – 3,661 vehicles (2014) and 3,600 vehicles (2018).

Therefore the 2014 traffic counts are still representative of existing conditions, and furthermore the analysis as part of the approved Integrated Transport Plan is considered conservative as it adopted a 2% compounded growth, when in fact there has been no demonstrated growth over the past 4 years.

8.2 Traffic Generation

For the addition of the non-retail uses (2,450 square metres), we expect that these uses will be less intensive than standard retail, particularly during the critical Friday afternoon commuter peak period. More specifically, the majority of the non-retail floor area is likely to be used either as a gymnasium or cinema and these uses are low traffic generators during commuter peak hours and at Saturday lunch times. To this end, it is reasonable to adopt a rate that is 50% of the adopted retail traffic generation rate for the Friday afternoon peak hour and Saturday peak hour.

This is a conservative assumption that is based on the traffic generation rates included in the RTA Guide to Traffic Generating Developments (Version 2.2 October, 2002). In particular, Section 3.6.1 of this guide includes traffic generation formulas for 'shopping centres' that are split up into various categories of commercial uses. These formulas demonstrate that traffic generation for non-retail commercial uses such as office / medical uses (A(OM) category) are much lower than typical retail and supermarket uses during peak periods (i.e. less than 50%). The A(OM) category is considered to be most representative of the non-retail retail uses in the proposed development given that cinema and gymnasium are low traffic generating uses for the large floor areas they occupy..

Therefore, the following rate will be adopted for non-retail uses.

Non-Retail 2.3 movements per 100 square metres for the Friday PM and Saturday peak, and 1.15 movements per 100 square metres for the AM peak.

Based on the above, the proposed non-retail commercial space is projected to generate approximately 28 vehicle movements during the AM peak hour and 56 vehicle movements during the PM and Saturday peak hours.

In relation to daily movements, it is typical for the peak hours to represent 10% of the daily traffic generation. Whilst we acknowledge this rate is typically applicable to residential traffic generation, we are of the view that this rate can also be applied to the proposed non-retail commercial floor area.

SCATs data from Friday 22nd June 2018 and Saturday 23rd June 2018 was reviewed for the intersection of Burwood Highway / Burwood Heights Shopping Centre / Site Access to establish if traffic during the peak hours for in/out movements generated by Burwood Shopping Centre represented approximately 10% of the of the daily traffic generation. The SCATs data revealed that during the PM and Saturday peak hours, 10% and 12% of the daily traffic was generated respectively. Accordingly, it is considered appropriate to apply a peak hour rate of 10% of the daily traffic generation for the proposed non-retail commercial floor area and therefore the following daily traffic generation is projected.

Non-Retail 23 movements per 100 square metres – 564 movements.

This level of additional daily traffic is relatively low and we are satisfied that the capacity of the proposed internal roads will be sufficient to accommodate this increase.

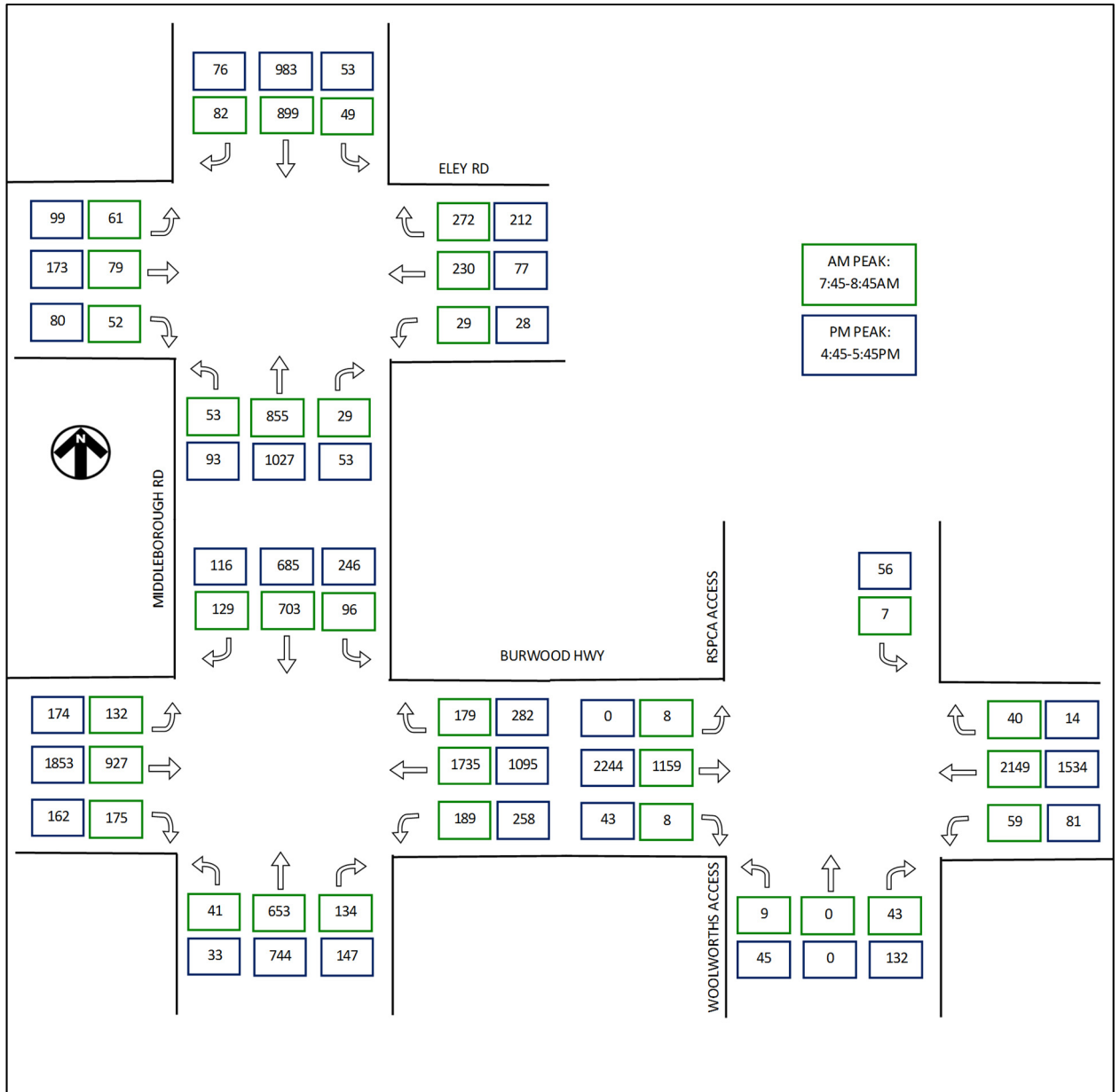


Figure 16: Peak Hour Traffic Volumes – Friday 22 June 2018

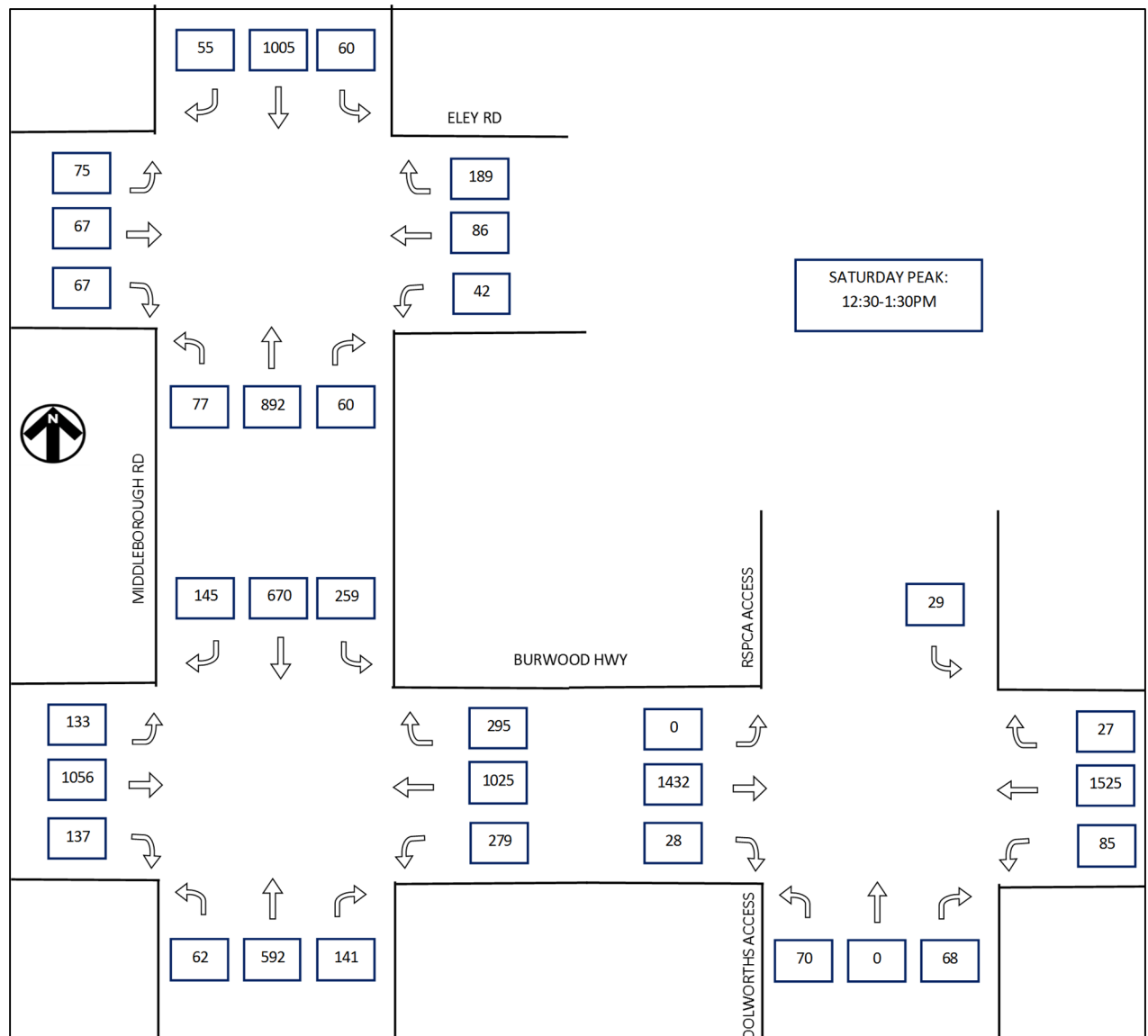


Figure 17: Peak Hour Traffic Volumes – Saturday 23 June 2018

8.3 Traffic Distribution

The peak hour traffic distribution assumptions outlined previously at Section 6.3 have been adopted for the proposed non-retail commercial use.

The predicted additional turning movements generated by the non-retail commercial floor space at the proposed site connections and also at the Burwood Highway / Middleborough Road, and Middleborough Road / Eley Road intersections are shown at Figure 18.

The predicted daily traffic volumes, including the addition of the projected non-retail floor space traffic generation, are shown at Figure 19.

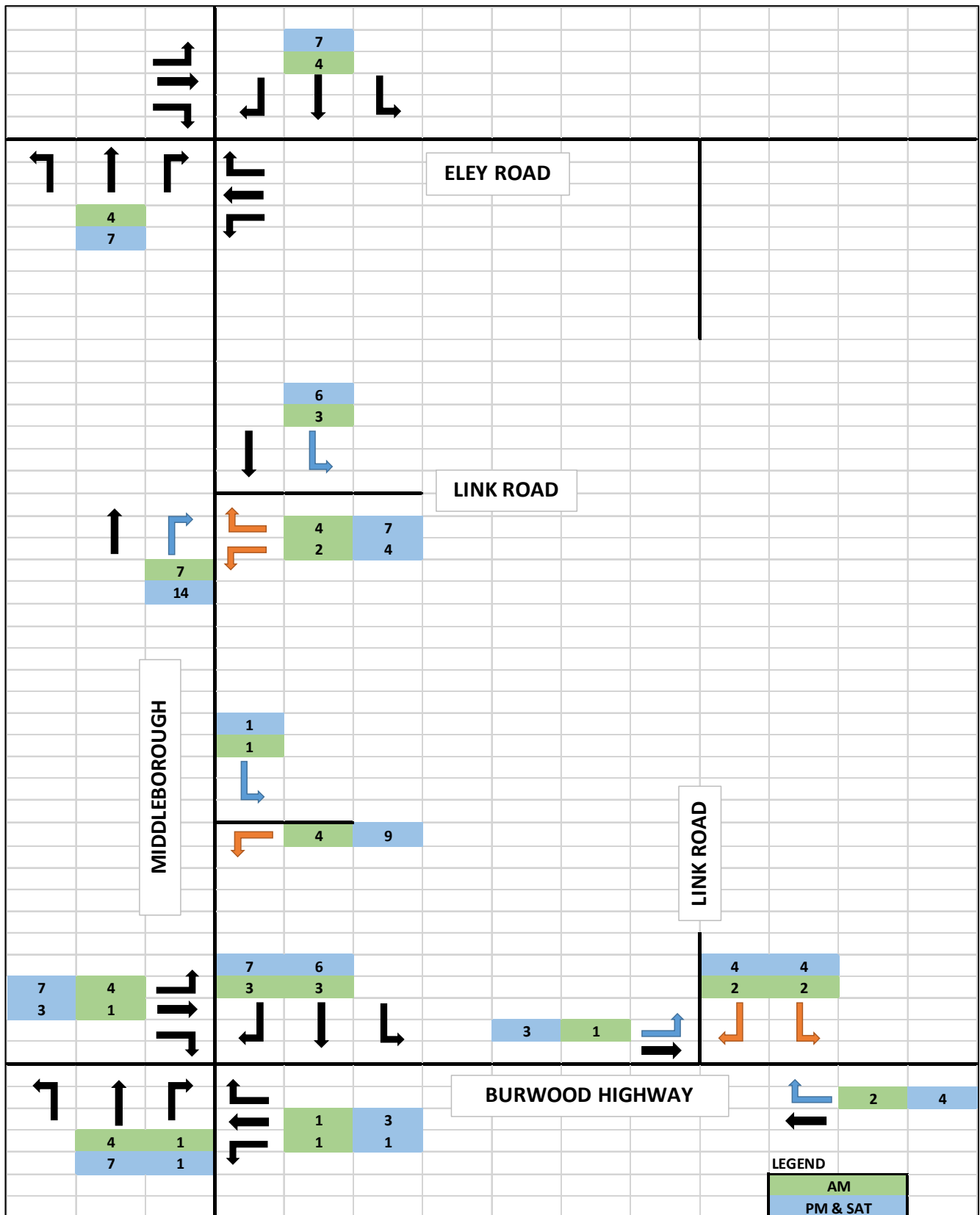


Figure 18: Forecast Peak Hour Traffic Volumes Generated by Non-Retail Commercial

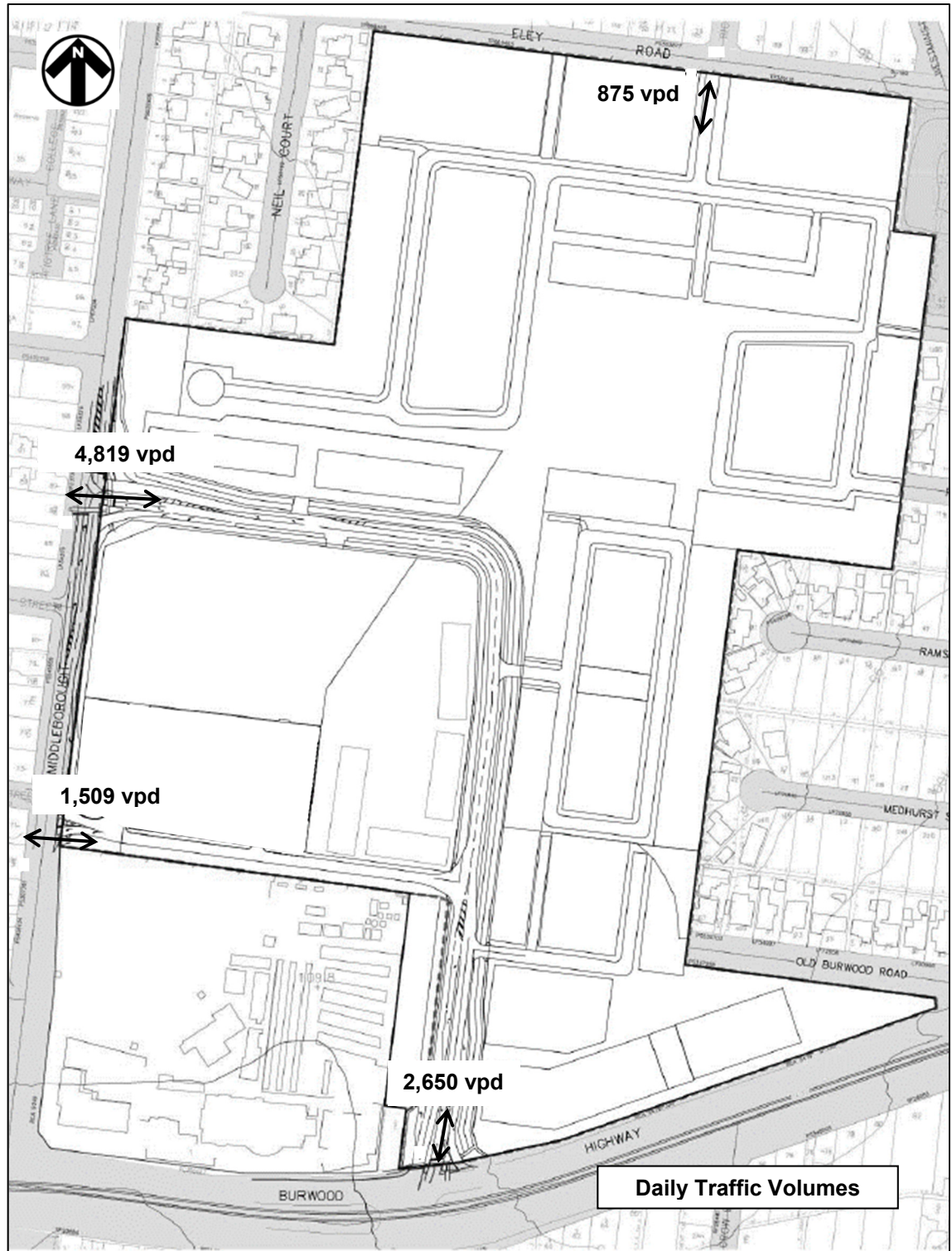


Figure 19: Forecast Daily Development Traffic Distribution

8.4 Traffic Impact

The inclusion of the non-retail floor space is only expected to generate in the order of an additional 56 movements (during the critical peak hours) which is a relatively low level of traffic above what has already been assessed and approved. The 56 movements are expected to comprise 31 movements to the intersection of Middleborough Road and the site access, ten (10) movements to the secondary access to Middleborough Road, and 15 movements to the intersection of Burwood Highway and the site access.

Fifty six (56) movements equates, on average, to less than an additional vehicle every minute, and when spread across the three site access opportunities and individual movements, no single movement is expected to increase by more than 14 movements in any one hour.

The largest increase is at the signalised site access to Middleborough Road, which as part of the approved Integrated Transport Plan was predicted to operate with a degree of saturation of 0.61 or in the 'very good' category. This means that there is more than sufficient capacity at the intersection to accommodate the modest increase in traffic arising from the proposed increase in non-retail floor area.

For the broader network, the increase in non-retail floor area is expected to add 35 movements to the intersection of Middleborough Road and Burwood Highway, including no more than seven (7) vehicle movements to any one turning movement.

This is a low level of increase and in our view does not warrant any additional mitigation measures beyond those already agreed.

Review of Figure 19 reveals that the increased in non-retail floor area will result in projected daily volumes for the Boulevard (link road) of up to 4,819 vehicles, and for the secondary access road of 1,509 vehicles. This level of daily volumes is well within the design parameters and functional operation of these roads.

Based on the above analysis, it is our view that the previously approved functional layout plans for the access connections and agreed mitigation works are adequate to accommodate the relatively modest additional traffic to be generated by the proposed Development Plan amendment.

The above methodology has been discussed with VicRoads and they have provided 'in-principle' support that no further works are necessary as a result of the proposed amendments.

9 CLAUSE 56 MOBILITY REQUIREMENTS

Access and mobility management for subdivisions are outlined in Clause 56.06 of the Whitehorse Planning Scheme. The general objectives of Clause 56.06 are:

Clause 56.06-2 Walking and cycling network objectives

To contribute to community health and by encouraging walking and cycling as part of the daily lives of residents, employees and visitors.

To provide safe and direct movement through and between neighbourhoods by pedestrians and cyclists.

To reduce car use, greenhouse gas emissions and air pollution.

Clause 56.06-5 Walking and cycling network detail objectives

To design and construct footpaths, shared path and cycle path networks that are safe, comfortable, well constructed and accessible for people with disabilities.

To design footpaths to accommodate wheelchairs, prams, scooters and other footpath bound vehicles.

