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Western Sydney Employment Hub - Proposed Erskine Park Link Road Network

Supplementary Traffic Study

NSW Roads and Traffic Authority

Western Sydney Employment Hub - Proposed Erskine Park Link Road Network

Prepared for

NSW Roads and Traffic Authority

Prepared by

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1.0 Introduction

1.1 Background

1.1.1 Previous Announcements

In May 2004, the Premier of New South Wales (NSW), announced that land would be rezoned under the provisions of State Environmental Planning Policy number 59 (SEPP 59) to enable a road to be built that would link the existing Erskine Park Employment Area (EPEA) and the Westlink M7. A preferred option by Penrith City Council envisaged that the proposed road would be a higher order route linking the EPEA in the Penrith Local Government Area (LGA) at its western end, through the SEPP 59 employment lands in Blacktown LGA at its eastern end, to Wallgrove Road and the Westlink M7 Motorway via Old Wallgrove Road - a distance of approximately 7 kilometres.

On 5 December 2005, the Government released the Sydney Metropolitan Strategy. This strategy includes the creation of the Western Sydney Employment Hub (the Hub) **(Figure 1.1)**. The Hub includes ten precincts between Erskine Park & Greystanes. The four north-west precincts comprises the land between M7, M4, Mamre Road/Erskine Park Road and Sydney Water pipeline, hereafter known as North West Precincts (NWP). One precinct south of the Sydney Water pipeline is identified for future land release, hereafter known as South West Precincts (SWP). **Figure 1.2** displays the location of the NWP and SWP.

In March 2007, the NSW State Government released an 'Action Plan for Sydney's Employment Lands' covering the whole of the Sydney Region. A feature of the action plan is the announcement by the State Government of the Western Sydney Employment Lands Investigation Area (WSELIA) in the area between the Hub and Badgerys Creek to the north of Elizabeth Drive.

1.1.2 RTA's Project Involvement

Since 2004, the Roads and Traffic Authority (RTA) has provided advice to the Department of Planning (DoP) with respect to traffic impacts resulting from developing land in the vicinity of the Hub. Following the establishment of the Hub as part of the Sydney Metropolitan Strategy, the RTA became the proponent at the request of the Minister for Planning, to develop a Concept Plan for a network of roads, known as the Erskine Park Link Road (EPLR) network, in the Western Sydney Employment Hub to provide access to the NWP and connections with the SWP.

After considering various road proposals, the RTA engaged Maunsell to undertake constraints mapping and to develop the EPLR network within the NWP. **Figure 1.2** displays the preferred RTA road network for the NWP, which consists of a set of road corridors wide enough for 4 lane divided carriageway.

The RTA as the proponent for the proposed EPLR network submitted a concept plan to the Department of Planning under Part 3A of the EP&A Act to seek approval for the proposed road network.

A key component of the concept plan was a comprehensive traffic modelling report, prepared by Maunsell based on RTA's EMME/2 traffic modelling. This assessed the appropriateness of the model for evaluating the traffic impacts of the Hub developments, and details of the future year modelling results for the EPLR and surrounding road network.