Clause 56.06-6 Public transport network detail objectives

To provide for the safe, efficient operation of public transport and the comfort and convenience of public transport users.

To provide public transport stops that are accessible to people with disabilities.

Clause 56.06-4 Neighbourhood street network objective

To provide for direct, safe and easy movement through and between neighbourhoods for pedestrians, cyclists, public transport and other motor vehicles using the neighbourhood street network.

Clause 56.06-7 Neighbourhood street network detail objective

To design and construct street carriageways and verges so that the street geometry and traffic speeds provide an accessible and safe neighbourhood street system for all users.

Clause 56.06-8 Lot access objective

To provide for safe vehicle access between roads and lots.

The assessment of the mobility requirements of Clause 56 and other relevant considerations follows.

9.1 Walking & Cycling

Internal Network

The design team at Frasers is committed to providing a pedestrian and cycle focus within the development. The pedestrian network will be designed to be DDA compliant, taking into account (amongst other things) the gradient of the site.

The movement and access strategy is to provide a comprehensive network of pedestrian and cycle paths (primarily off-road) to allow movement between neighbourhoods, through the site, and to the proposed open space, community retail facilities, and to public transport services already available to the site.

Specifically, footpaths will generally be provided on both sides of local streets and there will be an off-road path for the length of the link road, connecting Middleborough Road and Burwood Highway. There will also be off-road connections to the north to connect to Eley Road, which is on the Principal Bicycle Network, and pedestrian connections to existing residential streets to the east, including Rochdale Drive, Old Burwood Road and Ridley Street.

The movement network includes a series of dedicated, high-quality pedestrian and cycling paths that are formally divided from the road network. Specifically, dedicated off-road cycle paths will be provided alongside the link road, connecting Burwood Highway with Middleborough Road. This dedicated off-road bicycle route is complimented by shared pedestrian and cycle paths which have been strategically integrated to form a permeable network connecting to Eley Road, the community centre, the retail precinct, Middleborough Road and Burwood Highway.

These facilities will be particularly attractive to residents north of Eley Road who will benefit with improved and more direct connections to the Burwood Highway fixed rail and bus corridors. In addition, residents to the west will be provided with improved access to bus services operating on Middleborough Road via the cycle and pedestrian linkages.

A connection from the site to Old Burwood Road to the east will facilitate pedestrian and cycle access, particularly to the Burwood Highway tram and bus stops. The pedestrian connection will link into the existing footpath on the north side of Old Burwood Road and cyclists will use the adjacent road space.

The link running adjacent to the Melbourne Water retarding basin accommodates a shared bicycle and pedestrian path and provides a connection through to the proposed open space south of the retarding basin. The shared path shall be provided with a minimum width of 2.5 metres, consistent with the function of the facility as described by Figure A 2 specified by the Austroads Guidelines Part 6A and be built to Council's Road Management Plan standards.

Presently the site is fenced off, and consequently acts as a barrier between the existing neighbourhood to the north and Burwood Highway where access to the tram stops and Burwood Heights Shopping Centre is provided. Development of the site, will significantly improve pedestrian and cycle accessibility for the broader community to the north. The proposed bicycle network and pedestrian connections are illustrated in Figure 20.

Where cycling and pedestrian paths intersect i.e. at the north-east corner of the Boulevard / Burwood Highway intersection, these junctions can be appropriately managed via advisory signs and / or contrasting coloured pavement to alert cyclists and pedestrians alike of potential conflict points.

External Network

Middleborough Road has a reservation of approximately 20 metres, and is constructed with a 12.7 metre pavement, realising relatively narrow (~3 – 3.5 metres on the east side at the site frontage), but not unusual verges, for an arterial road.

The Development Plan proposes a widening of Middleborough Road to accommodate auxiliary turn lanes at the proposed access points, and replacement and improvement of the verge at the frontage of the site.

In addition, the inclusion of the left turn deceleration lane for the primary signalised access and secondary access will further separate pedestrians from through traffic movements on Middleborough Road, improving pedestrian conditions.

The Development Plan also contemplates activation of the Middleborough Road frontage, which will improve the pedestrian experience.

The pedestrian paths on Middleborough Road will also be strategically integrated with the on-site pedestrian routes, providing a convenient and legible network connecting Middleborough Road, Eley Road and Burwood Highway.

The Eley Road frontage is part of the Principal Bicycle Network. In lieu of a strategic bicycle network plan for Eley Road, Frasers Property for its part, will linemark sharrows on the approaches to the proposed roundabout at the Eley Road / Richmond Street intersection and a bicycle head start storage area on the west approach of the Middleborough Road / Eley Road intersection¹.

The sharrows have been illustrated on the concept functional layout for the Eley Road roundabout at Appendix B.

Eley Road has a carriageway width of some 7.7 metres, effectively providing for a 3.85 metre lane in each direction.

Cycling Aspects of Austroads Guidelines outlines a minimum width of 3.7 metres to provide for a wide kerbside lane for a 60km/h road. As Eley Road has an effective lane width in the order of 3.8 metres it can operate as a shared wide kerbside lane.

¹ Due to the shared left and through lane in addition to the bonus left turn signal on the east approach, a bicycle head start storage area would create a conflict of priority. In this regard, no head start storage area has been proposed on the west approach.



Figure 20: Proposed Bicycle Network & Pedestrian Interface

9.2 Public Transport

The site is well situated in relation to available public transport services, with bus routes operating along Middleborough Road, Burwood Highway and Eley Road / Royton Street to the east, and a tram route on Burwood Highway.

A review of the site shows that over 95% of the site is situated within 400 metres of available existing public transport services, and in this regard it is not necessary for the diversion of existing bus routes to travel through the site.

The Development Plan ensures that convenient pedestrian connections are provided to the existing tram stops on Burwood Highway and bus stops on Middleborough Road, Burwood Highway and Royton Street (via Rochdale Drive). A map detailing the public transport nodes in vicinity of the site is provided at Appendix C.

The development proposes to provide access points in proximity to the existing public transport nodes located on the frontage roads. The key routes between the site and public transport nodes will be designed to make pedestrian and cycle access attractive, convenient and legible, which will encourage higher use of alternate transport modes.

More specifically, where the intersection of The Boulevard intersects with Middleborough Road there are existing bus stops (northbound and southbound) that will be positioned to the south of the intersection, with the final location to the satisfaction of PTV and VicRoads. These stops will be conveniently accessible via footpaths on the Boulevard, with safe opportunity to cross Middleborough Road at the traffic signals.

95% of the site is within 400 metres walking distance to an existing public transport node. There are four (4) bus stops on Middleborough Road, spaced at approximately 200-250 metres apart between Eley Road and Burwood Highway and two (2) tram stops on Burwood Highway, spaced at approximately 500 metres apart between Middleborough Road and Old Burwood Road. It is envisaged that:

- The bus stop at the intersection of Middleborough Road and Eley Road will predominantly serve residents within stages LA1, MD3 and MD5. The maximum walking distance to this node will be 460 metres.
- The bus stops proposed to be relocated at the retail frontage will mainly serve the residential catchments within stages MD2, MD4, MD6-7 and AP4-7 with the maximum walking distance to this node of approximately 450 metres.
- The bus stop located near the intersection of Middleborough Road and Johnston Street will for the majority provide public transport access to the retail precinct, urban plaza, AP1-3 and part of MD1 with a maximum walking distance to this node of approximately 470 metres.
- The tram and bus stops located on Burwood Highway near Old Burwood Road will primarily serve residents within stages AP1-3 and MD1. The maximum walking distance to this node will be 400 metres.
- The tram and bus stops located at the Burwood Highway and Middleborough Road intersection will for the most part provide secondary public transport access for the retail precinct, urban plaza, AP2-3 and parts of MD1 and AP1.
- It is noted that final bus stop locations will be to the satisfaction of PTV and VicRoads.

For the tram stops and bus stops on Burwood Highway, future residents will be able to use the cycle and pedestrian connection to Old Burwood Road or walk along The Boulevard to connect to Burwood Highway and then walk along Burwood Highway to the stops at Middleborough Road or the tram stop near to Old Burwood Road. Crossing Burwood Highway is facilitated by the existing traffic signals (modified as part of the project).

The bus stops on Royton Street are accessible by foot through the new footpath system and connections at Rochdale Street and Ridley Street.

The existing Burwood Highway tram stops, existing bus stops at the Middleborough Road / Eley Road, Middleborough Road / Johnston Street, Burwood Highway / Middleborough Road, Burwood Highway / Old Burwood Road intersections and the proposed relocation of the retail centre bus stop are considered to be well located to optimally serve the residential catchment areas of the site. In addition, the development of the site will also provide more convenient connections for the existing neighbourhood to the north to access the tram on Burwood Highway.

9.3 Street Network

The street network includes the Boulevard which connects Middleborough Road and Burwood Highway, and there is no vehicle connection between the northern and southern precincts to constrain traffic impacts to Eley Road.

Individual allotments will be provided with access from local streets or laneways.

The Development Plan provides for a connective network avoiding, where possible, the provision of dead-end streets. In this regard, waste collection and emergency vehicles will be able to navigate the site comfortably without the need to reverse.

The proposed cross sections of the different street types are attached as Appendix D, and are summarised as follows

Connector Street – Link Road

For Connector Streets, the Melbourne Planning Authority (MPA) suggests a road reserve of 25 - 31 metres.

The Boulevard has a 25.9 metre wide road reservation to typically comprise an 11.6-12 metre pavement, and will generally consist of 2.3 metre wide parking lanes and 3.5 metre traffic lanes in each direction.

The east-west section of the Boulevard provides for a 4.5 metre wide footpath along the retail frontage. A 1.5 metre wide footpath and a 3.0 metre wide dedicated two-way off road bicycle path is provided within a 9.8 metre wide verge on the opposite side (north side) of the Boulevard.

The north-south section of the Boulevard provides for a 4.5 metre verge on one side and a 9.8 metre verge on the opposite side. Each verge is provided with a separated 1.5 metre wide footpath and the wider verge accommodates a 3.0 metre wide dedicated two-way off road bicycle path.

To deter 'rat running', The Boulevard at the Civic Square will narrow and be constructed with a threshold treatment (wombat crossing or similar) and paved in a colour to signify a shared environment. This will reduce vehicle speeds and provide the road at the same level as the footpath. A concept plan detailing a possible threshold treatment is provided at Appendix B.

The threshold treatment will:

- Reduce vehicle speeds.
- Discourage through traffic due to lower speeds and longer travel times.
- Highlight the presence of a pedestrian crossing.
- Reduce pedestrian conflicts; and
- Provide a designated place of crossing for pedestrian crossings.

The threshold treatment will be clearly visible to approaching drivers, illuminated by street lighting, and made conspicuous by the use of signs, pavement markings and other forms of delineation. The crossing will be enhanced with kerb extensions/lane narrowing and median treatments and flashing amber lights will be considered in detailed design.

The approach speeds will be further reduced by road humps on the approach to the crossing to account for the sight distance at the bend. The treatment and speed humps will be sensitive to pedestrian and cycle movements. Pedestrians and cyclists will share the space north of the treatment. Appropriate signage will indicate the end of 'right of way' cycle facilities to cyclists and to exercise caution in this area.

At this point, priority will be afforded to pedestrians through the inclusion of a 10km/h shared zone and / or a zebra crossing further deterring through movements (subject to VicRoads' approval). Where appropriate, threshold treatments will also be included at other points along The Boulevard to encourage a low speed environment.

Access Street – Level 1 (<2,000vpd)

It is proposed that the local streets will be provided with a minimum 14 metre reservation, with the exception of streets that abut a reserve where a minimum reservation of 10.5 metres will be provided.

All local streets will be constructed with a 7.3 metre pavement. Footpaths will generally be, where possible, provided on both sides, except where streets abut public open spaces, where a footpath will only be provided on the development side.

The pavement width exceeds the suggested minimum requirement of 5.5 metres stipulated within Clause 56.06-7 and will provide the opportunity for on-street parking on both sides of the road, whilst maintaining a single traffic lane.

Provision for on-street parking, accounting for access to individual dwellings, will be assessed as part of individual applications.

Laneways

Some housing is likely to be provided with access to car parking at the rear, accessed via laneways.

It is proposed that laneways will be provided with a minimum reservation of 7 metres to allow a minimum pavement width of 5.5 metres and intermittent street tree planting and placement of bins for collection.

The proposed width exceeds the minimum width of 5.5 metres as specified for an Access Lane under Clause 56.06-7 of the Planning Scheme.

Overall, we are satisfied that the design intent for the proposed road layout and access arrangements will development of a street network that meets the objectives of the Planning Scheme, good design practice and will operate safely and efficiently for all road users, including pedestrians, cyclists and motorists.

Pathways

Both shared and dedicated pedestrian and cycle paths within the development will be provided generally in accordance with the Austroads Guide and Council's Road Management Plan.

A number of considerations should be taken into account when determining the widths of pathways including:

- Level of pedestrian and cyclist use;
- The types of cyclists likely to be attracted to the path;
- Objectives of the path i.e. major cycling link
- Speed of cyclists;
- Traffic regime;
- Available clearances;
- User envelopes.

Based on the parameters above, the internal access network will be typically provided with minimum pathway dimensions as follows, to provide a convenient access network.

- 1.5 metre wide pedestrian footpaths (1.0 metre wide for laneways, and 1.2 metre wide for roads with less than 300 vehicle movements per day);
- 2.5 metre wide shared paths; and
- 3.0 metre wide dedicated cycle paths.

10 CAR PARKING / LOADING CONSIDERATIONS

10.1 Car Parking

The statutory car parking requirements for the development are outlined in Clause 52.06 of the Whitehorse Planning Scheme. A summary of the car parking rates for the relevant uses contemplated within the Development Plan are:

- Residential Tenant - 1 car space to each one or two-bedroom dwelling.
- Residential Tenant - 2 car spaces to each three or more bedroom dwelling.
- Residential Visitor - 1 space for every 5 dwellings.
- Retail (Shop) - 4 car spaces to each 100 square metres of leasable floor area.
- Supermarket - 5 car spaces to each 100 square metres of leasable floor area.
- Cinema based entertainment complex – 0.3 car spaces per patron.

There is no intention for the above rates to be reduced within the Development Plan. However, this does not preclude future individual applications seeking a waiver of car parking and being tested under the requirements of Clause 52.06, noting that as a result of Planning Scheme Amendment VC148 there is no longer a requirement for visitor parking to be provided for the development of dwellings within the Principal Public Transport Network Area and also the rate for retail (shop) has been reduced to 3.5 spaces per 100 square metres of leasable floor area.

It is likely that the creation of on-street parking will be used to, at least partially, satisfy the residential visitor parking provision.

For the retail development, the Development Plan contemplates the inclusion of a combination of at-grade and basement parking. The at-grade parking will be located to the south of the retail floor area and will be accessible via the east-west service road at the southern boundary of the site.

The basement parking will be accessible via The Boulevard, with a secondary connection from within the at-grade parking.

Car parking management for the retail centre continues to be under investigation to find the optimal outcome prior to occupation. It is likely to include some form of parking restrictions that allows adequate time for customers to utilise retail services, whilst also encouraging sufficient turnover of car spaces. The management may also include a fee for parking in excess of a designated length of time, that again will be cognisant of the proposed uses and if necessary allow free or longer parking for particular uses such as the cinema.

A more resolved car parking management plan will be agreed with Council as part of the planning application.

In development of the residential apartments, basement parking is preferred but that there may be some constructed with a combination of basement and / or podium parking.

10.2 Bicycles

Bicycle parking provision, location and end-trip facilities will be assessed as part of individual planning applications for all residential and commercial uses, including medium density i.e. Urban Grid Townhouse Living node, apartments and other land lots. In addition, bicycle parking will be provided at the major focal points and public realm areas within the development including, the urban plaza, wetland park, and retail and social hub, as appropriate.

10.3 Loading

The Development Plan proposes a service road at the southern boundary of the development. The primary purpose of the service road is to provide access to the retail at-grade parking and loading areas.

It is expected that retail loading will be primarily undertaken at this location, however there is likely to be intermittent activity along The Boulevard consistent with strip retail centres throughout Melbourne.

11 TRANSPORT DEMAND MANAGEMENT

Transport Demand Management (TDM) is the general term for strategies that result in more efficient use of transportation resources, and in particular reduction in single occupant car trips.

A typical person makes more than a dozen trips away from home each week – to work, shopping, errands, social and recreation activities. Many of these trips are flexible in terms of their timing, mode and destination. For example, many commuters can vary when and how they travel to work or school, at least some days. Similarly, errands can be organised in various ways, such as walking or bicycling to neighbourhood shops, or making several car trips to various destinations.

Recreational activities can also have various travel options, ranging from a neighbourhood stroll, driving across town to exercise at a gym, or cycling for errands and commuting. Many factors affect people's transport decisions including the relative convenience and safety of travel modes (such as whether streets have sidewalks and bike paths, and the quality of public transport available), prices; and land use factors (such as whether or not schools, parks and shops are located close to residential neighbourhoods).

The subject land is situated at the intersection of two major arterial roads that experience levels of congestion at peak periods. The site is well situated to provide convenient access to existing public transport services, including the tram network on Burwood Highway and bus routes on Middleborough Road, Burwood Highway and Eley Road.

The Development Plan contemplates a mixed-use development to comprise retail, residential and recreational facilities. This in itself is a form of Travel Demand Management as it provides the opportunity for future residents to reduce the dependence on the private car and make local trips by walking or cycling to do shopping or recreational / leisure activities.

The premise of the Development Plan has been to design a walkable, cycle friendly urban environment to promote a healthy community. The plan proposes a connective footpath and cycle network within the subject land, and connections to existing public transport services to help deliver this objective.

The layout of the Development Plan provides the opportunity for convenient walking / cycling connections to existing public transport services and bicycle routes, and accordingly allows an encouragement of sustainable transport.

Fraser's Property will commit to the provision of an all-encompassing Green Travel Plan (GTP), as part of its first planning application. In addition, a GTP will be prepared as part of individual planning applications which will identify the bodies responsible for managing the GTP actions upon project completion.

A GTP is a package of strategies, targets and actions designed to encourage greener modal splits, reducing the number of trips made by car and single occupancy trips and encourages walking, cycling and public transportation.

The GTP will demonstrate Fraser's commitment to sustainable objectives and promote green travel modes and reduced dependency on cars by:

- Providing bicycle and pedestrian trails and end of trip facilities;
- Encouraging public transport patronage;
- Promoting carpooling;
- Providing incentives for participants; and
- Providing information and events to drive the strategies above.

The GTP will provide initiatives that can be implemented relatively easily and economically, which will encourage mode shift behaviour in favour of car sharing, public transport, walking, cycling and other forms of sustainable transportation.

12 STATE GOVERNMENT TRANSPORT OBJECTIVES

Clause 18 of the Whitehorse Planning Scheme outlines the State Government's transport objectives.

The overarching principal is to provide an integrated and sustainable transport system that provides access to social and economic opportunities, facilitates economic prosperity, contributes to environmental sustainability, coordinates reliable movements of people and goods, and is safe.

Clause 18.01 – Integrated Transport has two sub clauses.

Clause 18.01-1S Land Use and Transport Planning has an objective to create a safe and sustainable transport system by integrating land-use and transport. The development has a frontage to Burwood Highway which forms part of the Principal Public Transport Network, and proposes both retail and residential uses, which means the site is ideally situated to provide for an integrated development that can promote sustainable transport options by providing good connections to existing transport services.

Clause 18.01-2S Transport System has an objective to coordinate development of all transport modes to provide a comprehensive transport system. This is a broader objective for the municipality, however the Development Plan provides good walking and cycling connections to access the existing public transport system, including the tram routes on Burwood Highway and local bus services operating on Burwood Highway, Middleborough Road and Eley Road.

Clause 18.02 – Movement Networks addresses the individual travel modes.

The objective of Clause 18.02-1S Sustainable Personal Transport is to promote the use of sustainable personal transport, whilst Clause 18.02-1R Sustainable personal transport (Metropolitan Melbourne) has the following strategies:

- Improve local travel options for walking and cycling to support 20 minute neighbourhoods.
- Develop local cycling networks and new cycling facilities that support the development of 20-minute neighbourhoods and that link to and complement the metropolitan-wide network of bicycle routes - the Principal Bicycle Network.

A guiding principle of the Development Plan has been to provide a walkable, cycle friendly urban environment through the provision of a connective and legible footpath network and cycle paths. These paths provide the opportunity for future residents to walk and cycle, particularly for local trips, rather than use the private vehicle.

Clause 18.02-2R Principal Public Transport Network states the following strategies:

- Facilitate high-quality public transport access to job-rich areas.
- Maximise the use of existing infrastructure and increase the diversity and density of development along the Principal Public Transport Network, particularly at interchanges, activity centres and where principal public transport routes intersect.
- Identify and plan for new Principal Public Transport Network routes
- Support the Principal Public Transport Network with a comprehensive network of local public transport.
- Plan for local bus services to provide for connections to the Principal Public Transport Network.
- Improve the operation of the Principal Public Transport Network by providing for:
 - A metro-style rail system.
 - Extended tram lines and the establishment of a light rail system.
 - Road space management measures including transit lanes, clearways, stops and interchanges.

The Development Plan proposes a mixed-use development along a Principal Public Transport route (Burwood Highway). In this regard, the Development Plan builds on providing employment opportunities and residential uses that are directly accessible to the Principal Public Transport Network.

The Development Plan has abuttal to two arterial roads, proposes convenient connection to these roads through signalised intersections, and will fund upgrades to the intersection of Middleborough Road and Burwood Highway. This strategy satisfies the objective of Clause 18.02-3S Road System which is to manage the road system to achieve integration, choice and balance by developing an efficient and safe network and making the most of existing infrastructure. The objective of Clause 18.02-4S Car Parking is to ensure an adequate supply of car parking that is appropriately designed and located. There is no intention as part of the Development Plan to seek a waiver of car parking requirements, and it is proposed where possible to provide residential apartment car parking within basements or podiums.

Overall, it is considered development of the site in accordance with the Development Plan will meet the transport objectives of the State Government.

13 CONCLUSIONS

Having visited the site, collected traffic volume data, and undertaken an assessment of the traffic impacts for the potential development yield, we are of the opinion that:

- a) The subject land has good accessibility to existing public transport services, including buses on Middleborough Road and Burwood Highway, and trams on Burwood Highway.
- b) The site can be suitably accessed via the proposed access strategy incorporating:
 - A Boulevard that links Middleborough Road and Burwood Highway.
 - A new set of traffic signals that provides access to Middleborough Road.
 - A left-in / left-out access to Middleborough Road at the southern boundary. This road is at the boundary of the RSPCA and is intended to service parking and loading for the retail precinct. It will remain a private road, managed by the retail development.
 - Limited access to Eley Road.
 - Construction of a roundabout at the intersection of Eley Road / Richmond Street / development access and installation of 'No Stopping' restrictions on the south side of Eley Road between Westminster Close and Middleborough Road
 - Provision of a northern leg at the Burwood Highway / Burwood Heights Shopping Centre traffic signals, and improvement works to provide for a double right turn lane on the east approach, an auxiliary left turn lane on the west approach of Burwood Highway, a dedicated left-out access to Burwood Highway and signalised pedestrian crossings on all intersection approaches
- c) The development will fund mitigation works comprising lengthening of the right turn lanes on the east and north approaches for the intersection of Middleborough Road and Burwood Highway and provision of the above intersection treatments at the site, plus the implementation of 'No Stopping' restrictions on the south side of Eley Road between Westminster Close and Middleborough Road
- d) The proposed amendment to the Development Plan, incorporating an additional 2,456 square metres of non-retail floor space, can be suitably accommodated by the approved access arrangements and agreed mitigation road works.
- e) Development of the site should provide for legible and convenient pedestrian and cycling connections throughout the site and to the broader community, and provide for improved connections to public transport.
- f) The proposed road cross sections will provide for suitable and convenient access to individual properties and along residential streets.

MOVEMENT SUMMARY

Site: Existing FRI AM Peak

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 123 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	116	5.0	0.708	51.0	LOS D	20.6	150.4	0.95	0.87	26.8
2	T	648	5.0	0.708	42.3	LOS D	20.6	150.4	0.96	0.83	26.4
3	R	147	5.0	0.504	36.9	LOS D	6.1	44.5	0.85	0.78	31.4
Approach		912	5.0	0.708	42.5	LOS D	20.6	150.4	0.94	0.83	27.2
East: Burwood Hwy											
4	L	163	5.0	0.224	10.9	LOS B	1.8	13.1	0.25	0.67	51.1
5	T	1907	5.0	0.986	99.6	LOS F	59.5	434.1	1.00	1.36	17.0
6	R	161	5.0	0.361	62.9	LOS E	5.7	41.8	0.96	0.74	23.3
Approach		2232	5.0	0.986	90.5	LOS F	59.5	434.1	0.94	1.27	18.2
North: Middleborough Rd											
7	L	112	5.0	0.179	12.9	LOS B	1.7	12.6	0.33	0.68	46.1
8	T	813	5.0	0.378	37.1	LOS D	19.1	139.6	0.85	0.72	28.5
9	R	154	5.0	0.667	37.9	LOS D	6.0	43.5	0.91	0.78	31.0
Approach		1078	5.0	0.667	34.7	LOS C	19.1	139.6	0.81	0.73	30.1
West: Burwood Hwy											
10	L	121	5.0	0.267	13.7	LOS B	2.1	15.2	0.35	0.69	48.1
11	T	1076	5.0	0.556	35.3	LOS D	17.4	127.2	0.87	0.75	32.2
12	R	181	5.0	0.478	66.6	LOS E	5.3	38.8	0.99	0.78	22.4
Approach		1378	5.0	0.556	37.5	LOS D	17.4	127.2	0.84	0.75	31.4
All Vehicles		5599	5.0	0.986	58.9	LOS E	59.5	434.1	0.89	0.96	23.7

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	14.6	LOS B	0.1	0.1	0.49	0.49
P2	Across S approach	53	11.9	LOS B	0.1	0.1	0.44	0.44
P3	Across E approach	53	40.7	LOS E	0.2	0.2	0.81	0.81
P4	Across E approach	53	36.7	LOS D	0.1	0.1	0.77	0.77
P5	Across N approach	53	31.5	LOS D	0.1	0.1	0.72	0.72
P6	Across N approach	53	29.4	LOS C	0.1	0.1	0.69	0.69
P7	Across W approach	53	40.7	LOS E	0.2	0.2	0.81	0.81
P8	Across W approach	53	36.7	LOS D	0.1	0.1	0.77	0.77
All Pedestrians		424	30.3	LOS D			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: Existing FRI PM Peak

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 127 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	87	5.0	0.803	58.0	LOS E	25.4	185.3	0.99	0.93	24.9
2	T	749	5.0	0.803	49.2	LOS D	25.4	185.3	0.99	0.92	24.4
3	R	139	5.0	0.572	41.2	LOS D	6.0	44.0	0.95	0.79	29.7
Approach		976	5.0	0.803	48.9	LOS D	25.4	185.3	0.99	0.90	25.1
East: Burwood Hwy											
4	L	109	5.0	0.181	13.5	LOS B	1.8	12.9	0.33	0.67	48.3
5	T	1156	5.0	0.191	31.5	LOS C	16.4	119.8	0.76	0.63	34.3
6	R	324	5.0	0.693	61.4	LOS E	11.5	84.3	0.94	0.78	23.7
Approach		1589	5.0	0.693	36.3	LOS D	16.4	119.8	0.77	0.66	32.1
North: Middleborough Rd											
7	L	273	5.0	0.609	28.1	LOS C	9.4	68.3	0.63	0.84	35.5
8	T	712	5.0	0.684	44.3	LOS D	19.7	144.0	0.95	0.82	26.0
9	R	118	5.0	0.558	42.2	LOS D	5.0	36.8	0.97	0.79	29.3
Approach		1102	5.0	0.684	40.1	LOS D	19.7	144.0	0.88	0.82	28.3
West: Burwood Hwy											
10	L	155	5.0	0.380	15.4	LOS B	3.2	23.5	0.40	0.71	46.4
11	T	1889	5.0	1.008	125.4	LOS F	66.9	488.1	1.00	1.49	14.3
12	R	196	5.0	0.408	64.3	LOS E	5.7	41.6	0.96	0.78	22.9
Approach		2240	5.0	1.008	112.5	LOS F	66.9	488.1	0.96	1.37	15.5
All Vehicles		5907	5.0	1.008	68.0	LOS E	66.9	488.1	0.89	1.00	21.7

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	16.1	LOS B	0.1	0.1	0.50	0.50
P2	Across S approach	53	13.2	LOS B	0.1	0.1	0.46	0.46
P3	Across E approach	53	42.6	LOS E	0.2	0.2	0.82	0.82
P4	Across E approach	53	38.6	LOS D	0.1	0.1	0.78	0.78
P5	Across N approach	53	33.3	LOS D	0.1	0.1	0.72	0.72
P6	Across N approach	53	31.2	LOS D	0.1	0.1	0.70	0.70
P7	Across W approach	53	42.6	LOS E	0.2	0.2	0.82	0.82
P8	Across W approach	53	38.6	LOS D	0.1	0.1	0.78	0.78
All Pedestrians		424	32.0	LOS D			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.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Existing SAT Peak

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 113 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	113	5.0	0.704	47.7	LOS D	18.8	137.2	0.95	0.87	27.9
2	T	644	5.0	0.704	39.0	LOS D	18.8	137.2	0.95	0.83	27.5
3	R	141	5.0	0.547	36.6	LOS D	5.3	38.3	0.95	0.79	31.6
Approach		898	5.0	0.704	39.7	LOS D	18.8	137.2	0.95	0.83	28.2
East: Burwood Hwy											
4	L	277	5.0	0.599	15.2	LOS B	5.6	40.6	0.45	0.73	46.5
5	T	1097	5.0	0.684	39.0	LOS D	18.0	131.6	0.95	0.82	30.5
6	R	265	5.0	0.500	53.4	LOS D	8.1	59.5	0.92	0.74	25.9
Approach		1639	5.0	0.684	37.3	LOS D	18.0	131.6	0.86	0.79	31.4
North: Middleborough Rd											
7	L	231	5.0	0.413	15.0	LOS B	4.7	34.2	0.45	0.73	44.2
8	T	703	5.0	0.730	40.8	LOS D	18.0	131.7	0.96	0.86	27.1
9	R	133	5.0	0.574	36.7	LOS D	5.0	36.5	0.95	0.79	31.5
Approach		1066	5.0	0.730	34.7	LOS C	18.0	131.7	0.85	0.82	30.3
West: Burwood Hwy											
10	L	173	5.0	0.361	13.4	LOS B	2.8	20.6	0.37	0.70	48.4
11	T	1137	5.0	0.709	39.5	LOS D	18.9	137.9	0.96	0.83	30.3
12	R	181	5.0	0.357	57.2	LOS E	4.6	33.8	0.95	0.78	24.7
Approach		1491	5.0	0.709	38.6	LOS D	18.9	137.9	0.89	0.81	30.8
All Vehicles		5094	5.0	0.730	37.6	LOS D	18.9	137.9	0.88	0.81	30.4

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	17.6	LOS B	0.1	0.1	0.56	0.56
P2	Across S approach	53	14.4	LOS B	0.1	0.1	0.50	0.50
P3	Across E approach	53	38.3	LOS D	0.1	0.1	0.82	0.82
P4	Across E approach	53	34.3	LOS D	0.1	0.1	0.78	0.78
P5	Across N approach	53	34.3	LOS D	0.1	0.1	0.78	0.78
P6	Across N approach	53	32.0	LOS D	0.1	0.1	0.75	0.75
P7	Across W approach	53	38.3	LOS D	0.1	0.1	0.82	0.82
P8	Across W approach	53	34.3	LOS D	0.1	0.1	0.78	0.78
All Pedestrians		424	30.4	LOS D			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.

MOVEMENT SUMMARY

Site: Existing FRI AM Peak

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 123 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Woolworths											
1	L	23	0.1	0.257	67.5	LOS E	1.4	10.1	0.98	0.71	19.0
2	T	1	0.0	0.257	61.4	LOS E	1.4	10.1	0.98	0.70	17.1
3	R	27	0.1	0.227	66.9	LOS E	1.6	11.5	0.98	0.71	19.4
Approach		52	0.1	0.257	67.0	LOS E	1.6	11.5	0.98	0.71	19.1
East: Burwood Hwy											
4	L	66	0.1	0.109	9.6	LOS A	0.4	2.5	0.10	0.70	52.6
5	T	2272	5.0	0.503	1.3	LOS A	4.3	31.0	0.10	0.10	66.6
6	R	32	0.0	0.523	78.2	LOS E	2.1	14.4	1.00	0.73	20.0
Approach		2369	4.8	0.523	2.5	LOS A	4.3	31.0	0.12	0.12	64.3
North: RSPCA											
7	L	9	0.0	0.018	6.6	LOS A	0.1	0.5	0.18	0.56	38.4
Approach		9	0.0	0.018	6.6	LOS A	0.1	0.5	0.18	0.56	38.4
West: Burwood Hwy											
10	L	13	0.0	0.305	13.1	LOS B	7.6	55.3	0.31	1.02	49.7
11	T	1337	5.0	0.305	4.1	LOS A	7.6	55.3	0.31	0.28	60.2
12	R	6	0.1	0.209	81.2	LOS F	0.4	3.0	1.00	0.64	18.3
Approach		1356	4.9	0.305	4.5	LOS A	7.6	55.3	0.31	0.29	59.6
All Vehicles		3786	4.8	0.523	4.1	LOS A	7.6	55.3	0.20	0.19	60.5

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	4.7	LOS A	0.1	0.1	0.28	0.28
All Pedestrians		53	4.7	LOS A			0.28	0.28

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: Existing FRI PM Peak

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 127 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Woolworths											
1	L	98	0.1	0.997	63.0	LOS E	5.8	40.8	0.97	0.77	19.7
2	T	1	0.0	0.997	56.9	LOS E	5.8	40.8	0.97	0.75	17.8
3	R	73	0.1	0.311	60.8	LOS E	4.2	29.3	0.95	0.76	20.4
Approach		172	0.1	0.997	62.0	LOS E	5.8	40.8	0.96	0.77	20.0
East: Burwood Hwy											
4	L	88	0.1	0.183	10.7	LOS B	0.7	4.6	0.24	0.71	51.0
5	T	1577	5.0	0.426	11.1	LOS B	15.3	111.7	0.52	0.47	50.0
6	R	19	0.0	0.432	81.9	LOS F	1.3	9.1	1.00	0.69	18.2
Approach		1684	4.7	0.432	11.9	LOS B	15.3	111.7	0.51	0.48	49.2
North: RSPCA											
7	L	45	0.0	0.144	6.7	LOS A	0.4	2.8	0.19	0.58	38.4
Approach		45	0.0	0.144	6.7	LOS A	0.4	2.8	0.19	0.58	38.4
West: Burwood Hwy											
10	L	13	0.0	0.564	10.8	LOS B	5.4	39.1	0.12	1.06	51.6
11	T	2328	5.0	0.564	1.8	LOS A	5.4	39.1	0.12	0.11	65.5
12	R	40	0.1	0.391	54.4	LOS D	2.1	14.7	1.00	0.72	24.2
Approach		2381	4.9	0.564	2.7	LOS A	5.4	39.1	0.13	0.13	63.8
All Vehicles		4282	4.6	0.997	8.7	LOS A	15.3	111.7	0.32	0.30	52.7

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	11.1	LOS B	0.1	0.1	0.42	0.42
All Pedestrians		53	11.1	LOS B			0.42	0.42

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: Existing SAT Peak

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 114 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Woolworths											
1	L	58	0.1	0.546	57.5	LOS E	3.1	21.8	0.95	0.76	20.7
2	T	1	0.0	0.546	51.5	LOS D	3.1	21.8	0.95	0.73	18.8
3	R	80	0.1	0.378	57.3	LOS E	4.3	29.8	0.97	0.77	21.0
Approach		139	0.1	0.546	57.4	LOS E	4.3	29.8	0.96	0.76	20.9
East: Burwood Hwy											
4	L	98	0.1	0.213	11.2	LOS B	0.8	5.5	0.29	0.72	50.3
5	T	1542	5.0	0.437	11.8	LOS B	14.6	106.3	0.56	0.50	49.1
6	R	38	0.0	0.582	73.0	LOS E	2.3	16.1	1.00	0.75	19.8
Approach		1678	4.6	0.582	13.1	LOS B	14.6	106.3	0.55	0.52	47.8
North: RSPCA											
7	L	53	0.0	0.107	5.9	LOS A	0.6	4.2	0.27	0.51	35.7
Approach		53	0.0	0.107	5.9	LOS A	0.6	4.2	0.27	0.51	35.7
West: Burwood Hwy											
10	L	3	0.0	0.369	15.4	LOS B	10.4	76.0	0.41	1.00	47.5
11	T	1499	5.0	0.369	6.4	LOS A	10.4	76.0	0.41	0.37	56.2
12	R	25	0.1	0.172	46.3	LOS D	1.1	7.8	0.96	0.70	26.8
Approach		1527	4.9	0.369	7.1	LOS A	10.4	76.0	0.42	0.38	55.3
All Vehicles		3397	4.5	0.582	12.1	LOS B	14.6	106.3	0.51	0.46	48.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	11.9	LOS B	0.1	0.1	0.46	0.46
All Pedestrians		53	11.9	LOS B			0.46	0.46

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.

Processed: Monday, 22 September 2014 9:02:30 AM

SIDRA INTERSECTION 5.1.13.2093

Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Existing SIDRA Major Intersections -

modified to match queues\Burwood Hwy x RSPCA x Woolworths.sip

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SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: Existing FRI AM Peak

Middleborough Rd x Eley Rd, Blackburn East

Signals - Fixed Time Cycle Time = 49 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	63	0.0	0.450	15.2	LOS B	6.7	48.9	0.66	0.93	43.4
2	T	837	5.0	0.450	9.0	LOS A	6.7	49.3	0.66	0.61	45.8
3	R	28	0.0	0.108	20.0	LOS B	0.5	3.5	0.71	0.73	37.6
Approach		928	4.5	0.450	9.7	LOS A	6.7	49.3	0.66	0.64	45.3
East: Eley Rd											
4	L	28	0.0	0.825	32.4	LOS C	9.8	68.7	1.00	1.04	30.1
5	T	330	0.0	0.825	25.2	LOS C	9.8	68.7	1.00	1.04	29.5
6	R	326	0.0	1.000 ³	30.4	LOS C	8.4	58.7	1.00	0.84	29.9
Approach		684	0.0	1.000	27.9	LOS C	9.8	68.7	1.00	0.95	29.7
North: Middleborough Rd											
7	L	35	0.0	0.552	15.8	LOS B	8.9	65.0	0.71	0.95	43.4
8	T	1071	5.0	0.552	8.4	LOS A	8.9	65.2	0.71	0.63	46.1
9	R	82	0.0	0.255	19.2	LOS B	1.4	10.0	0.71	0.76	38.1
Approach		1187	4.5	0.552	9.3	LOS A	8.9	65.2	0.71	0.65	45.4
West: Eley Rd											
10	L	40	0.0	0.322	25.3	LOS C	2.9	20.4	0.88	0.80	35.4
11	T	99	0.0	0.322	17.9	LOS B	2.9	20.4	0.88	0.70	32.9
12	R	58	0.0	0.431	33.3	LOS C	1.5	10.2	0.99	0.72	28.7
Approach		197	0.0	0.431	23.9	LOS C	2.9	20.4	0.91	0.73	32.0
All Vehicles		2997	3.2	1.000	14.7	LOS B	9.8	68.7	0.77	0.72	39.5

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

³ x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

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	Across E approach	53	9.2	LOS A	0.0	0.0	0.61	0.61
P7	Across W approach	53	9.2	LOS A	0.0	0.0	0.61	0.61
All Pedestrians		106	9.2	LOS A			0.61	0.61

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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SIDRA INTERSECTION 5.1.13.2093

Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Existing SIDRA Major Intersections - modified to match queues\Eley Rd x Middleborough Rd.sip
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SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: Existing FRI PM Peak

Middleborough Rd x Eley Rd, Blackburn East

Signals - Fixed Time Cycle Time = 48 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	97	0.0	0.594	15.6	LOS B	9.8	70.9	0.72	0.93	43.3
2	T	1117	5.0	0.594	8.2	LOS A	9.8	71.5	0.72	0.64	46.1
3	R	53	0.0	0.187	19.1	LOS B	0.9	6.2	0.70	0.75	38.1
Approach		1266	4.4	0.594	9.2	LOS A	9.8	71.5	0.72	0.67	45.5
East: Eley Rd											
4	L	59	0.0	0.374	25.7	LOS C	3.1	21.9	0.90	0.79	32.4
5	T	89	0.0	0.374	18.5	LOS B	3.1	21.9	0.90	0.72	32.1
6	R	166	0.0	1.005	80.7	LOS F	8.1	56.5	1.00	1.68	17.7
Approach		314	0.0	1.005	52.7	LOS D	8.1	56.5	0.95	1.24	22.4
North: Middleborough Rd											
7	L	58	0.0	0.522	15.1	LOS B	8.1	59.0	0.68	0.94	43.7
8	T	1008	5.0	0.522	7.7	LOS A	8.1	59.3	0.68	0.60	46.8
9	R	73	0.0	0.297	21.4	LOS C	1.4	9.6	0.78	0.77	36.6
Approach		1139	4.4	0.522	8.9	LOS A	8.1	59.3	0.69	0.63	45.8
West: Eley Rd											
10	L	85	0.0	0.746	29.5	LOS C	7.4	52.1	0.99	0.94	31.1
11	T	214	0.0	0.746	22.4	LOS C	7.4	52.1	0.99	0.94	30.6
12	R	125	0.0	0.813	33.2	LOS C	3.2	22.6	0.93	1.00	28.8
Approach		424	0.0	0.813	27.0	LOS C	7.4	52.1	0.97	0.96	30.1
All Vehicles		3143	3.4	1.005	15.8	LOS B	9.8	71.5	0.77	0.75	39.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across E approach	53	8.8	LOS A	0.0	0.0	0.60	0.60
P7	Across W approach	53	8.8	LOS A	0.0	0.0	0.60	0.60
All Pedestrians		106	8.8	LOS A			0.60	0.60