Figure 1.1: Western Sydney Employment Hub – Development Precincts

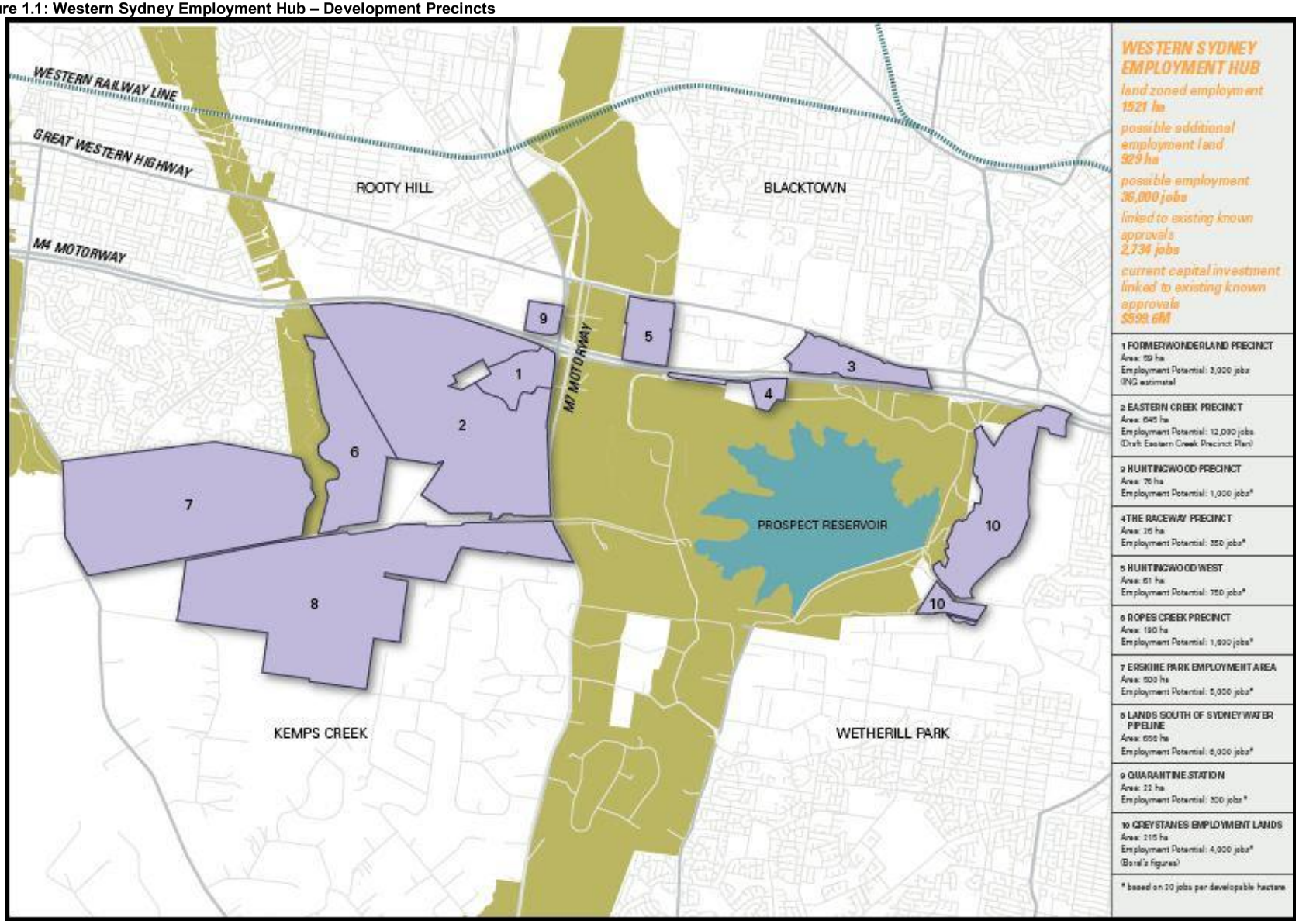
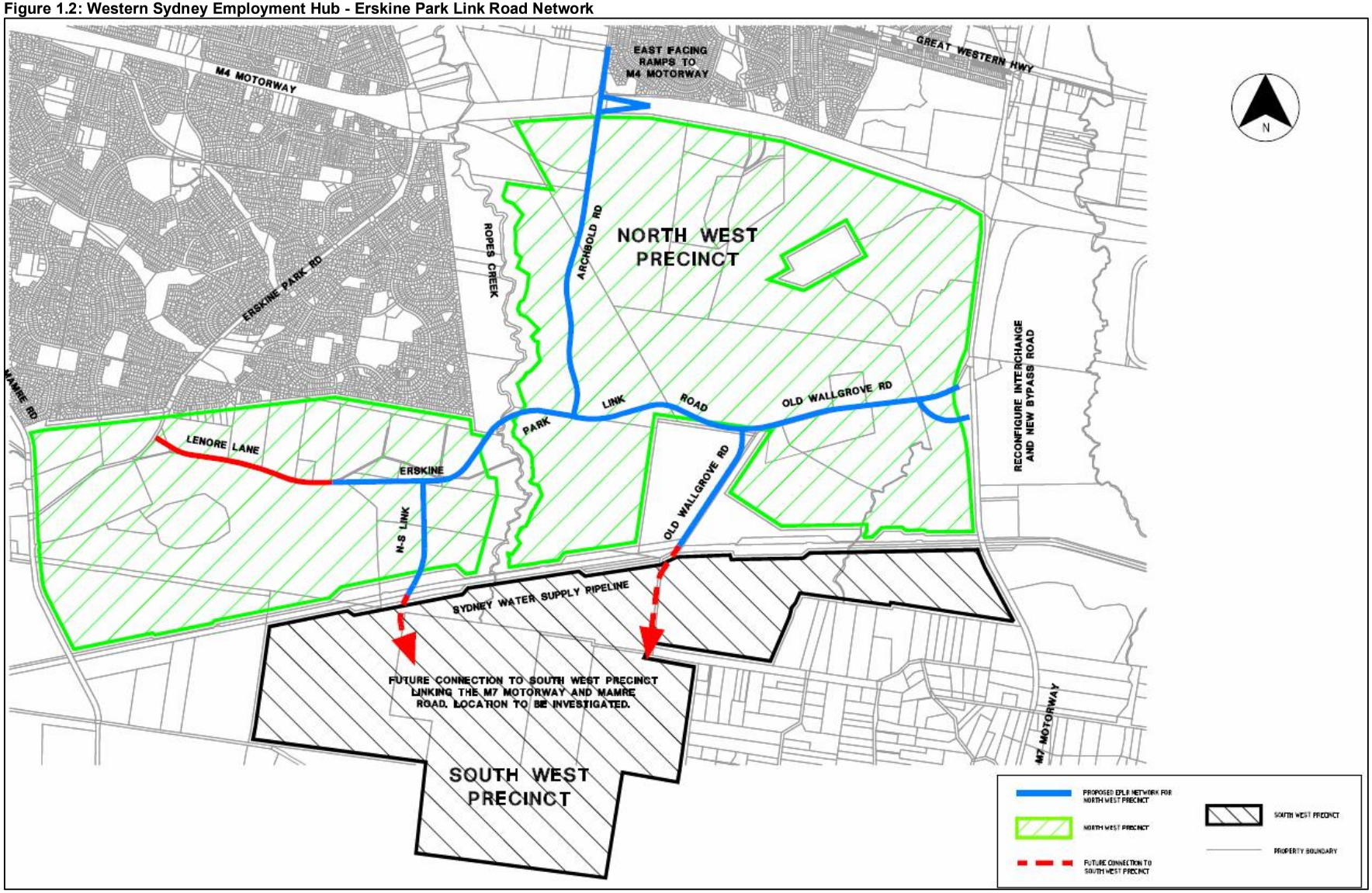