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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SIDRA INTERSECTION 5.1.13.2093

Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Existing SIDRA Major Intersections -

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SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: Existing SAT Peak

Middleborough Rd x Eley Rd, Blackburn East

Signals - Fixed Time Cycle Time = 45 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	69	0.0	0.497	14.2	LOS B	7.2	51.9	0.66	0.94	44.4
2	T	973	5.0	0.497	6.7	LOS A	7.2	52.3	0.66	0.58	47.8
3	R	52	0.0	0.173	17.5	LOS B	0.8	5.5	0.67	0.74	39.3
Approach		1094	4.4	0.497	7.7	LOS A	7.2	52.3	0.66	0.61	47.1
East: Eley Rd											
4	L	40	0.0	0.404	26.0	LOS C	2.9	20.0	0.93	0.79	32.7
5	T	98	0.0	0.404	18.8	LOS B	2.9	20.0	0.93	0.73	32.4
6	R	199	0.0	0.798	32.4	LOS C	5.0	35.3	1.00	0.99	29.1
Approach		337	0.0	0.798	27.7	LOS C	5.0	35.3	0.97	0.89	30.3
North: Middleborough Rd											
7	L	73	0.0	0.510	14.2	LOS B	7.4	53.8	0.66	0.94	44.4
8	T	996	5.0	0.510	6.8	LOS A	7.4	54.2	0.66	0.58	47.7
9	R	83	0.0	0.273	18.0	LOS B	1.3	9.3	0.71	0.76	38.9
Approach		1152	4.3	0.510	8.1	LOS A	7.4	54.2	0.67	0.62	46.8
West: Eley Rd											
10	L	63	0.0	0.413	26.1	LOS C	2.9	20.4	0.93	0.79	32.4
11	T	77	0.0	0.413	18.9	LOS B	2.9	20.4	0.93	0.74	32.1
12	R	79	0.0	0.506	27.8	LOS C	1.7	11.9	0.94	0.77	31.0
Approach		219	0.0	0.506	24.2	LOS C	2.9	20.4	0.93	0.76	31.8
All Vehicles		2801	3.5	0.798	11.6	LOS B	7.4	54.2	0.72	0.66	42.6

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across E approach	53	8.1	LOS A	0.0	0.0	0.60	0.60
P7	Across W approach	53	8.1	LOS A	0.0	0.0	0.60	0.60
All Pedestrians		106	8.1	LOS A			0.60	0.60

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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SIDRA
INTERSECTION

PHASING SUMMARY

Site: Existing FRI AM Peak

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 123 seconds (User-Given Phase Times)

Phase times specified by the user

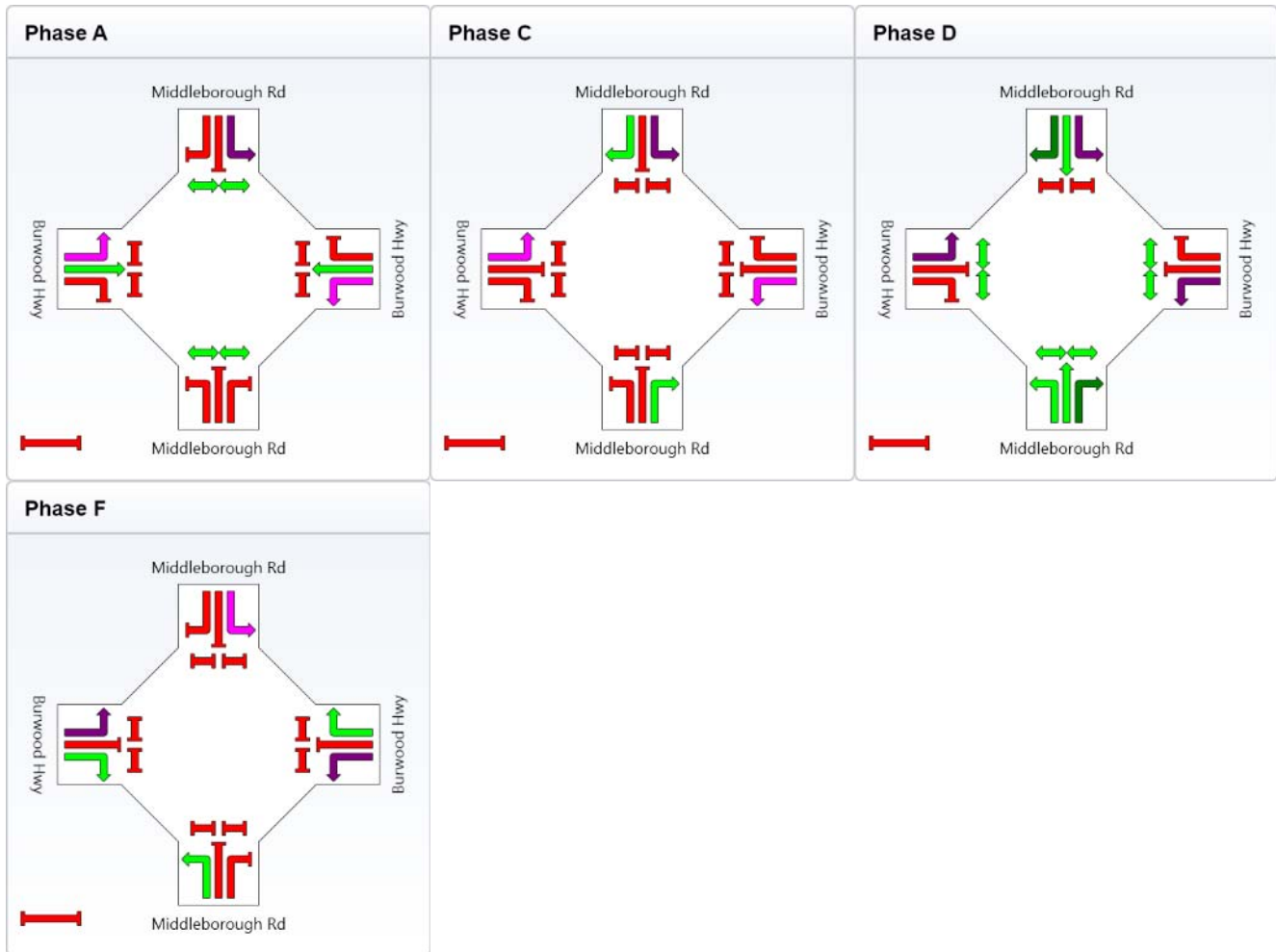
Sequence: Leading Right Turn

Input Sequence: A, C, D, F

Output Sequence: A, C, D, F

Phase Timing Results

Phase	A	C	D	F
Green Time (sec)	42	9	35	13
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	48	15	41	19
Phase Split	39 %	12 %	33 %	15 %



Normal Movement	Permitted/Opposed
Slip-Lane Movement	Opposed Slip-Lane
Stopped Movement	Continuous Movement
Turn On Red	Undetected Movement
	Phase Transition Applied

Processed: Wednesday, 8 October 2014 10:54:33 AM
SIDRA INTERSECTION 5.1.13.2093

Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Existing SIDRA Major Intersections - modified to match queues\Middleborough Rd x Burwood Hwy.sip
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INTERSECTION

PHASING SUMMARY

Site: Existing FRI PM Peak

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 127 seconds (User-Given Phase Times)

Phase times specified by the user

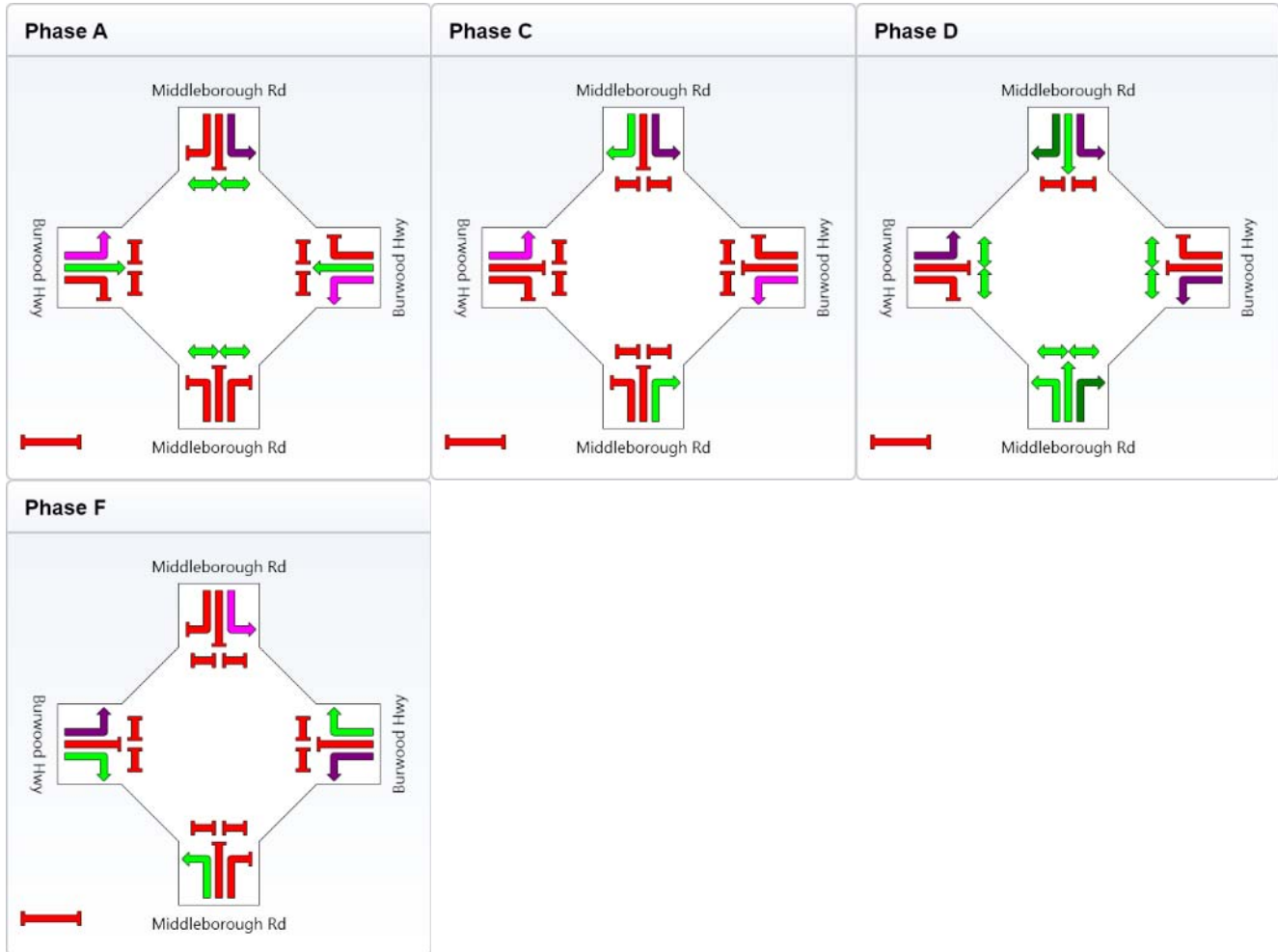
Sequence: Leading Right Turn

Input Sequence: A, C, D, F

Output Sequence: A, C, D, F

Phase Timing Results

Phase	A	C	D	F
Green Time (sec)	42	9	35	17
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	48	15	41	23
Phase Split	38 %	12 %	32 %	18 %



	Normal Movement		Permitted/Opposed
	Slip-Lane Movement		Opposed Slip-Lane
	Stopped Movement		Continuous Movement
	Turn On Red		Undetected Movement
			Phase Transition Applied

Processed: Wednesday, 8 October 2014 10:54:33 AM
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INTERSECTION

PHASING SUMMARY

Site: Existing SAT Peak

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 113 seconds (User-Given Phase Times)

Phase times specified by the user

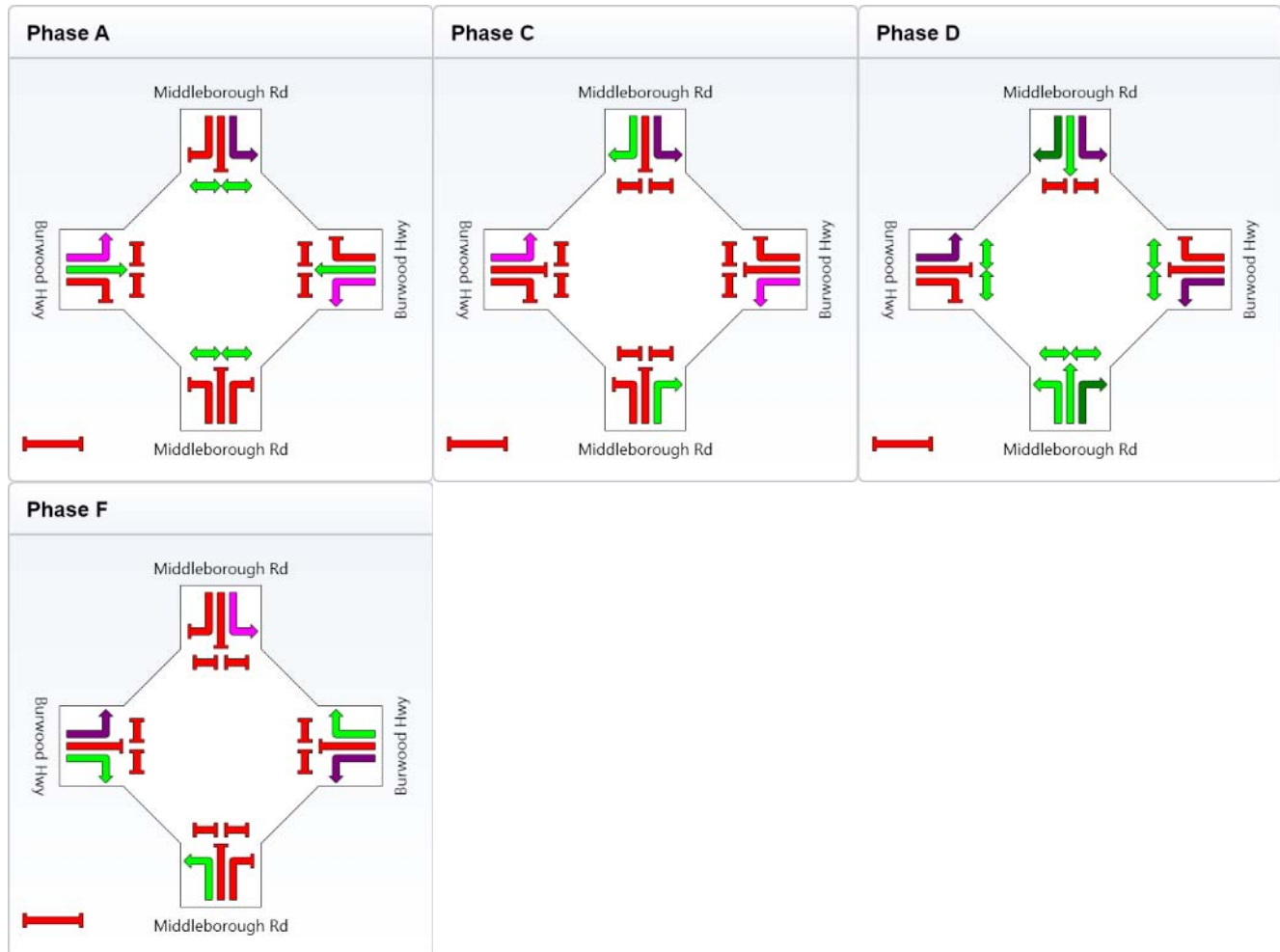
Sequence: Leading Right Turn

Input Sequence: A, C, D, F

Output Sequence: A, C, D, F

Phase Timing Results

Phase	A	C	D	F
Green Time (sec)	32	9	32	16
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	38	15	38	22
Phase Split	34 %	13 %	34 %	19 %



█ Normal Movement	█ Permitted/Opposed
█ Slip-Lane Movement	█ Opposed Slip-Lane
█ Stopped Movement	█ Continuous Movement
█ Turn On Red	█ Undetected Movement
	● Phase Transition Applied

Processed: Wednesday, 8 October 2014 10:54:33 AM
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PHASING SUMMARY

Site: Existing FRI AM Peak

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 123 seconds (User-Given Phase Times)

Phase times specified by the user

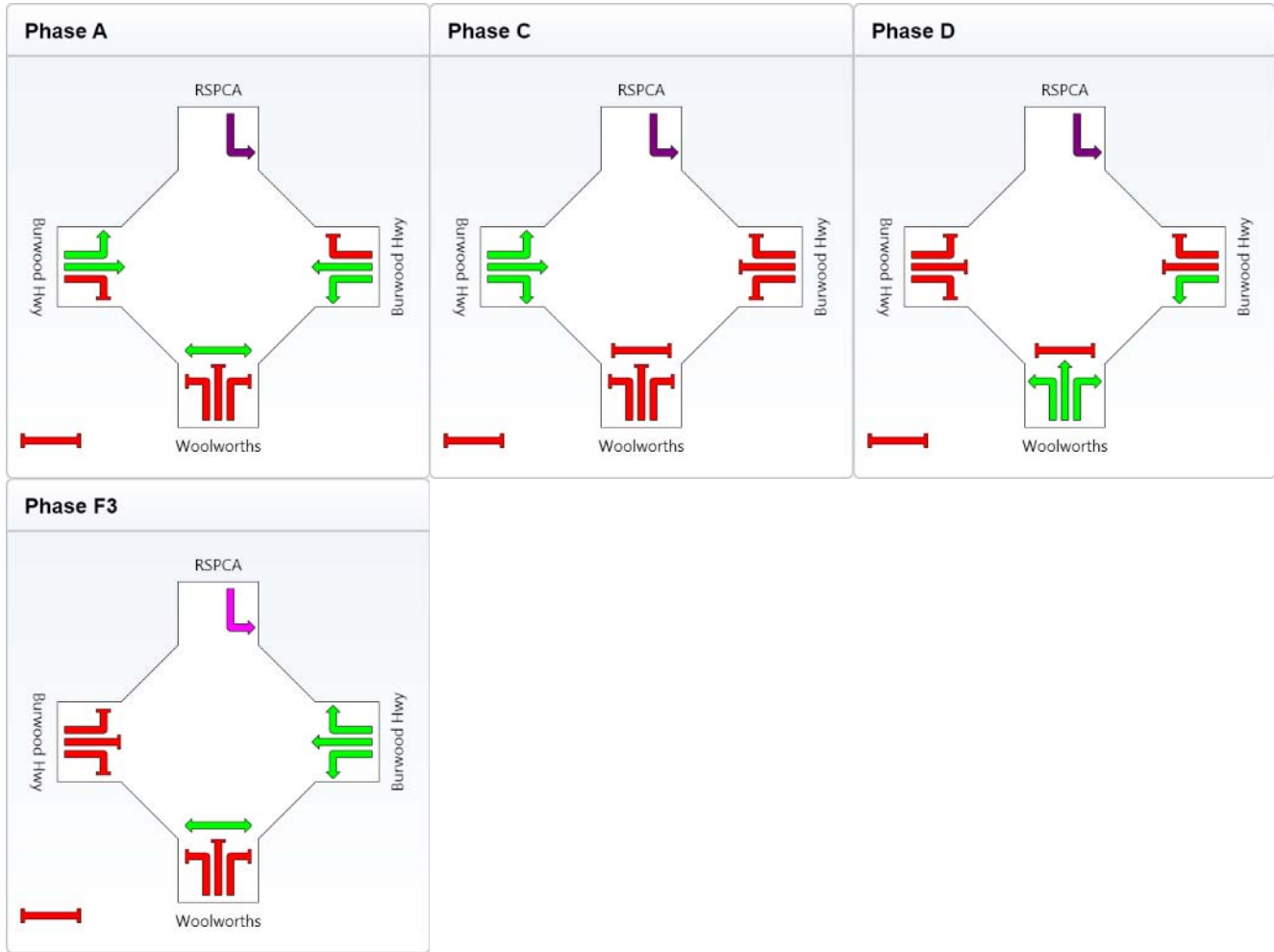
Sequence: Split Phasing

Input Sequence: A, C, D, F3

Output Sequence: A, C, D, F3

Phase Timing Results

Phase	A	C	D	F3
Green Time (sec)	88	2	8	4
Yellow Time (sec)	4	2	4	4
All-Red Time (sec)	2	1	2	2
Phase Time (sec)	94	5	14	10
Phase Split	76 %	4 %	11 %	8 %



█ Normal Movement	█ Permitted/Opposed
█ Slip-Lane Movement	█ Opposed Slip-Lane
█ Stopped Movement	█ Continuous Movement
█ Turn On Red	█ Undetected Movement
	● Phase Transition Applied