Figure 1.2: Western Sydney Employment Hub - Erskine Park Link Road Network



1.2 Scope of Report

Maunsell have been commissioned by the RTA to prepare a technical note to include details of supplementary EMME/2 and SIDRA modelling that was undertaken by the RTA as a result of specific traffic related queries raised in submissions from the public exhibition to the concept plan. More specifically, the report includes:

- Overview of the network and intersection modelling prepared by the RTA in response to revised land use assumptions and WSELIA; and
- Assessment of the impact of revised modelling assumptions to confirm if the RTA proposed 4 lane divided carriageway is adequate to serve the proposed SWP | NWP developments.

1.3 Report Overview

The technical note is documented in the following three sections:

- **Section 2** reviews the revised assumptions and results of the 2016 AM peak EMME/2 modelling undertaken by the RTA to assess the impacts of the Hub and WSELIA developments.
- **Section 3** reports the results of the network performance measures using volume-to-capacity (V/C) ratios and intersection analysis.
- **Section 4** provides a summary of the key findings and conclusions of the report.

2.0 Network Traffic Modelling

2.1 Model Development

2.1.1 Background to the Hub Development

The North West Precinct (NWP) and South West Precinct (SWP) land use proposals comprise a large development area located within the Local Government Areas (LGA) of Penrith, Blacktown and Fairfield (**Figure 1.2**). The area is bounded by Erskine Park Road and Mamre Road to the west, the M7 to the east, M4 to the north and Bakers Lane to the south. The road network for development is structured in the following order:

Development of the North West Precincts (NWP):

- NWP consists of precincts 1, 2, 6 & 7 of the Hub (**Figure 1.1**), which includes the following;
- Development in the Eastern Creek area, including Stages 1 to 3 of the precincts identified in the State Environmental Planning Policy number 59 (SEPP 59) in addition to development at the Former Wonderland Site and a further area between the western edge of the existing SEPP 59 border and Ropes Creek precinct (Lots 4 and 5); and
- Erskine Park Employment Area between Mamre Road/Erskine Park Road and Ropes Creek/The Eastern Creek development area.

Development of the South West Precinct (SWP):

- SWP consists of precinct 8 of the Hub (**Figure 1.1**), which includes a large area identified for development in Fairfield LGA, south of the Sydney Water pipeline, adjacent to Burley Road and west of Wallgrove Road.

Figure 2.1 shows approximate location of the SWP and NWP within the development area. The area is expected to undergo rapid development with most areas fully developed by 2016, which remains the year chosen for the future year traffic modelling.

2.1.2 Hub - Revised Land Use Assumptions

The RTA previously based its detailed trip generation assumptions regarding the Hub on developable land area forecasts provided by Blacktown City Council, Penrith City Council and the Department of Planning (DoP); as no specific employment forecasts were available at the time.

More recently, revised trip tables have been supplied to the RTA from the TDC based on revised employment numbers expected for the Hub developments as supplied by the DoP. **Table 2.1** provides origin and destination trips that are generated by each development area.

Trip forecasts show that developments in the Hub will generate a total of 16,843 trips by 2016. **Figure 2.1** shows the spread of trip forecasts in the NWP and SWP, including 5,245 trips in the Eastern Creek precinct, 4,098 trips in the Ropes Creek precinct, 3,539 trips in the Erskine Park Employment Area and 3,961 trips will be generated in the area of lands south of the Sydney Water pipeline.

The split of the total generated trips is assumed to be approximately 20% productions and 80% attractions, which is based on trip data for the nearby industrial areas of Minchinbury, Huntingwood and Wetherill Park.

Figure 2.1: Indicative Location & Total Trip Forecasts of SWP and NWP

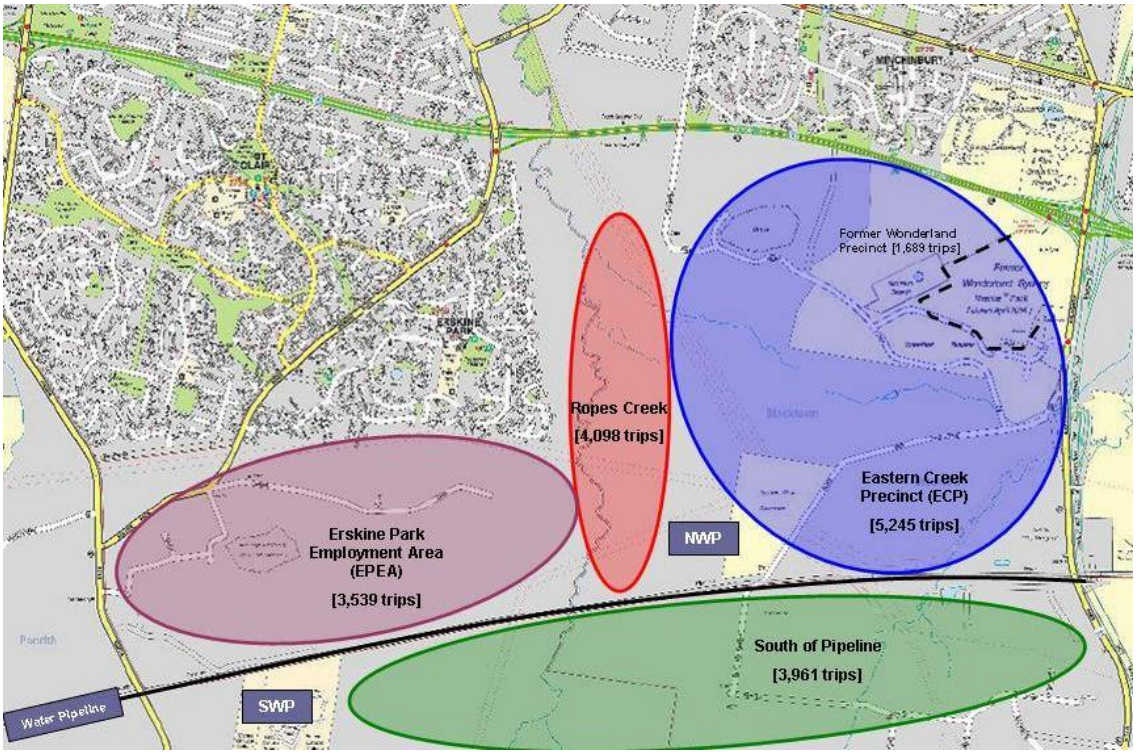


Table 2.1: Details of the Hub Developments – Trip Generation

Development Sector	Location	Total Trips (Veh) 2016 2hr AM Peak Period		
		In	Out	Total
North West Precinct (NWP)				
Eastern Creek Precinct (ECP) [Precinct 2]	Eastern Creek Precinct South	949	267	1,217
	Former Wonderland Precinct 1	1,318	371	1,689
	Eastern Creek Precinct North	1,217	343	1,560
	Eastern Creek Precinct East	609	171	780
	Total	**4,093**	**1,152**	**5,245**
Ropes Creek [Precinct 6]		**3,198**	**900**	**4,098**
Erskine Park Employment Area (EPEA) [Precinct 7]	Erskine Park Employment Area A	142	70	212
	Erskine Park Employment Area B	592	293	885
	Erskine Park Employment Area C	1,634	808	2,442
	Total	**2,368**	**1,171**	**3,539**
South West Precinct (SWP)				
Lands South of Sydney Water pipeline [Precinct 8]		**3,685**	**276**	**3,961**
Total		**13,344**	**3,500**	**16,843**

2.1.3 WSELIA Development

Figure 2.2 shows the approximate location of the Western Sydney Employment Lands Investigation Area (WSELIA), which is situated in the area between the Hub (south of the water pipeline) and Badgerys Creek to the north of Elizabeth Drive.