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SIDRA
INTERSECTION

PHASING SUMMARY

Site: Existing FRI PM Peak

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 127 seconds (User-Given Phase Times)

Phase times specified by the user

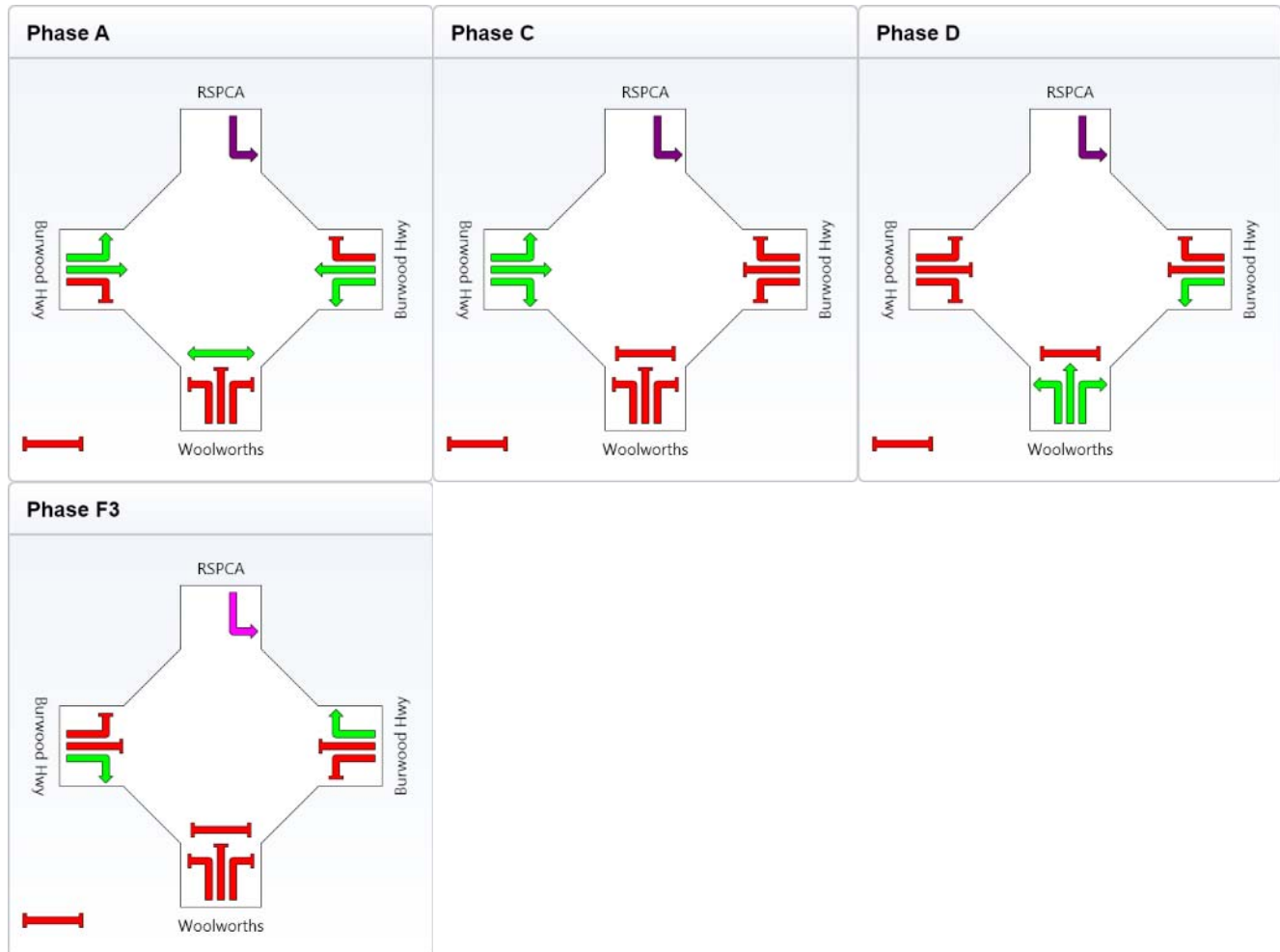
Sequence: Split Phasing

Input Sequence: A, C, D, F3

Output Sequence: A, C, D, F3

Phase Timing Results

Phase	A	C	D	F3
Green Time (sec)	83	4	16	3
Yellow Time (sec)	4	2	4	4
All-Red Time (sec)	2	1	2	2
Phase Time (sec)	89	7	22	9
Phase Split	70 %	6 %	17 %	7 %



	Normal Movement		Permitted/Opposed
	Slip-Lane Movement		Opposed Slip-Lane
	Stopped Movement		Continuous Movement
	Turn On Red		Undetected Movement
			Phase Transition Applied

Processed: Thursday, 18 September 2014 5:06:20 PM
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Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Existing SIDRA Major Intersections - modified to match queues\Burwood Hwy x RSPCA x Woolworths.sip
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PHASING SUMMARY

Site: Existing SAT Peak

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 114 seconds (User-Given Phase Times)

Phase times specified by the user

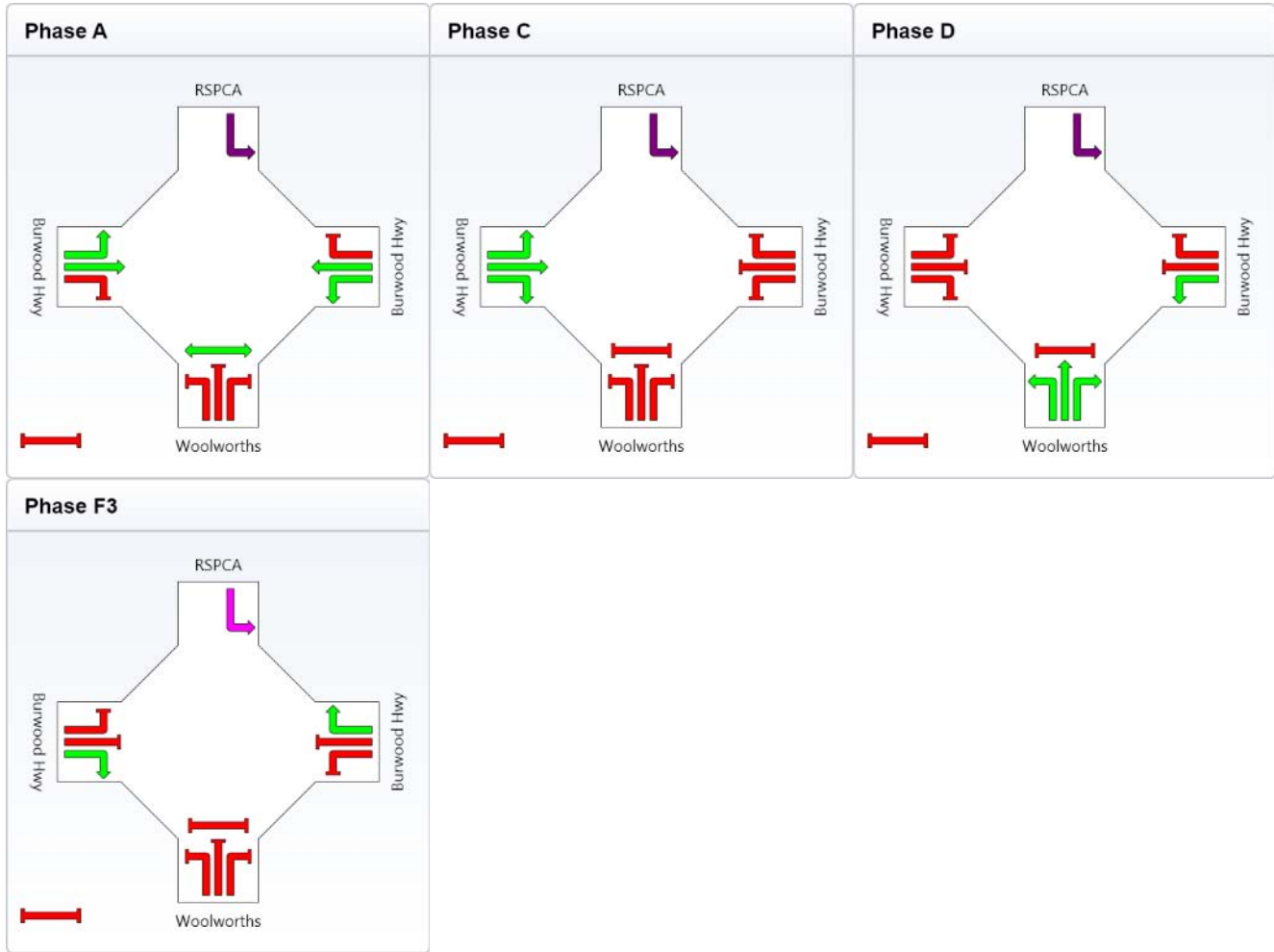
Sequence: Split Phasing

Input Sequence: A, C, D, F3

Output Sequence: A, C, D, F3

Phase Timing Results

Phase	A	C	D	F3
Green Time (sec)	71	5	13	4
Yellow Time (sec)	4	2	4	4
All-Red Time (sec)	2	1	2	2
Phase Time (sec)	77	8	19	10
Phase Split	68 %	7 %	17 %	9 %



█ Normal Movement	█ Permitted/Opposed
█ Slip-Lane Movement	█ Opposed Slip-Lane
█ Stopped Movement	█ Continuous Movement
█ Turn On Red	█ Undetected Movement
	● Phase Transition Applied

Processed: Monday, 22 September 2014 9:02:30 AM
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INTERSECTION

PHASING SUMMARY

Site: Existing FRI AM Peak

Middleborough Rd x Eley Rd, Blackburn East

Signals - Fixed Time Cycle Time = 49 seconds (User-Given Phase Times)

Phase times specified by the user

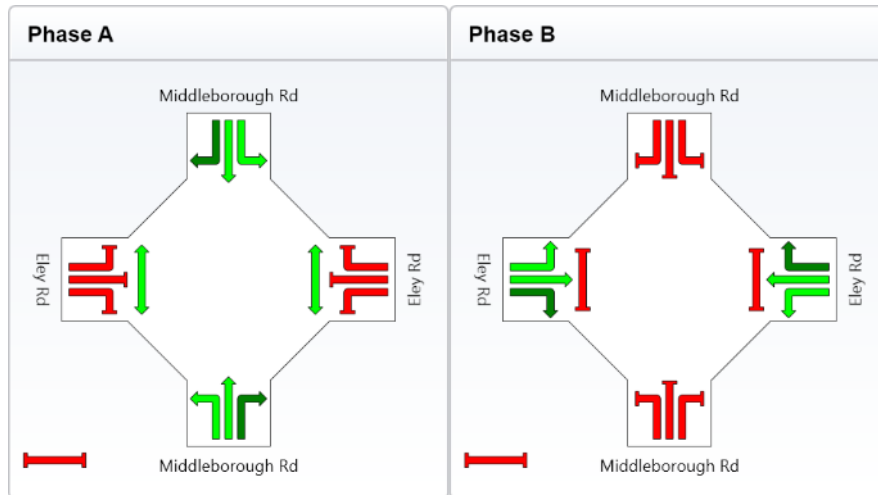
Sequence: Two-Phase

Input Sequence: A, B

Output Sequence: A, B

Phase Timing Results

Phase	A	B
Green Time (sec)	26	11
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	32	17
Phase Split	65 %	35 %



Processed: Monday, 13 October 2014 4:11:16 PM
SIDRA INTERSECTION 5.1.13.2093

Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Existing SIDRA Major Intersections - modified to match queues\Eley Rd x Middleborough Rd.sip
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INTERSECTION

PHASING SUMMARY

Site: Existing FRI PM Peak

Middleborough Rd x Eley Rd, Blackburn East

Signals - Fixed Time Cycle Time = 48 seconds (User-Given Phase Times)

Phase times specified by the user

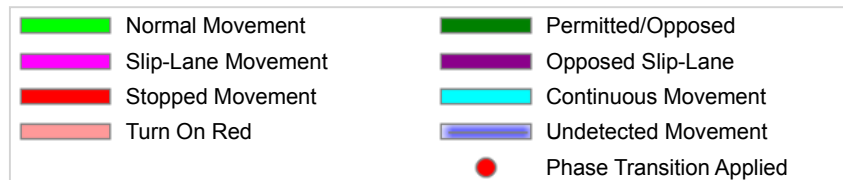
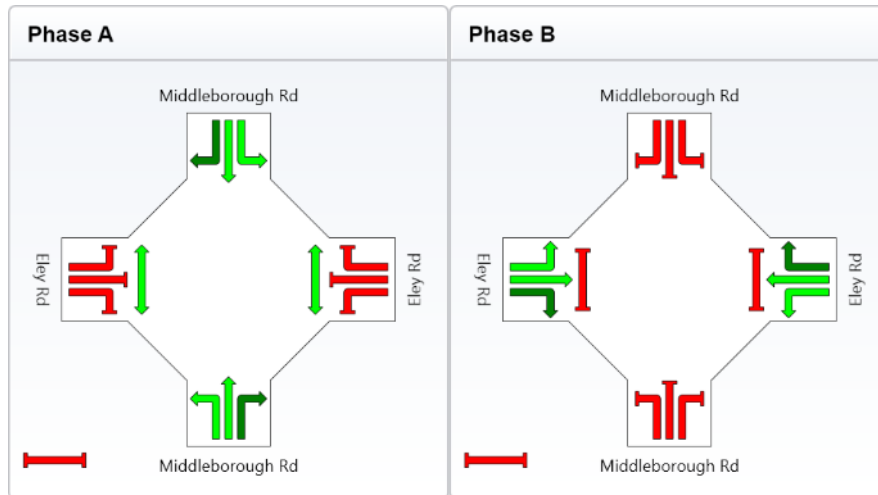
Sequence: Two-Phase

Input Sequence: A, B

Output Sequence: A, B

Phase Timing Results

Phase	A	B
Green Time (sec)	26	10
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	32	16
Phase Split	67 %	33 %



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SIDRA INTERSECTION 5.1.13.2093

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INTERSECTION

PHASING SUMMARY

Site: Existing SAT Peak

Middleborough Rd x Eley Rd, Blackburn East

Signals - Fixed Time Cycle Time = 45 seconds (User-Given Phase Times)

Phase times specified by the user

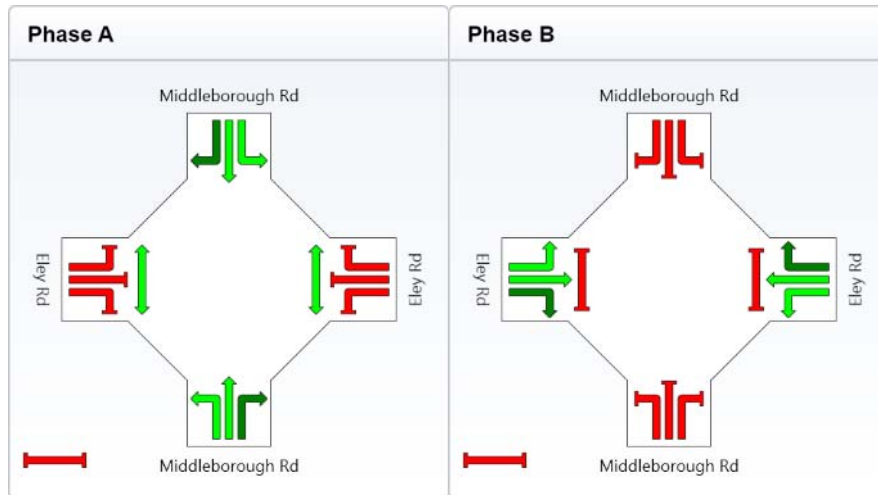
Sequence: Two-Phase

Input Sequence: A, B

Output Sequence: A, B

Phase Timing Results

Phase	A	B
Green Time (sec)	25	8
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	31	14
Phase Split	69 %	31 %



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SIDRA INTERSECTION 5.1.13.2093

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INTERSECTION

MOVEMENT SUMMARY

Site: FRI AM - Future with Annual Growth

Middleborough Rd / Site Access

Signals - Fixed Time Cycle Time = 123 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
2	T	1148	5.0	0.406	1.3	LOS A	2.7	20.0	0.09	0.08	57.4
3	R	44	0.0	0.155	14.6	LOS B	0.6	3.9	0.40	0.67	38.2
Approach		1193	4.8	0.406	1.8	LOS A	2.7	20.0	0.10	0.10	56.3
East: Site Access											
4	L	42	3.0	0.131	11.8	LOS B	0.7	5.4	0.35	0.65	40.3
6	R	148	3.0	0.264	57.2	LOS E	4.0	28.6	0.92	0.76	21.9
Approach		191	3.0	0.264	47.2	LOS D	4.0	28.6	0.80	0.74	24.4
North: Middleborough Rd											
7	L	43	3.0	0.038	7.1	LOS A	0.1	1.0	0.10	0.59	48.9
8	T	1443	5.0	0.587	12.8	LOS B	24.0	175.5	0.61	0.56	42.5
Approach		1486	4.9	0.587	12.7	LOS B	24.0	175.5	0.60	0.56	42.6
All Vehicles		2869	4.8	0.587	10.5	LOS B	24.0	175.5	0.40	0.38	44.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	55.6	LOS E	0.2	0.2	0.95	0.95
P3	Across E approach	53	11.9	LOS B	0.1	0.1	0.44	0.44
All Pedestrians		106	33.8	LOS D			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.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Processed: Friday, 19 September 2014 5:13:34 PM

SIDRA INTERSECTION 5.1.13.2093

Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Middleborough Rd Site Access

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SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: FRI PM - Future with Annual Growth

Middleborough Rd / Site Access

Signals - Fixed Time Cycle Time = 127 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
2	T	1585	5.0	0.555	1.6	LOS A	5.1	37.1	0.12	0.11	56.8
3	R	164	0.0	0.610	17.5	LOS B	3.8	26.8	0.60	0.75	36.4
Approach		1749	4.5	0.610	3.1	LOS A	5.1	37.1	0.16	0.17	54.0
East: Site Access											
4	L	65	3.0	0.213	12.7	LOS B	1.3	9.5	0.38	0.66	39.6
6	R	129	3.0	0.238	59.1	LOS E	3.6	25.8	0.92	0.76	21.5
Approach		195	3.0	0.238	43.5	LOS D	3.6	25.8	0.74	0.73	25.5
North: Middleborough Rd											
7	L	141	3.0	0.136	7.2	LOS A	0.6	4.6	0.13	0.60	48.8
8	T	1509	5.0	0.604	12.8	LOS B	25.9	188.7	0.61	0.56	42.5
Approach		1651	4.8	0.604	12.3	LOS B	25.9	188.7	0.57	0.57	43.0
All Vehicles		3595	4.6	0.610	9.5	LOS A	25.9	188.7	0.38	0.38	45.8

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	57.6	LOS E	0.2	0.2	0.95	0.95
P3	Across E approach	53	11.5	LOS B	0.1	0.1	0.43	0.43
All Pedestrians		106	34.6	LOS D			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.