The proposed WSELIA development area is represented by 3 TDC travel zones, which have been refined to 6 sub-divided zones in the EMME/2 model. The WSELIA development area includes the following precincts and zoning system:

- Mount Vernon: Zones - 303831 - 303836
- Badgerys Creek North: Zone - 307321
- Horsley Park: Zone - 820

As previously discussed, revised trip tables have been supplied to the RTA from the TDC based on revised employment numbers expected for WSELIA development as supplied by the DoP. **Table 2.2** provides origin and destination trips that are generated by each development area within WSELIA.

Trip forecasts show that developments in WSELIA will generate a total of 6,449 trips by 2016. **Figure 2.2** shows the spread of trip forecasts, including 4,270 trips in the Mount Vernon precinct, 1,340 trips in the Horsley Park precinct and 839 trips will be generated in Badgerys Creek North precinct.

Trips generated by WSELIA equates to 6,449 vehicles in the 2 hour AM Peak period, comprising of 4,262 trips arriving at the developments and 2,178 trips departing during the morning peak.

Figure 2.2: Indicative Location & Total Trip Forecasts of WSELIA

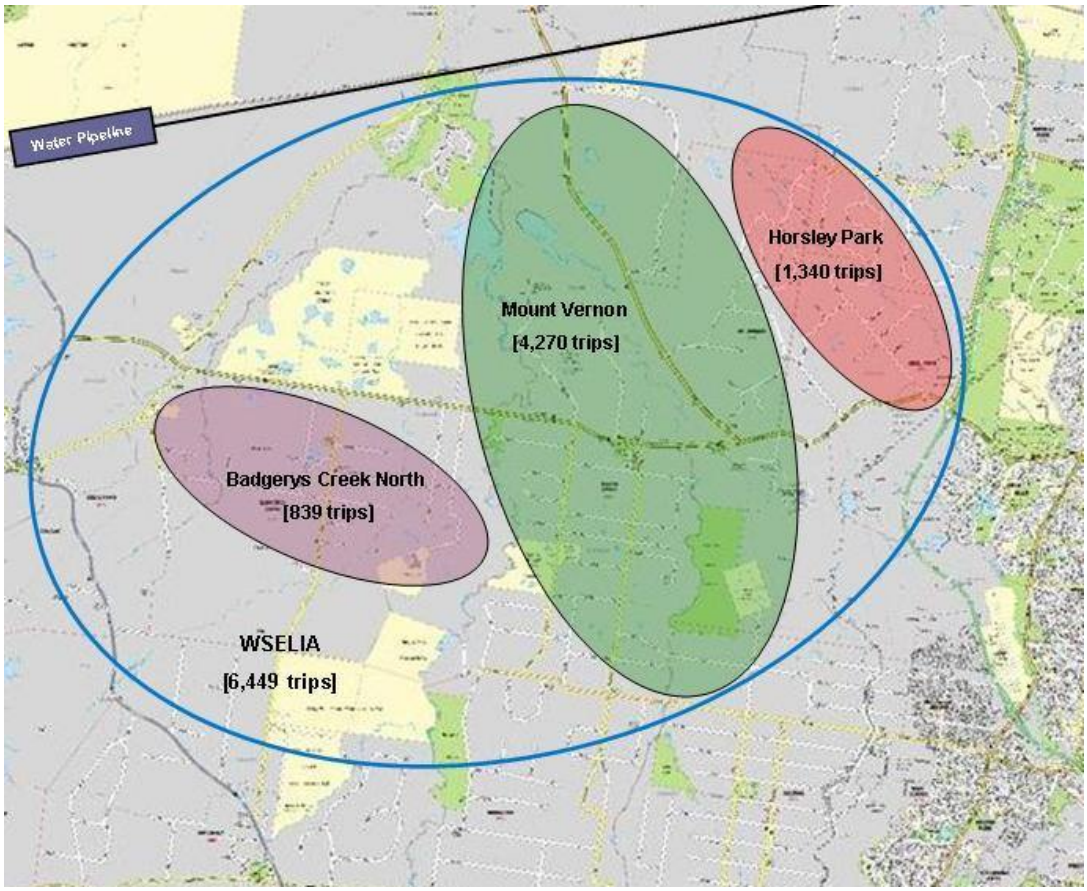


Table 2.2: Details of WSELIA Developments – Trip Generation

Development Sector	Location	Total Trips (Veh) 2016 2hr AM Peak Period		
		In	Out	Total
Western Sydney Employment Lands Investigation Area (WSELIA)	Mount Vernon Precinct	2,931	1,339	4,270
	Horsley Park Precinct	793	547	1,340
	Badgerys Creek North Precinct	537	302	839
Total		4,262	2,187	6,449

2.2 Modelling Options

Supplementary 2016 EMME/2 models were developed to assess the impact of the revised trip generation assumptions to determine if the previously defined Erskine Park Link Road (EPLR) network will continue to be required to service revised assumptions of traffic generated from the South West Precincts (SWP) and North West Precincts (NWP) of the Western Sydney Employment Hub (the Hub) and the Western Sydney Employment Lands Investigation Area (WSELIA). The modelling exercise included the development of 2 revised modelling options as detailed below:

Rev Modelling Option B1
Revised Option B1 was modelled with the WSELIA development and external road network upgrades, as summarised below:

- Option B1: M7 Hub & WSELIA with external road upgrades.

Rev Modelling Option C
This option was previously defined to service the NWP of the Hub with connections to SWP, which is designed to accommodate additional traffic that will eventually be generated from the SWP. Option C was also modelled with external road network upgrades, as summarised below:

- Option C: M7 Hub with external road upgrades.

2.3 Model Results

The following sections include a summary of the revised modelling results as detailed below:

- Revised Option B1 and Option C: Hub dev trips generated from employment forecasts.

Appendix A provides details of the 2 hour AM peak link flows for the previous and revised network Option B1 and Option C.

2.3.1 Modelling Option B1 Analysis

Figure 2.3 displays the modelled AM peak link volumes at each location included in **Appendix A** for the revised Option B1. In comparison to the previous modelling Option B1, traffic volumes on the EPLR and surrounding road network are of similar levels for the majority of links. However, traffic volumes have increased and decreased on a few locations, as detailed in the following paragraphs.

When assessing Option B1, the only notable increase in traffic is on Wallgrove Road northbound and Mamre Road southbound with an AM peak flow of 2,796 and 4,736 vehicles respectively, which

equates to a 47% and 33% increase in traffic when compared to the previous Option B1. The growth in traffic is due to the impact of trips with a northern distribution from the WSELIA developments areas, which is included in the modelling for the revised Option B1.

Traffic levels have decreased quite considerably for Option B1 in comparison to the previous modelling for the following 3 inbound (towards the Hub) road links in the EPLR network:

- Archbold Road: 2,001 (-37%)
- Direct Connection: 1,309 (-46%)
- Southern Route Extension: 1,676 (-48%)

In revised Option B1 the total number of inbound morning peak trips that enter the proposed Hub related road network on the main access roads is 13,910 vehicles/2 hours, as shown in **Table 2.3**. The table also highlights the peak directional flow for the two internal north-south links.

The split of traffic between these links as a proportion of total inbound flow is displayed in **Table 2.3**. The distribution of arrival trips to the development area is fairly evenly spread between the main external access links (identified by the link number, which relates to **Figure 2.3**), including the Erskine Park Link Road in the west and the Southern Route.

Table 2.3: AM Peak Inbound Trips – Rev Option B1

Link No.	Access Road	Inbound Trips	% of Total
Hub External Access Road Links			
1	Erskine Park Link Road	2,978	21%
2	Archbold Road	2,001	14%
3	Wonderland Drive	1,147	8%
4	Old Wallgrove Road	2,305	17%
5	Direct Connection	1,309	9%
6	Southern Route Extension	1,676	12%
7	Southern Route	2,494	18%
Total		**13,910**	**-**
Internal Road Links			
1	North | South A	1,091	-
2	North | South B	1,601	-

2.3.2 Modelling Option C Analysis

Figure 2.4 displays the modelled AM peak link volumes at each location included in **Appendix A** for the revised Option C. In comparison to the previous modelling for Option C, traffic volumes on the EPLR and surrounding road network are of similar levels for the majority of links. However, traffic volumes have increased and decreased on a few locations, as detailed in the following paragraphs.

When assessing Option C, the only notable increase in traffic is on Erskine Park Link Road and Mamre Road southbound with an AM peak flow of 3,377 and 3,546 vehicles respectively, which equates to a 22% and 66% increase in traffic when compared to previous modelling of this option.

As a result of the revised Hub trip generation assumptions based on employment forecasts, traffic levels have decreased quite considerably for Option C in comparison to previous modelling, for the following 3 inbound (towards the Hub) road links in the EPLR network:

- Archbold Road: 1,712 (-28%)
- Direct Connection: 1,378 (-41%)
- Old Wallgrove Road: 1,102 (-36%)

In revised Option C, the total number of inbound morning peak trips that enter the proposed Hub related road network on the main access roads is 8,713 vehicles/2 hours, as shown in **Table 2.4**.