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SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: FRI SAT - Future with Annual Growth

Middleborough Rd / Site Access

Signals - Fixed Time Cycle Time = 113 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
2	T	1376	5.0	0.502	1.5	LOS A	3.6	25.9	0.10	0.09	57.1
3	R	159	0.0	0.541	17.5	LOS B	3.1	21.5	0.61	0.75	36.4
Approach		1535	4.5	0.541	3.1	LOS A	3.6	25.9	0.16	0.16	53.9
East: Site Access											
4	L	69	3.0	0.191	12.3	LOS B	1.3	9.1	0.39	0.66	39.9
6	R	146	3.0	0.239	51.6	LOS D	3.6	25.5	0.91	0.76	23.2
Approach		216	3.0	0.239	38.9	LOS D	3.6	25.5	0.74	0.73	26.9
North: Middleborough Rd											
7	L	126	3.0	0.121	7.3	LOS A	0.6	4.1	0.14	0.60	48.7
8	T	1415	5.0	0.605	13.9	LOS B	23.4	170.6	0.66	0.60	41.5
Approach		1541	4.8	0.605	13.3	LOS B	23.4	170.6	0.62	0.60	42.0
All Vehicles		3292	4.6	0.605	10.3	LOS B	23.4	170.6	0.41	0.40	45.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	50.7	LOS E	0.2	0.2	0.95	0.95
P3	Across E approach	53	12.9	LOS B	0.1	0.1	0.48	0.48
All Pedestrians		106	31.8	LOS D			0.71	0.71

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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INTERSECTION

PHASING SUMMARY

Site: FRI AM - Future with Annual Growth

Middleborough Rd / Site Access

Signals - Fixed Time Cycle Time = 123 seconds (User-Given Cycle Time)

Phase times determined by the program

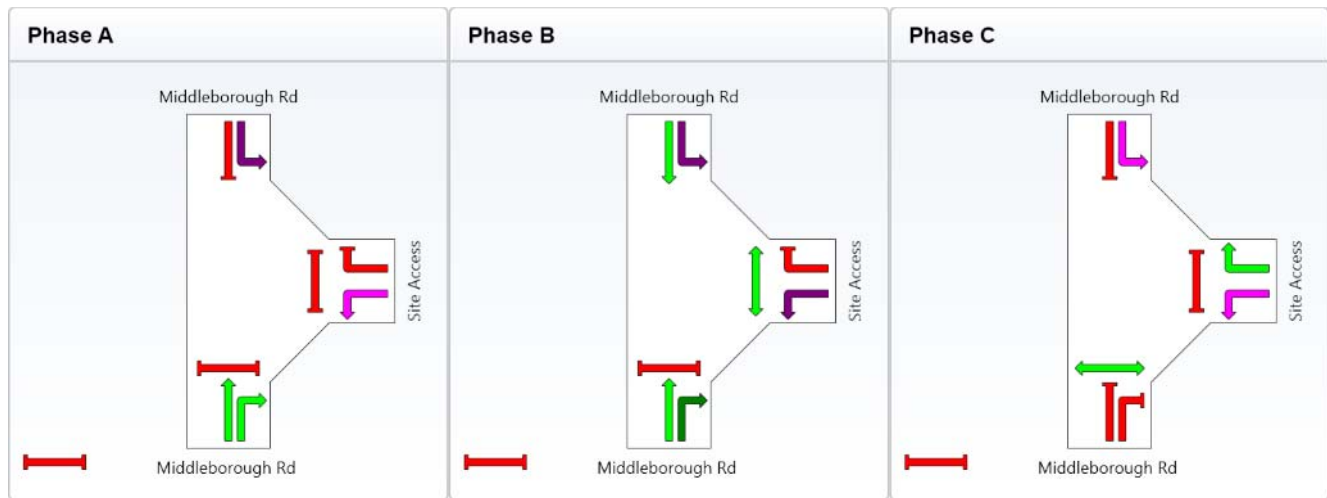
Sequence: Two-Phase

Input Sequence: A, B, C

Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	6	80	19
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	86	25
Phase Split	10 %	70 %	20 %



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INTERSECTION

PHASING SUMMARY

Site: FRI PM - Future with Annual Growth

Middleborough Rd / Site Access
Signals - Fixed Time Cycle Time = 127 seconds (User-Given Cycle Time)

Phase times determined by the program

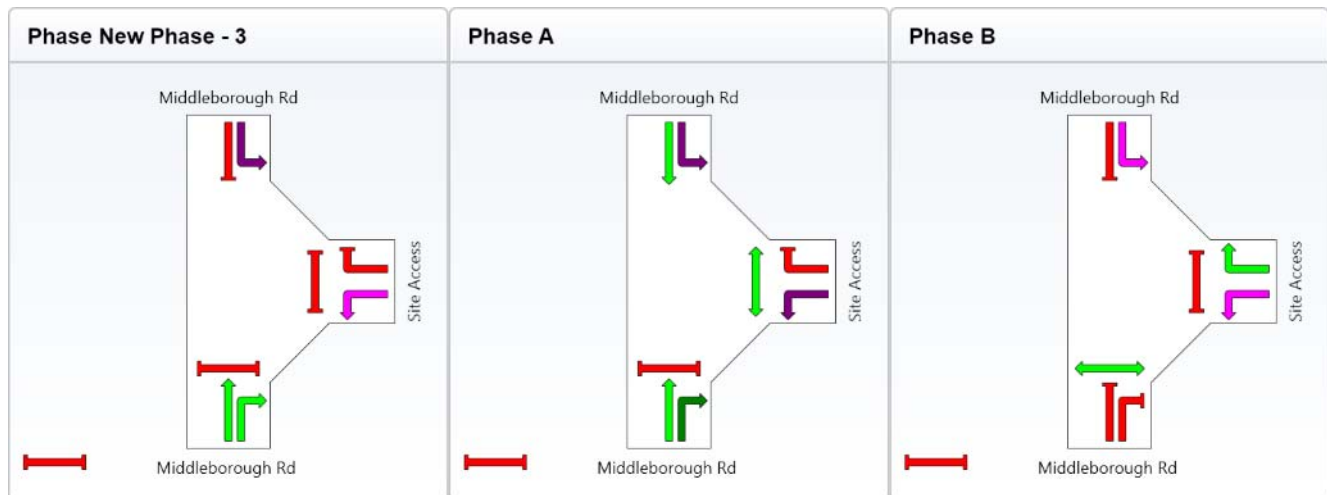
Sequence: Two-Phase

Input Sequence: New Phase - 3, A, B

Output Sequence: New Phase - 3, A, B

Phase Timing Results

Phase	New Phase - 3	A	B
Green Time (sec)	6	84	19
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	90	25
Phase Split	9 %	71 %	20 %



	Normal Movement		Permitted/Opposed
	Slip-Lane Movement		Opposed Slip-Lane
	Stopped Movement		Continuous Movement
	Turn On Red		Undetected Movement
			Phase Transition Applied

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INTERSECTION

PHASING SUMMARY

Site: FRI SAT - Future with Annual Growth

Middleborough Rd / Site Access

Signals - Fixed Time Cycle Time = 113 seconds (User-Given Cycle Time)

Phase times determined by the program

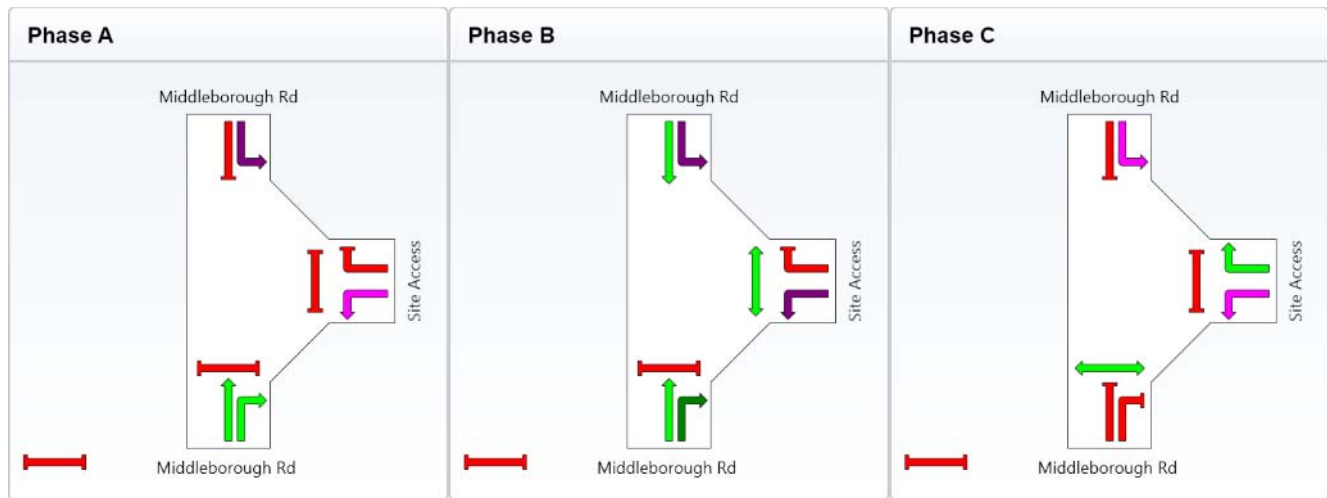
Sequence: Two-Phase

Input Sequence: A, B, C

Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	6	70	19
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	12	76	25
Phase Split	11 %	67 %	22 %



	Normal Movement		Permitted/Opposed
	Slip-Lane Movement		Opposed Slip-Lane
	Stopped Movement		Continuous Movement
	Turn On Red		Undetected Movement
			Phase Transition Applied

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INTERSECTION

MOVEMENT SUMMARY

Site: Projected FRI AM Peak with
DRTL

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 123 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Woolworths											
1	L	23	0.1	0.257	67.5	LOS E	1.4	10.1	0.98	0.71	19.0
2	T	1	0.0	0.257	61.4	LOS E	1.4	10.1	0.98	0.70	17.1
3	R	27	0.1	0.227	66.8	LOS E	1.6	11.5	0.98	0.71	19.5
Approach		52	0.1	0.257	67.0	LOS E	1.6	11.5	0.98	0.71	19.2
East: Burwood Hwy											
4	L	66	0.1	0.143	10.9	LOS B	0.5	3.6	0.25	0.71	51.0
5	T	2769	5.0	0.691	2.4	LOS A	8.9	65.0	0.18	0.17	63.9
6	R	59	0.0	0.488	77.8	LOS E	1.9	13.4	1.00	0.72	20.1
Approach		2895	4.8	0.691	4.2	LOS A	8.9	65.0	0.20	0.19	61.0
North: RSPCA											
7	L	76	0.0	0.185	7.2	LOS A	0.7	5.2	0.23	0.59	38.1
8	T	1	0.0	0.685	73.0	LOS E	2.1	14.7	1.00	0.78	18.8
9	R	61	0.0	0.685	80.4	LOS F	2.1	14.7	1.00	0.78	19.0
Approach		138	0.0	0.685	40.1	LOS D	2.1	14.7	0.57	0.67	26.4
West: Burwood Hwy											
10	L	47	0.0	0.060	12.1	LOS B	0.6	4.3	0.24	0.71	49.2
11	T	1629	5.0	0.407	7.8	LOS A	13.1	95.6	0.44	0.40	54.3
12	R	6	0.1	0.105	75.0	LOS E	0.4	2.8	0.99	0.65	19.4
Approach		1683	4.8	0.407	8.2	LOS A	13.1	95.6	0.44	0.41	53.8
All Vehicles		4767	4.6	0.691	7.3	LOS A	13.1	95.6	0.30	0.29	55.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	8.2	LOS A	0.1	0.1	0.37	0.37
All Pedestrians		53	8.2	LOS A			0.37	0.37

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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INTERSECTION

MOVEMENT SUMMARY

Site: Projected FRI PM Peak with
DRTL

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 127 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Woolworths											
1	L	98	0.1	0.990	63.0	LOS E	5.8	40.8	0.97	0.77	19.7
2	T	1	0.0	0.990	56.9	LOS E	5.8	40.8	0.97	0.75	17.8
3	R	73	0.1	0.311	60.7	LOS E	4.2	29.3	0.95	0.76	20.5
Approach		172	0.1	0.990	62.0	LOS E	5.8	40.8	0.96	0.77	20.0
East: Burwood Hwy											
4	L	88	0.1	0.219	11.2	LOS B	0.8	5.9	0.27	0.71	50.4
5	T	1922	5.0	0.539	13.9	LOS B	21.8	159.2	0.61	0.55	46.9
6	R	111	0.0	0.540	75.2	LOS E	3.6	24.9	1.00	0.75	19.4
Approach		2121	4.5	0.540	17.0	LOS B	21.8	159.2	0.61	0.57	44.1
North: RSPCA											
7	L	114	0.0	0.384	12.3	LOS B	2.4	16.5	0.41	0.65	35.1
8	T	1	0.0	0.671	75.3	LOS E	2.1	14.4	1.00	0.77	18.5
9	R	58	0.0	0.671	82.6	LOS F	2.1	14.4	1.00	0.77	18.6
Approach		173	0.0	0.671	36.3	LOS D	2.4	16.5	0.61	0.69	27.2
West: Burwood Hwy											
10	L	129	0.0	0.203	15.4	LOS B	2.5	17.5	0.34	0.73	45.6
11	T	2838	5.0	0.795	9.2	LOS A	27.8	202.8	0.53	0.49	52.2
12	R	40	0.1	0.391	74.4	LOS E	2.5	17.8	1.00	0.73	19.5
Approach		3007	4.7	0.795	10.3	LOS B	27.8	202.8	0.52	0.50	50.9
All Vehicles		5473	4.4	0.990	15.3	LOS B	27.8	202.8	0.57	0.54	44.8

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	12.3	LOS B	0.1	0.1	0.44	0.44
All Pedestrians		53	12.3	LOS B			0.44	0.44

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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SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: Projected SAT Peak with
DRTL

Burwood Hwy / RSPCA / Woolworths

Signals - Fixed Time Cycle Time = 114 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Woolworths											
1	L	58	0.1	0.545	57.5	LOS E	3.1	21.8	0.95	0.76	20.7
2	T	1	0.0	0.545	51.5	LOS D	3.1	21.8	0.95	0.73	18.8
3	R	80	0.1	0.378	57.2	LOS E	4.3	29.8	0.97	0.77	21.1
Approach		139	0.1	0.545	57.3	LOS E	4.3	29.8	0.96	0.76	20.9
East: Burwood Hwy											
4	L	98	0.1	0.223	11.1	LOS B	0.8	5.9	0.28	0.71	50.5
5	T	1880	5.0	0.525	12.3	LOS B	18.9	137.9	0.60	0.54	48.5
6	R	122	0.0	0.750	73.2	LOS E	3.7	26.2	1.00	0.83	19.8
Approach		2100	4.5	0.750	15.7	LOS B	18.9	137.9	0.60	0.56	45.2
North: RSPCA											
7	L	128	0.0	0.353	7.4	LOS A	1.9	13.5	0.35	0.55	34.8
8	T	1	0.0	0.732	68.2	LOS E	2.3	15.8	1.00	0.81	19.6
9	R	71	0.0	0.732	75.6	LOS E	2.3	15.8	1.00	0.81	19.8
Approach		200	0.0	0.732	31.8	LOS C	2.3	15.8	0.58	0.64	27.0
West: Burwood Hwy											
10	L	111	0.0	0.158	14.3	LOS B	1.8	12.9	0.33	0.73	46.7
11	T	1827	5.0	0.511	12.1	LOS B	18.1	132.2	0.59	0.53	48.7
12	R	25	0.1	0.310	69.6	LOS E	1.5	10.3	1.00	0.71	20.5
Approach		1963	4.7	0.511	12.9	LOS B	18.1	132.2	0.58	0.54	47.9
All Vehicles		4402	4.2	0.750	16.5	LOS B	18.9	137.9	0.60	0.57	43.5

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	11.4	LOS B	0.1	0.1	0.45	0.45
All Pedestrians		53	11.4	LOS B			0.45	0.45

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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MOVEMENT SUMMARY

Site: Projected FRI AM Peak

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 123 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	116	5.0	0.723	51.4	LOS D	21.2	154.7	0.96	0.87	26.7
2	T	664	5.0	0.723	42.7	LOS D	21.2	154.7	0.96	0.84	26.3
3	R	162	5.0	0.581	37.4	LOS D	6.8	49.4	0.87	0.79	31.2
Approach		942	5.0	0.723	42.9	LOS D	21.2	154.7	0.95	0.83	27.1
East: Burwood Hwy											
4	L	189	5.0	0.271	11.2	LOS B	2.2	16.2	0.26	0.68	50.8
5	T	1948	5.0	1.007	121.8	LOS F	67.3	491.2	1.00	1.49	14.6
6	R	171	5.0	0.225	62.9	LOS E	4.7	34.2	0.96	0.75	23.3
Approach		2308	5.0	1.007	108.4	LOS F	67.3	491.2	0.94	1.37	15.9
North: Middleborough Rd											
7	L	137	5.0	0.223	13.3	LOS B	2.2	16.2	0.34	0.69	45.7
8	T	884	5.0	0.411	37.6	LOS D	21.0	153.6	0.86	0.73	28.4
9	R	201	5.0	0.602	37.8	LOS D	7.8	56.6	0.93	0.78	31.1
Approach		1222	5.0	0.602	34.9	LOS C	21.0	153.6	0.82	0.74	30.2
West: Burwood Hwy											
10	L	142	5.0	0.311	13.5	LOS B	2.4	17.7	0.35	0.70	48.3
11	T	1096	5.0	0.566	35.5	LOS D	17.8	130.2	0.87	0.76	32.2
12	R	181	5.0	0.478	66.6	LOS E	5.3	38.8	0.99	0.78	22.4
Approach		1419	5.0	0.566	37.2	LOS D	17.8	130.2	0.83	0.75	31.5
All Vehicles		5892	5.0	1.007	65.5	LOS E	67.3	491.2	0.89	1.00	22.1

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	14.6	LOS B	0.1	0.1	0.49	0.49
P2	Across S approach	53	11.9	LOS B	0.1	0.1	0.44	0.44
P3	Across E approach	53	40.7	LOS E	0.2	0.2	0.81	0.81
P4	Across E approach	53	36.7	LOS D	0.1	0.1	0.77	0.77
P5	Across N approach	53	31.5	LOS D	0.1	0.1	0.72	0.72
P6	Across N approach	53	29.4	LOS C	0.1	0.1	0.69	0.69
P7	Across W approach	53	40.7	LOS E	0.2	0.2	0.81	0.81
P8	Across W approach	53	36.7	LOS D	0.1	0.1	0.77	0.77
All Pedestrians		424	30.3	LOS D			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: Projected FRI PM Peak

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 127 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	87	5.0	0.854	63.1	LOS E	28.9	211.3	1.00	0.98	23.6
2	T	803	5.0	0.854	54.2	LOS D	28.9	211.3	1.00	0.99	23.1
3	R	189	5.0	0.842	51.7	LOS D	9.6	70.1	1.00	0.94	26.2
Approach		1080	5.0	0.854	54.5	LOS D	28.9	211.3	1.00	0.98	23.7
East: Burwood Hwy											
4	L	136	5.0	0.242	14.4	LOS B	2.4	17.6	0.36	0.68	47.3
5	T	1193	5.0	0.197	31.5	LOS C	17.0	123.9	0.76	0.63	34.3
6	R	359	5.0	0.453	60.5	LOS E	9.7	71.1	0.94	0.76	23.9
Approach		1687	5.0	0.453	36.3	LOS D	17.0	123.9	0.77	0.66	32.1
North: Middleborough Rd											
7	L	304	5.0	0.677	28.7	LOS C	10.4	76.2	0.65	0.85	35.2
8	T	785	5.0	0.754	46.5	LOS D	22.7	165.9	0.98	0.87	25.3
9	R	164	5.0	0.818	49.4	LOS D	7.9	57.4	1.00	0.90	26.9
Approach		1254	5.0	0.818	42.6	LOS D	22.7	165.9	0.90	0.87	27.5
West: Burwood Hwy											
10	L	228	5.0	0.577	16.3	LOS B	5.3	38.8	0.44	0.73	45.4
11	T	1956	5.0	1.044	172.3	LOS F	81.5	594.6	1.00	1.73	11.1
12	R	196	5.0	0.408	64.3	LOS E	5.7	41.6	0.96	0.78	22.9
Approach		2380	5.0	1.044	148.4	LOS F	81.5	594.6	0.94	1.55	12.5
All Vehicles		6401	5.0	1.044	82.3	LOS F	81.5	594.6	0.90	1.09	19.1

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	16.1	LOS B	0.1	0.1	0.50	0.50
P2	Across S approach	53	13.2	LOS B	0.1	0.1	0.46	0.46
P3	Across E approach	53	42.6	LOS E	0.2	0.2	0.82	0.82
P4	Across E approach	53	38.6	LOS D	0.1	0.1	0.78	0.78
P5	Across N approach	53	33.3	LOS D	0.1	0.1	0.72	0.72
P6	Across N approach	53	31.2	LOS D	0.1	0.1	0.70	0.70
P7	Across W approach	53	42.6	LOS E	0.2	0.2	0.82	0.82
P8	Across W approach	53	38.6	LOS D	0.1	0.1	0.78	0.78
All Pedestrians		424	32.0	LOS D			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.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Projected SAT Peak - 60m

Burwood Hwy x Middleborough Rd

Signals - Fixed Time Cycle Time = 113 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	113	5.0	0.750	49.6	LOS D	20.8	151.8	0.97	0.89	27.3
2	T	693	5.0	0.750	40.9	LOS D	20.8	151.8	0.97	0.87	26.9
3	R	187	5.0	0.791	42.8	LOS D	7.8	56.9	1.00	0.89	29.2
Approach		993	5.0	0.791	42.2	LOS D	20.8	151.8	0.98	0.88	27.3
East: Burwood Hwy											
4	L	306	5.0	0.698	17.7	LOS B	7.2	52.6	0.49	0.75	44.3
5	T	1138	5.0	0.709	39.5	LOS D	18.9	138.1	0.96	0.83	30.3
6	R	297	5.0	0.330	53.5	LOS D	7.0	51.3	0.92	0.75	25.8
Approach		1741	5.0	0.709	38.0	LOS D	18.9	138.1	0.87	0.80	31.1
North: Middleborough Rd											
7	L	265	5.0	0.475	16.1	LOS B	6.0	43.5	0.49	0.74	43.3
8	T	784	5.0	0.815	46.0	LOS D	22.0	160.3	1.00	0.96	25.4
9	R	183	5.0	0.829	45.9	LOS D	8.1	59.4	1.00	0.93	28.1
Approach		1233	5.0	0.829	39.5	LOS D	22.0	160.3	0.89	0.91	28.5
West: Burwood Hwy											
10	L	239	5.0	0.516	14.1	LOS B	4.4	31.9	0.41	0.72	47.6
11	T	1198	5.0	0.747	41.0	LOS D	20.6	150.1	0.97	0.86	29.7
12	R	181	5.0	0.357	57.2	LOS E	4.6	33.8	0.95	0.78	24.7
Approach		1618	5.0	0.747	38.8	LOS D	20.6	150.1	0.89	0.83	30.7
All Vehicles		5584	5.0	0.829	39.3	LOS D	22.0	160.3	0.90	0.85	29.7

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

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	Across S approach	53	17.6	LOS B	0.1	0.1	0.56	0.56
P2	Across S approach	53	14.4	LOS B	0.1	0.1	0.50	0.50
P3	Across E approach	53	38.3	LOS D	0.1	0.1	0.82	0.82
P4	Across E approach	53	34.3	LOS D	0.1	0.1	0.78	0.78
P5	Across N approach	53	34.3	LOS D	0.1	0.1	0.78	0.78
P6	Across N approach	53	32.0	LOS D	0.1	0.1	0.75	0.75
P7	Across W approach	53	38.3	LOS D	0.1	0.1	0.82	0.82
P8	Across W approach	53	34.3	LOS D	0.1	0.1	0.78	0.78
All Pedestrians		424	30.4	LOS D			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.

MOVEMENT SUMMARY

Site: Projected FRI AM Peak with
Annual Growth RFI

Middleborough Rd x Eley Rd, Blackburn East
Signals - Fixed Time Cycle Time = 49 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	76	0.0	0.612	16.2	LOS B	10.4	75.4	0.75	0.93	42.9
2	T	1151	5.0	0.612	10.0	LOS A	10.4	75.9	0.75	0.69	44.7
3	R	41	0.0	0.201	23.9	LOS C	0.8	5.8	0.81	0.75	35.1
Approach		1267	4.5	0.612	10.8	LOS B	10.4	75.9	0.75	0.71	44.2
East: Eley Rd											
4	L	40	0.0	0.931	45.2	LOS D	14.2	99.3	1.00	1.36	25.5
5	T	364	0.0	0.931	38.0	LOS D	14.2	99.3	1.00	1.36	24.9
6	R	323	0.0	1.000 ³	30.9	LOS C	8.3	58.2	1.00	0.83	29.7
Approach		726	0.0	1.000	35.2	LOS D	14.2	99.3	1.00	1.13	26.9
North: Middleborough Rd											
7	L	39	0.0	0.697	17.2	LOS B	12.9	94.2	0.80	0.95	42.5
8	T	1357	5.0	0.697	9.8	LOS A	12.9	94.4	0.80	0.73	44.4
9	R	82	0.0	0.350	23.0	LOS C	1.7	11.7	0.82	0.78	35.6
Approach		1478	4.6	0.697	10.7	LOS B	12.9	94.4	0.80	0.74	43.8
West: Eley Rd											
10	L	40	0.0	0.329	25.4	LOS C	3.0	20.9	0.88	0.80	35.4
11	T	102	0.0	0.329	17.9	LOS B	3.0	20.9	0.88	0.70	32.9
12	R	63	0.0	0.470	33.4	LOS C	1.6	11.2	1.00	0.73	28.7
Approach		205	0.0	0.470	24.1	LOS C	3.0	20.9	0.92	0.73	31.9
All Vehicles		3677	3.4	1.000	16.3	LOS B	14.2	99.3	0.83	0.80	38.4

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

³ x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	9.2	LOS A	0.0	0.0	0.61	0.61
P7	Across W approach	53	9.2	LOS A	0.0	0.0	0.61	0.61
All Pedestrians		106	9.2	LOS A			0.61	0.61

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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SIDRA INTERSECTION 5.1.13.2093

Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Existing SIDRA Major Intersections - modified to match queues\Eley Rd x Middleborough Rd.sip
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MOVEMENT SUMMARY

Site: Projected FRI PM Peak with
Annual Growth RFI

Middleborough Rd x Eley Rd, Blackburn East
Signals - Fixed Time Cycle Time = 48 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	113	0.0	0.790	20.4	LOS C	17.7	128.2	0.86	1.01	39.8
2	T	1502	5.0	0.790	12.9	LOS B	17.7	129.1	0.86	0.86	41.5
3	R	68	0.0	0.340	24.2	LOS C	1.4	10.0	0.84	0.77	34.9
Approach		1683	4.5	0.790	13.9	LOS B	17.7	129.1	0.86	0.87	41.1
East: Eley Rd											
4	L	64	0.0	0.423	25.9	LOS C	3.6	25.1	0.91	0.80	32.3
5	T	103	0.0	0.423	18.8	LOS B	3.6	25.1	0.91	0.73	32.0
6	R	167	0.0	1.011	81.9	LOS F	8.1	56.7	1.00	1.68	17.5
Approach		334	0.0	1.011	51.7	LOS D	8.1	56.7	0.96	1.22	22.5
North: Middleborough Rd											
7	L	72	0.0	0.717	17.3	LOS B	13.7	99.5	0.81	0.96	42.3
8	T	1395	5.0	0.717	9.9	LOS A	13.7	100.0	0.81	0.75	44.3
9	R	73	0.0	0.394	27.1	LOS C	1.6	11.4	0.90	0.77	33.3
Approach		1539	4.5	0.717	11.0	LOS B	13.7	100.0	0.81	0.76	43.5
West: Eley Rd											
10	L	85	0.0	0.767	30.1	LOS C	7.8	54.5	1.00	0.96	30.8
11	T	222	0.0	0.767	22.9	LOS C	7.8	54.5	1.00	0.96	30.3
12	R	142	0.0	0.929	31.6	LOS C	3.5	24.5	0.95	0.87	29.4
Approach		449	0.0	0.929	27.0	LOS C	7.8	54.5	0.98	0.93	30.1
All Vehicles		4005	3.6	1.011	17.4	LOS B	17.7	129.1	0.86	0.86	37.8

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	8.8	LOS A	0.0	0.0	0.60	0.60
P7	Across W approach	53	8.8	LOS A	0.0	0.0	0.60	0.60
All Pedestrians		106	8.8	LOS A			0.60	0.60

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: Projected SAT Peak with
Annual Growth RFI

Middleborough Rd x Eley Rd, Blackburn East

Signals - Fixed Time Cycle Time = 45 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Middleborough Rd											
1	L	86	0.0	0.680	15.5	LOS B	11.5	83.9	0.77	0.94	43.7
2	T	1340	5.0	0.680	8.0	LOS A	11.6	84.4	0.77	0.69	46.1
3	R	68	0.0	0.316	22.4	LOS C	1.3	9.1	0.82	0.77	36.0
Approach		1495	4.5	0.680	9.1	LOS A	11.6	84.4	0.77	0.71	45.4
East: Eley Rd											
4	L	47	0.0	0.447	26.2	LOS C	3.2	22.4	0.94	0.80	32.6
5	T	105	0.0	0.447	19.0	LOS B	3.2	22.4	0.94	0.75	32.2
6	R	211	0.0	0.867	35.3	LOS D	5.6	39.4	1.00	1.09	28.0
Approach		363	0.0	0.867	29.4	LOS C	5.6	39.4	0.97	0.95	29.6
North: Middleborough Rd											
7	L	84	0.0	0.696	15.9	LOS B	12.2	88.4	0.78	0.95	43.4
8	T	1375	5.0	0.696	8.4	LOS A	12.2	88.9	0.78	0.71	45.7
9	R	83	0.0	0.376	22.7	LOS C	1.6	11.3	0.84	0.78	35.8
Approach		1542	4.5	0.696	9.6	LOS A	12.2	88.9	0.78	0.73	44.9
West: Eley Rd											
10	L	63	0.0	0.434	26.1	LOS C	3.1	21.6	0.93	0.79	32.4
11	T	84	0.0	0.434	19.0	LOS B	3.1	21.6	0.93	0.74	32.1
12	R	95	0.0	0.618	29.5	LOS C	2.1	15.0	0.97	0.82	30.2
Approach		242	0.0	0.618	25.0	LOS C	3.1	21.6	0.95	0.78	31.4
All Vehicles		3642	3.7	0.867	12.4	LOS B	12.2	88.9	0.81	0.75	41.8

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	8.1	LOS A	0.0	0.0	0.60	0.60
P7	Across W approach	53	8.1	LOS A	0.0	0.0	0.60	0.60
All Pedestrians		106	8.1	LOS A			0.60	0.60

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.

Processed: Monday, 13 October 2014 4:11:21 PM

SIDRA INTERSECTION 5.1.13.2093

Project: \\Tfxsrv01\group\Synergy\Projects\GRP1\GRP17453\SIDRA\Existing SIDRA Major Intersections -
modified to match queues\Eley Rd x Middleborough Rd.sip
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WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services shown are approximate only and their exact position should be proven on site.

PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY

REVISION	REVISION NOTES	REVISION DATE
K	ROAD SAFETY AUDIT COMMENTS ADDRESSED	22 NOV 2017
J	BUS LANE ADDED AND MIDDLEBOROUGH ROAD ALIGNMENT AMENDED	24 JULY 2017
I	PARKING AMENDED AND MINOR ALTERATIONS TO ACCESS ROAD	11 APR 2017
H	ALIGNMENT ALTERED SLIGHTLY TO MATCH NEW ROAD RESERVES	30 SEPT 2015
G	NOTE REGARDING PEDESTRIAN FOOTPATHS ADDED	25 JUNE 2015

GENERAL NOTES
1 PEDESTRIAN PATH ALIGNMENT AND WIDTHS ARE SUBJECT TO DETAILED DESIGN AND AGREEMENT WITH COUNCIL 2 BASE INFORMATION FROM AERIAL PHOTOGRAPHY (SOURCE NEARMAP AUG 2017)

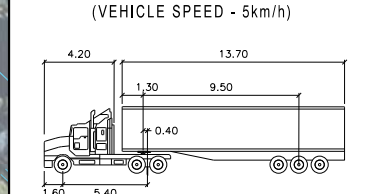
DESIGNED G RAKITA 29 AUG 2014
CHECKED/APPROVED
FILE NAME G17453-01.DGN

TraffixDesign
Traffic Engineering Design and Survey
Suite 8/431 Burke Road TEL: (03) 9822-2888
GLEN IRIS, VICTORIA 3146 FAX: (03) 9822-7444
www.traffixgroup.com.au

MIDDLEBOROUGH ROAD
BURWOOD EAST
WHITEHORSE CITY
FUNCTIONAL LAYOUT PLAN

SCALE 0 5 10 15 20
SHEET No. 1 of 4
DWG No. G17453-01

VEHICLE USED IN SIMULATION
(VEHICLE SPEED - 5km/h)



19m Semi	meters		
Tractor Width	: 2.50	Steering Angle	: 6.0
Tractor Track	: 2.50	Articulating Angle	: 28.3
Trailer Track	: 2.50		: 70.0

REMOVE BULLNOSE IN THIS
SECTION OF M5 KERB AND
BLEND GRADES TO MATCH


REMOVE BULLNOSE IN THIS
SECTION OF M5 KERB AND
BLEND GRADES TO MATCH

PROPOSED DEVELOPMENT
ACCESS ROAD

MELWAY MAP
REF 61 F5/6

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services
shown are approximate only and their exact
position should be proven on site.


PRELIMINARY PLAN
FOR DISCUSSION
PURPOSES ONLY

REVISION	REVISION NOTES	REVISION DATE	GENERAL NOTES	DESIGNED	 Traffic Engineering Design and Survey Suite 8/431 Burke Road TEL: (03) 9822-2888 GLEN IRIS, VICTORIA 3146 FAX: (03) 9822-7444 www.traffixgroup.com.au	MIDDLEBOROUGH ROAD BURWOOD EAST WHITEHORSE CITY FUNCTIONAL LAYOUT PLAN		
L	PRAM CROSSINGS ADDED	27 SEPT 2018	1 BASE INFORMATION FROM AERIAL PHOTOGRAPHY (SOURCE NEARMAP AUG 2017) 2 PEDESTRIAN PATH ALIGNMENT AND WIDTHS ARE SUBJECT TO DETAILED DESIGN AND AGREEMENT WITH COUNCIL	G RAKITA 03 SEP 2014				
K	ROAD SAFETY AUDIT COMMENTS ADDRESSED	22 NOV 2017		CHECKED/APPROVED				
J	BUS STOP REMOVED AND MIDDLEBOROUGH ROAD ALIGNMENT AMENDED	24 JULY 2017		FILE NAME				
I	ACCESS ROAD INTERSECTION AMENDED	11 APR 2017		G17453-01DGN		SCALE 0 5 10	SHEET No. 2 of 4	DWG No. G17453-02
H	CAR PARK ACCESS SHIFTED FURTHER EAST	15 OCT 2015						



WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services
shown are approximate only and their exact
position should be proven on site.

PRELIMINARY PLAN
FOR DISCUSSION
PURPOSES ONLY

REVISION		REVISION NOTES	REVISION DATE	GENERAL NOTES 1 PEDESTRIAN PATH ALIGNMENT AND WIDTHS ARE SUBJECT TO DETAILED DESIGN AND AGREEMENT WITH COUNCIL 2 BASE INFORMATION FROM AERIAL PHOTOGRAPHY (SOURCE NEARMAP AUG 2017)	DESIGNED	 Traffic Engineering Design and Survey Suite 8/431 Burke Road TEL : (03) 9822-2888 GLEN IRIS, VICTORIA 3146 FAX : (03) 9822-7444 www.traffixgroup.com.au	BURWOOD HIGHWAY BURWOOD EAST WHITEHORSE CITY FUNCTIONAL LAYOUT PLAN		
K		ROAD SAFETY AUDIT COMMENTS ADDRESSED	22 NOV 2017		G RAKITA 12 SEP 2014		SCALE 0 5 10 15 20	SHEET No. 3 of 4	DWG No. G17453-03
J		INTERSECTION AMENDED	24 JULY 2017		CHECKED/APPROVED				
I		ALIGNMENT ALTERED SLIGHTLY TO MATCH NEW ROAD RESERVES	30 SEPT 2015		FILE NAME G17453-01.DGN				
H		PEDESTRIAN FOOTPATHS ADDED PARALLEL TO BURWOOD HWY	25 JUNE 2015						
G		UPDATED CROSS SECTION OF PROPOSED ROAD WITHIN THE SITE	26 MAY 2015						



WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services shown are approximate only and their exact position should be proven on site.

PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY

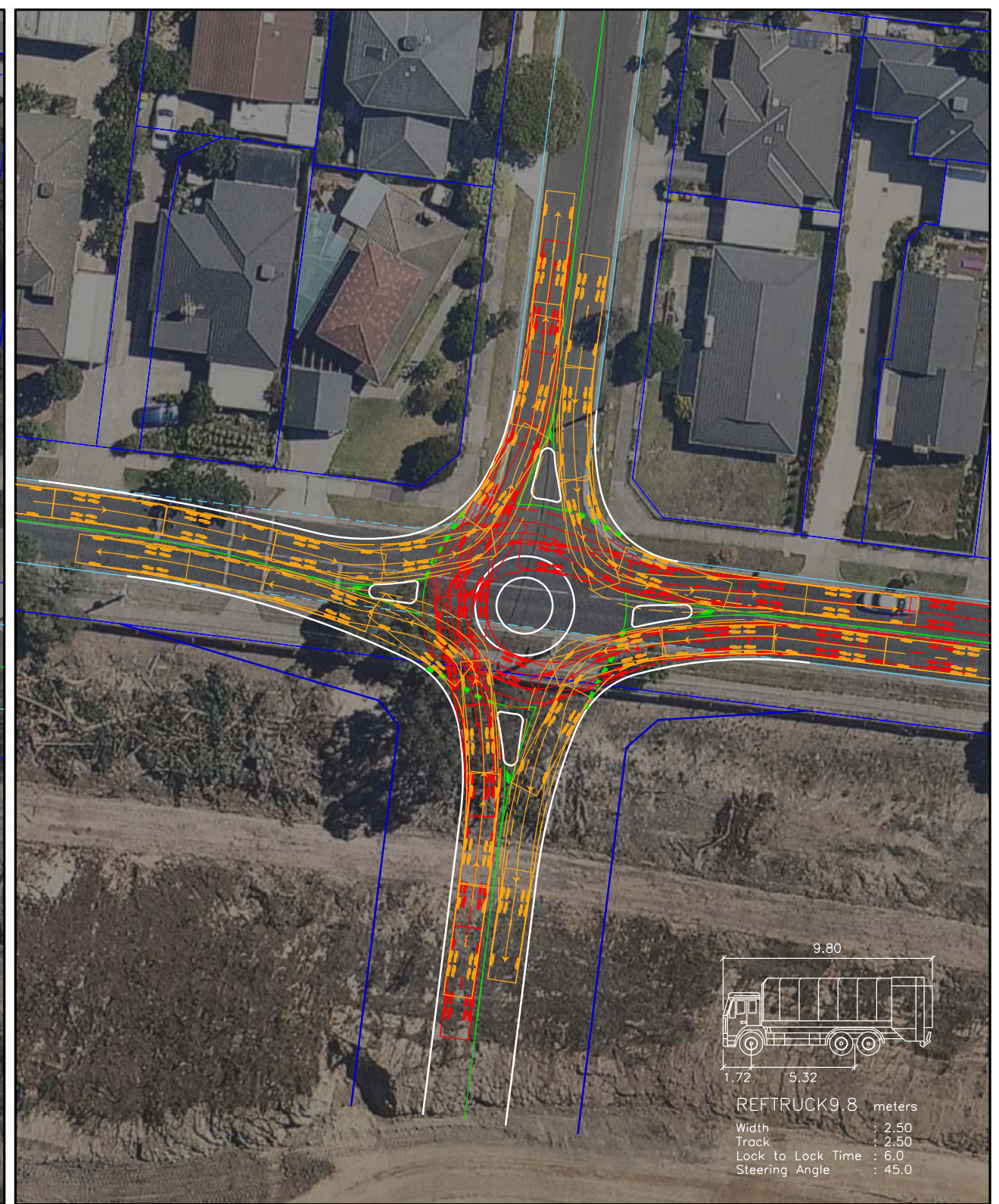
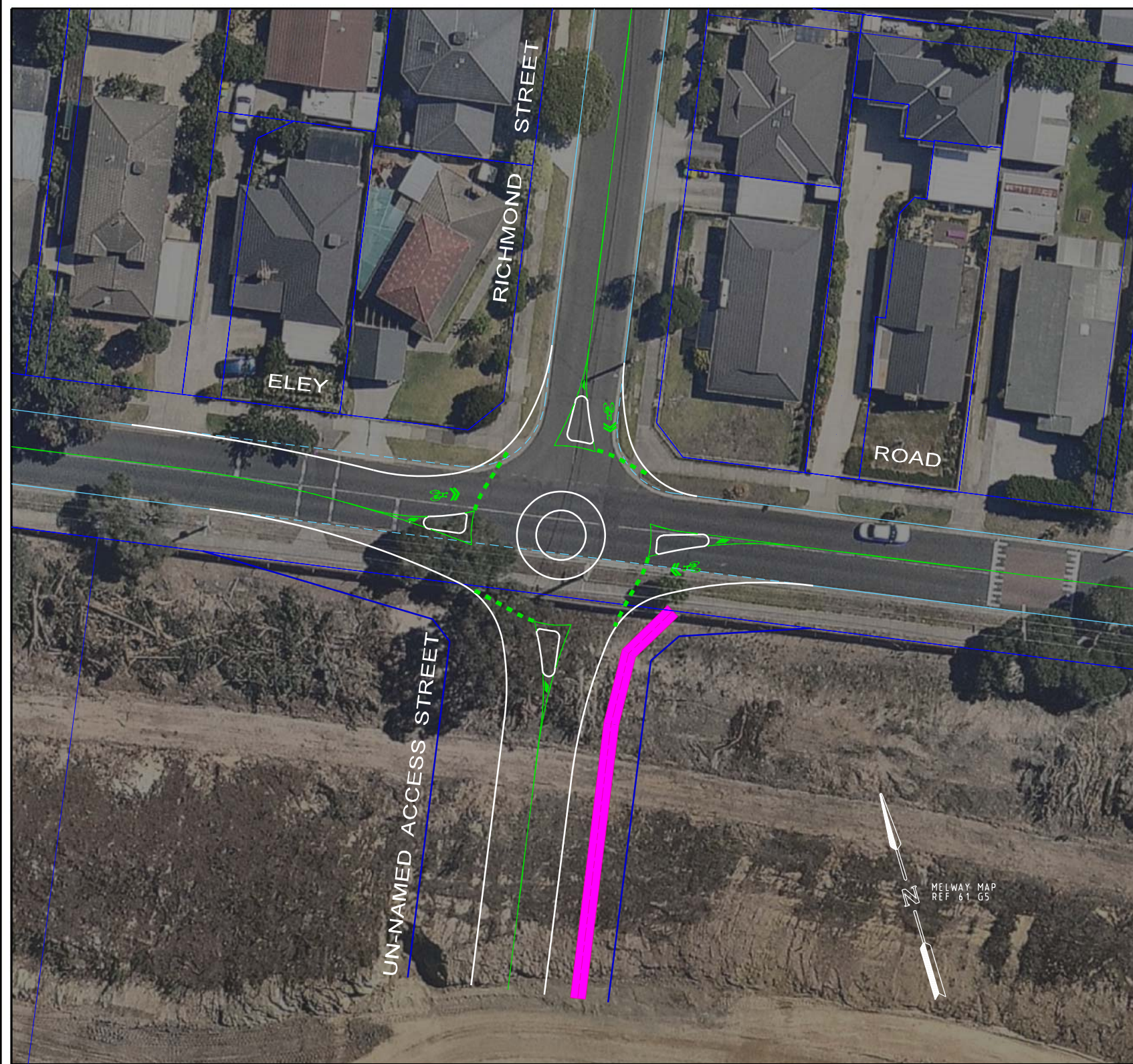
REVISION	REVISION NOTES	REVISION DATE
I	BURWOOD HIGHWAY - LINK ROAD AMENDED	24 JULY 2017
H	MINOR AMENDMENT TO ACCESS ROAD AND CARPARK ENTRANCE	
G	ALIGNMENT ALTERED SLIGHTLY TO MATCH NEW ROAD RESERVES	30 SEPT 2015
F	PEDESTRIAN FOOTPATHS ADDED PARALLEL TO BURWOOD HWY	25 JUNE 2015
E	UPDATED CROSS SECTION OF PROPOSED ROAD WITHIN THE SITE	26 MAY 2015

GENERAL NOTES
1 PEDESTRIAN PATH ALIGNMENT AND WIDTHS ARE SUBJECT TO DETAILED DESIGN AND AGREEMENT WITH COUNCIL
2 BASE INFORMATION FROM AERIAL PHOTOGRAPHY (SOURCE NEARMAP AUG 2017)

DESIGNED
G RAKITA 03 OCTOBER 2014
CHECKED/APPROVED
FILE NAME
G17453-01DGN

TraffixDesign
Traffic Engineering Design and Survey
Suite 8/431 Burke Road TEL: (03) 9822-2888
GLEN IRIS, VICTORIA 3146 FAX: (03) 9822-7444
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BURWOOD HWY / MIDDLEBOROUGH RD
BURWOOD EAST
WHITEHORSE CITY
FUNCTIONAL LAYOUT PLAN
SCALE 0 5 10 15 20
SHEET No. 4 of 4 DWG No. G17453-04



PRELIMINARY PLAN
FOR DISCUSSION
PURPOSES ONLY

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ISSUE	ISSUE DESCRIPTION	ISSUE DATE

GENERAL NOTES
1. BASE INFORMATION FROM AERIAL PHOTOGRAPH (SOURCE: NEARMAP APR 2015).
2. ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL.
3. LOCAL ROADS - ELEY ROAD/RICHMOND STREET & UN-NAMED ACCESS STREET (SPEED ZONE 50km/h).
4. ALL PROPOSED FOOTPATHS AND PRAM CROSSINGS ARE TO BE CONSTRUCTED WITH TACTILE GROUND SURFACE INDICATORS TO DDA COMPLIANCE GUIDELINES REFER TO AS 1428.4-2009.

[Pink line symbol] INDICATIVE LOCATION OF OFF-ROAD BICYCLE PATH

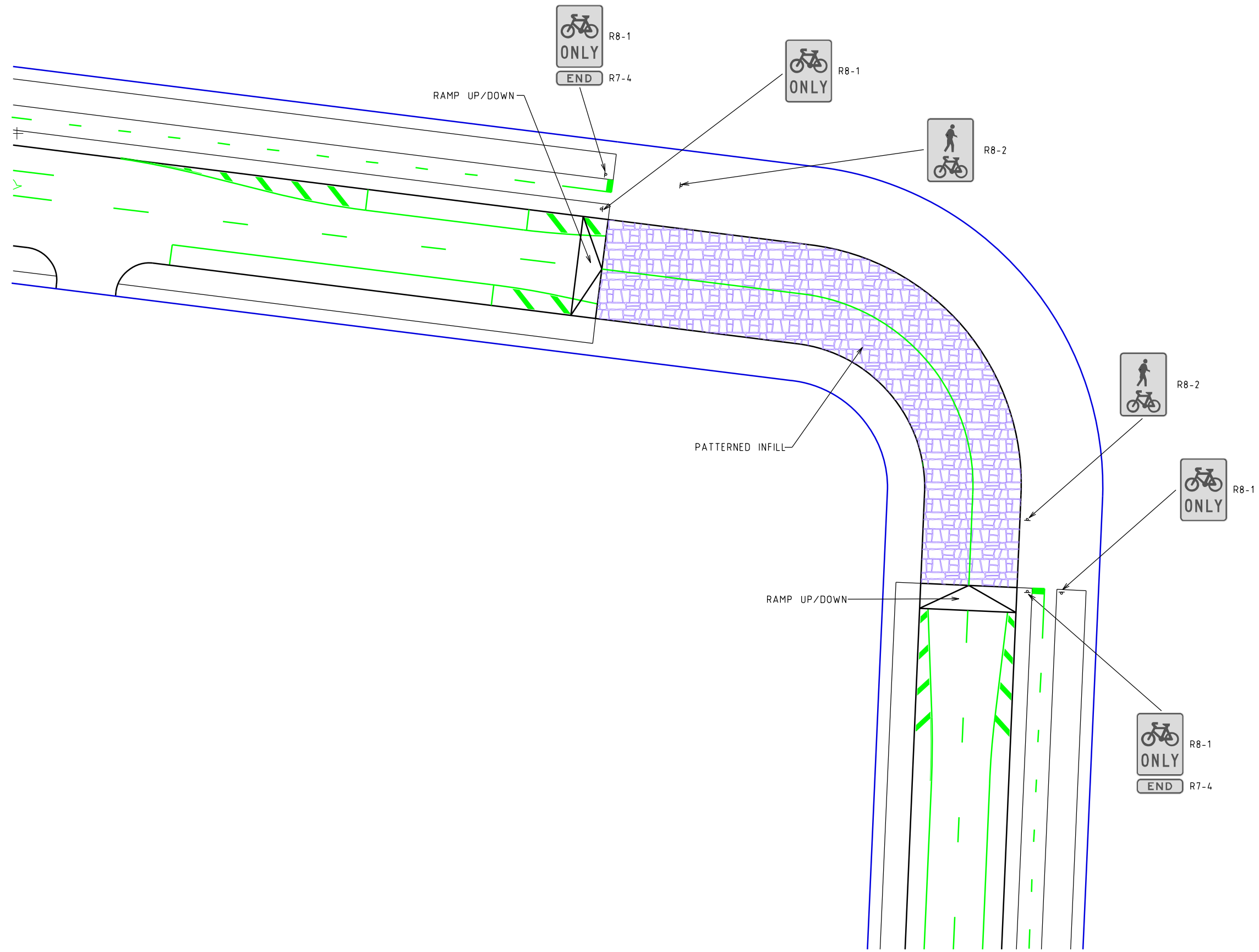
DESIGNED
R. CARBARNES 03 DEC 2015

CHECKED/APPROVED
N. CHEWTA 03 DEC 2015

FILE NAME
G17453B-00.dgn



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Suite 8/431 Burke Road TEL: (03) 9822-2888
GLEN IRIS, VICTORIA 3146 FAX: (03) 9822-7444
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**ELEY ROAD / RICHMOND STREET /
UN-NAMED ACCESS STREET**
WHITEHORSE CITY
CONCEPT PLAN
SCALE 0 2.5 5 7.5 10
SHEET No. DWG No. G17453B-01



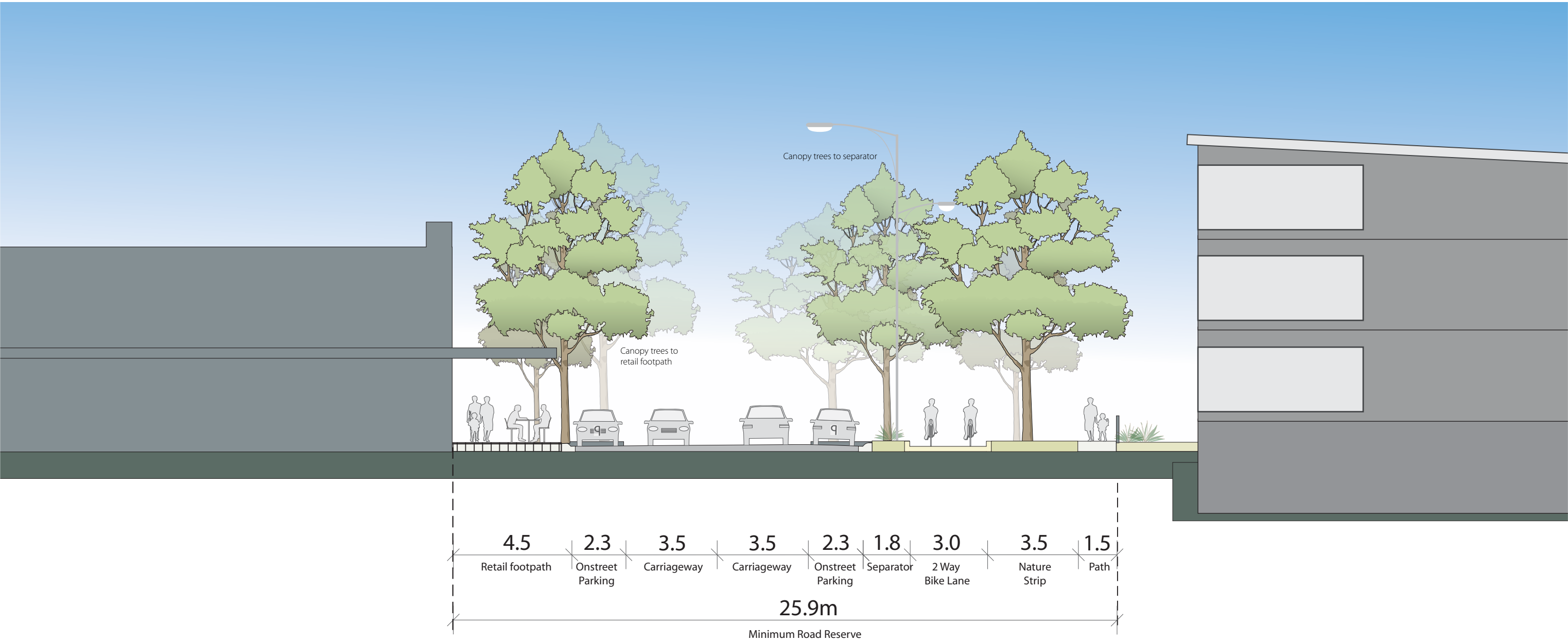
PRELIMINARY PLAN
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PURPOSES ONLY

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ISSUE	ISSUE DESCRIPTION	ISSUE DATE	GENERAL NOTES	DESIGNED	<div> Traffic Engineering Design and Survey <small>Suite 8/431 Burke Road TEL : (03) 9822-2888 GLEN IRIS, VICTORIA 3146 FAX : (03) 9822-7444 www.traffixgroup.com.au</small></div>	<div>BURWOOD SQUARE WHITEHORSE CITY PROPOSED THRESHOLD TREATMENT CONCEPT PLAN</div> <div>SCALE  SHEET No. DWG No. G17453B-02</div>	
			1. FOR ADDITIONAL DETAILS REFER TO INTEGRATED TRANSPORT PLAN SECTION 8.3.	R. CARBARN'S NOV' 2015			
				CHECKED/APPROVED			
				FILE NAME			
				G17453-1 THRESHOLD TREATMENT.dwg			

PUBLIC TRANSPORT MAP





Thoroughfare Cross Section Link Road
Burwood east
City of Whitehorse, VIC

REF NO
AST BUR

DRAW NO
UD 3006

REV
B

B Revision
A BASE
REV DESCRIPTION

04102014
28072014
YYMMDD

MJ
ZC
DRAWN

- MJ
APPR'D



SCALE 1:150 SIZE A3



RobertsDay
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robertsday
suite two
33 chessell street,
south melbourne
vic australia 3205
t+61 3 9645 0788
robertsday.com.au

melbourne sydney perth



Thoroughfare Cross Section 25.9m Boulevard
Burwood east
City of Whitehorse, VIC

REF NO
AST BUR

DRAW NO
UD 3006

REV
A

NOTES:
- Measurements sourced from Nearmaps

A BASE
REV DESCRIPTION

28072014
YYMMDD ZC
DRAWN MJ
APPRD



SCALE 1:150 SIZE A3
0 1 2 3 4 6 8 10m



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planning.design.place

robertsday
suite two
33 chessell street,
south melbourne
vic australia 3205
t+61 3 9645 0788
robertsday.com.au
melbourne sydney perth



Thoroughfare Cross Section 14m Street
Burwood east
 City of Whitehorse, VIC

REF NO
AST BUR

DRAW NO
UD 3006

REV
A

NOTES:
 - Measurements sourced from Nearmaps

A BASE
 REV DESCRIPTION

28072014
 YYMMDD

ZC
 DRAWN

MJ
 APPRD



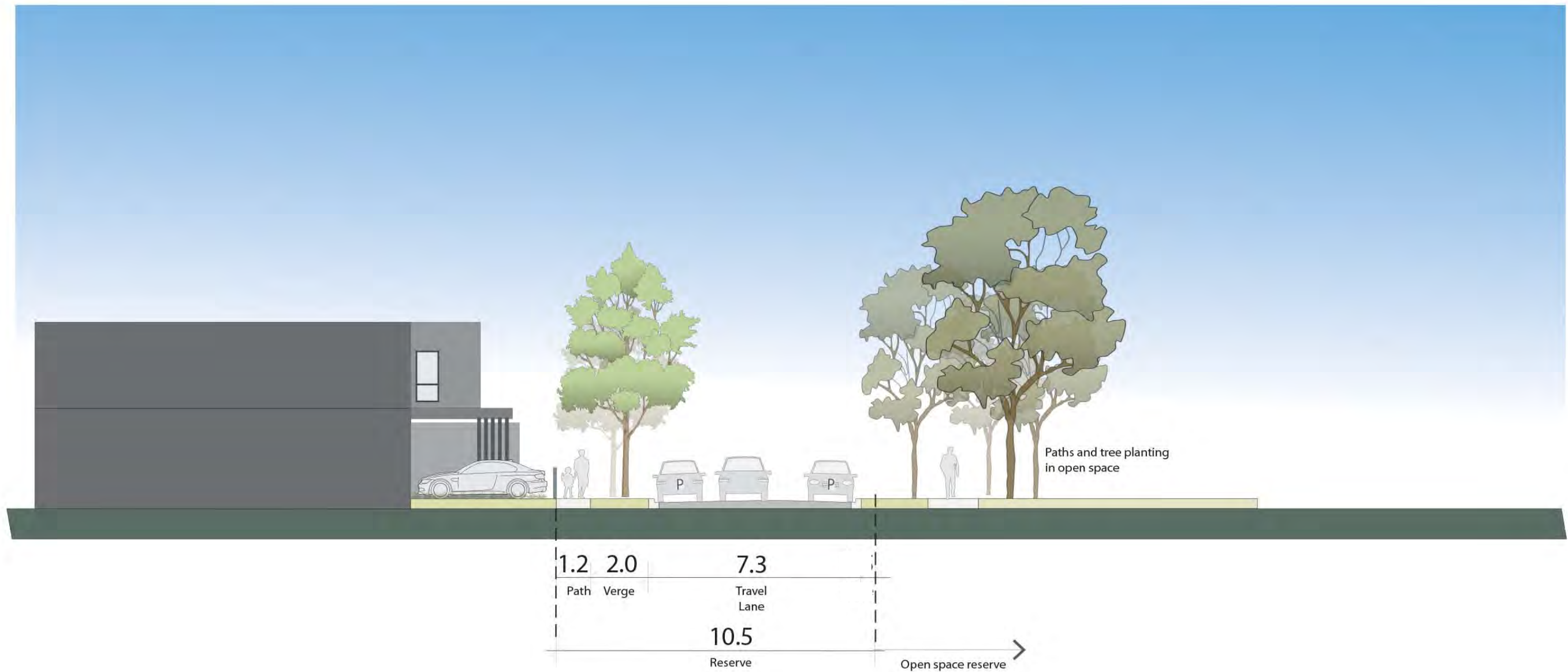
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RobertsDay
 planning·design·place

robertsday
 suite two
 33 chessell street,
 south melbourne
 vic australia 3205
 t+61 3 9645 0788
 robertsday.com.au

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Thoroughfare Cross Section 14m Street - Park Edge
Burwood east
 City of Whitehorse, VIC

REF NO
AST BUR

DRAW NO
UD 3006

REV
A

NOTES:
 - Measurements sourced from Nearmaps

A BASE
 REV DESCRIPTION

28072014
 YYMMDD

ZC
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MJ
 APPRD



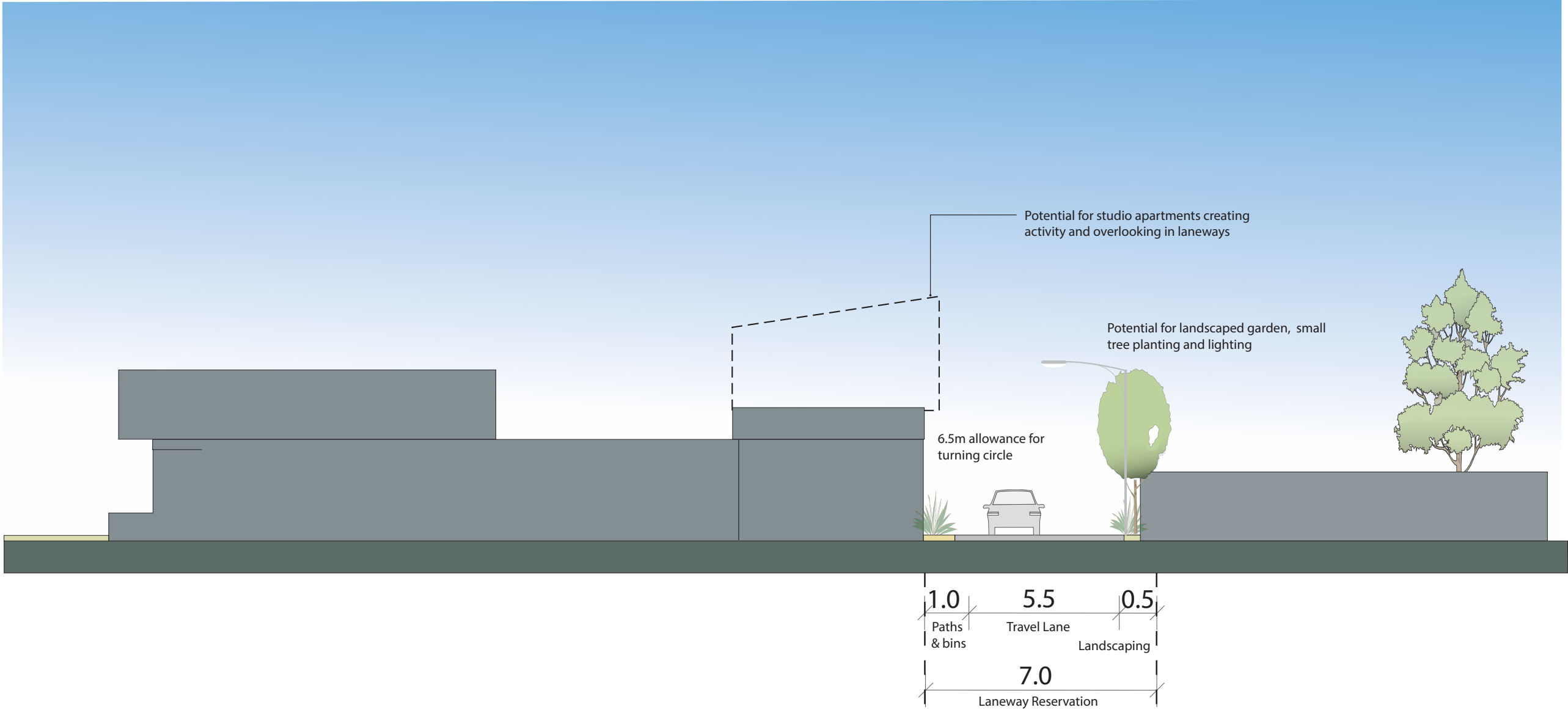
SCALE 1:150 SIZE A3



RobertsDay
 planning·design·place

robertsday
 suite two
 33 chessell street,
 south melbourne
 vic australia 3205
 t+61 3 9645 0788
 robertsday.com.au

melbourne sydney perth



Thoroughfare Cross Section Laneway
Burwood east
City of Whitehorse, VIC

REF NO	DRAW NO	REV	A	Draft	16102014	MJ	—
AST BUR	UD 3008	A	REV	DESCRIPTION	DDMMYY	DRAWN	APPR'D



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robertsday
suite two
33 chessell street,
south melbourne
vic australia 3205
t+61 3 9645 0788
robertsday.com.au

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