The split of traffic between these links as a proportion of total inbound flow is displayed in **Table 2.4**. The distribution of arrival trips to the development area is fairly evenly spread between the main external access links (identified by the link number, which relates to **Figure 2.4**) apart from the Erskine Park Link Road, which accommodates over 39% of traffic being generated by the Hub development.

Table 2.4: AM Peak Inbound Trips – Rev Option C

Link No.	Access Road	Inbound Trips	% of Total
Hub Access Road Links			
1	Erskine Park Link Road	3,377	39%
2	Archbold Road	1,712	20%
3	Wonderland Drive	1,144	13%
4	Old Wallgrove Road	1,102	13%
5	Direct Connection	1,378	16%
Total		**8,713**	-

The total number of inbound morning peak trips that enter the proposed Hub related EPLR network is 13,910 and 8,713 for Option B1 and Option C respectively, which equates to a difference in generated demand of 60%. The additional 5,197 trips are generated from the South West Precinct (SWP) in the Hub and the developments associated with the Western Sydney Employment Lands Investigation Area (WSELIA).

Figure 2.3: 2016 AM 2Hr Peak Link Volumes – Revised Option B1

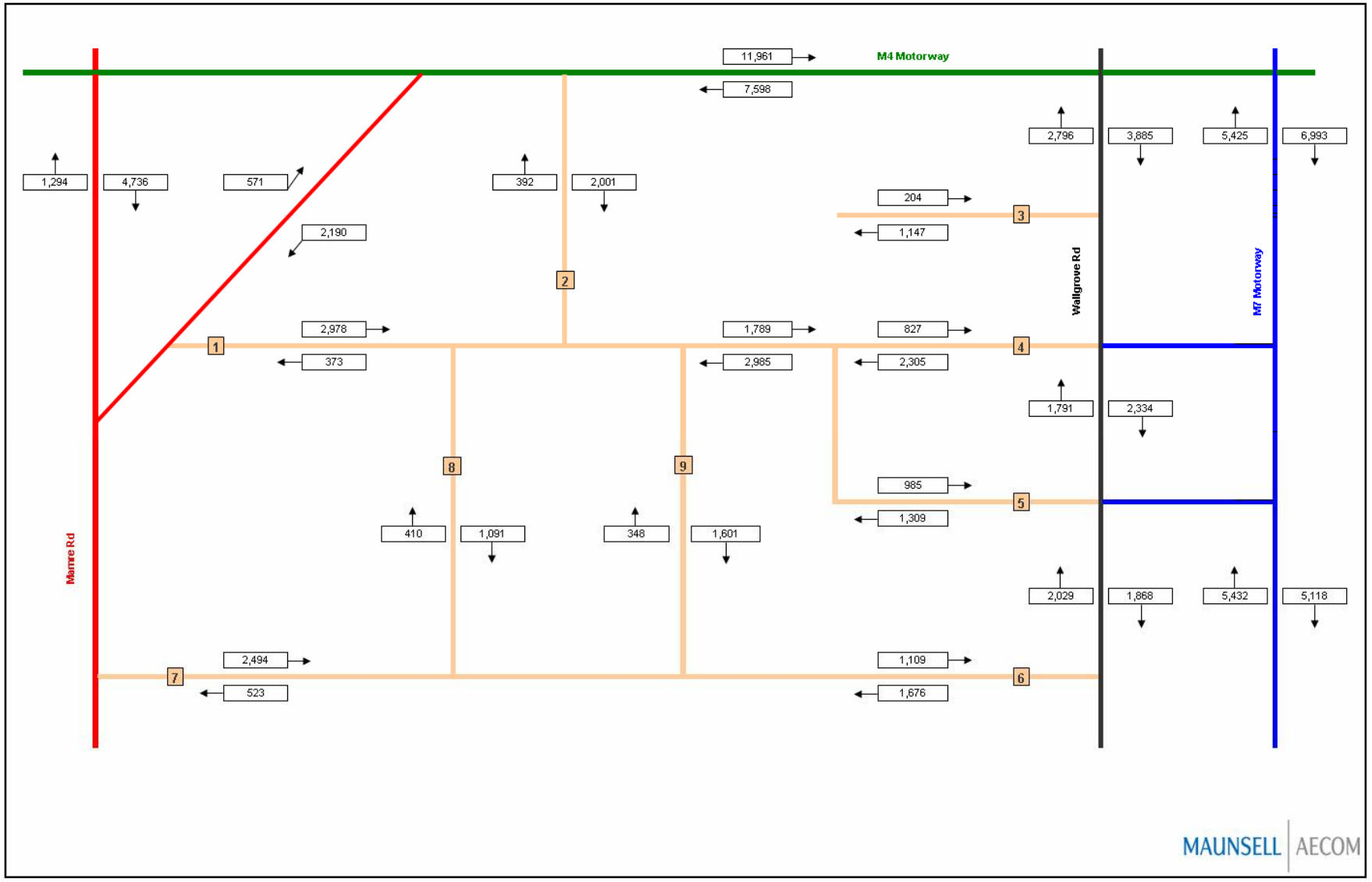
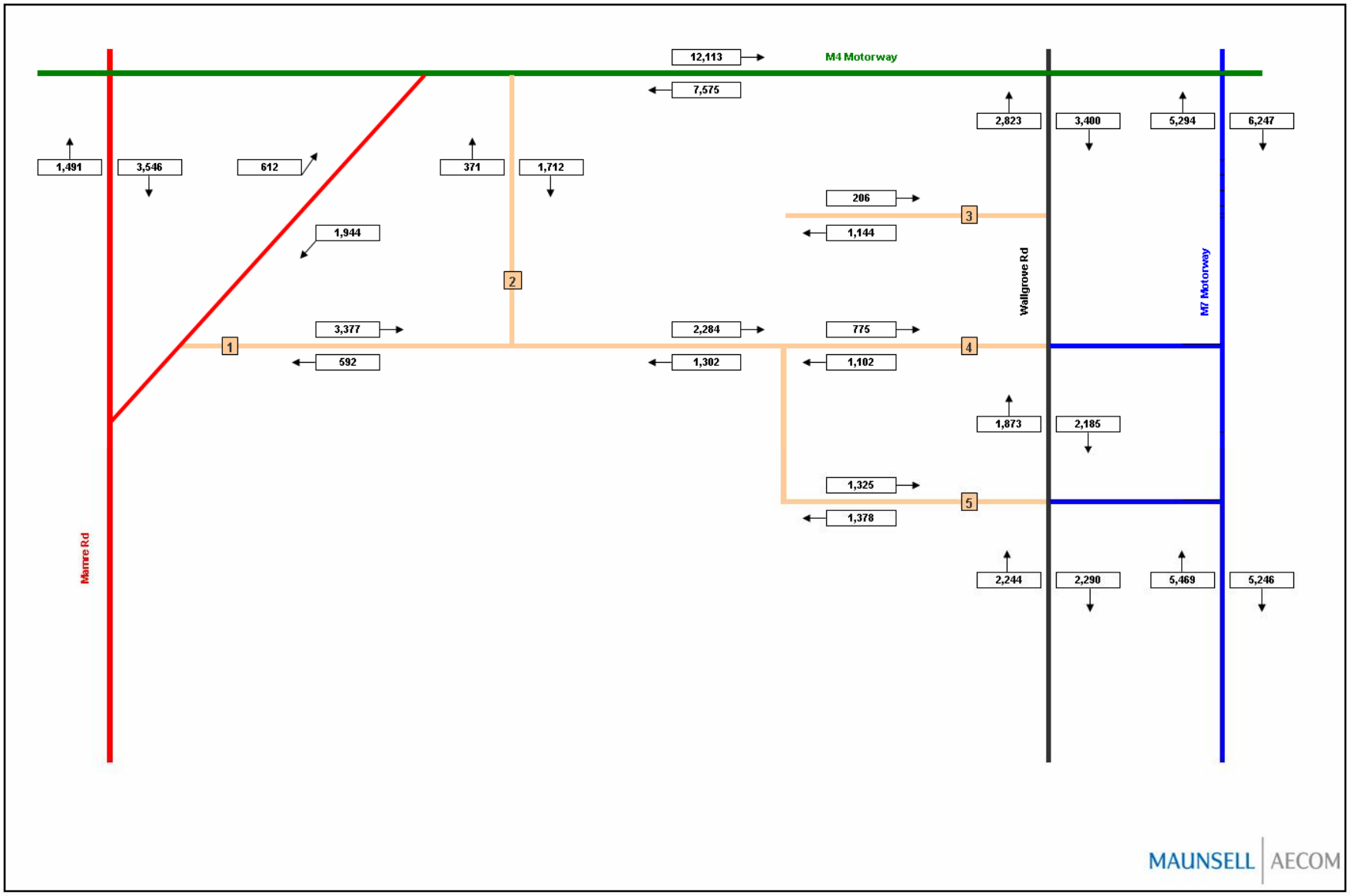


Figure 2.4: 2016 AM 2Hr Peak Link Volumes – Revised Option C



3.0 Road Network Performance Measures

3.1 Volume-to-Capacity (V/C) Ratios

The volume-to-capacity (V/C) ratio is a method of assessing congested conditions on road links between intersections. In summary, congested conditions are identified by V/C ratios greater than 1.0, bottlenecks have a value of 1.0, road sections operating close to capacity have a V/C greater than 0.8, and acceptable conditions generally have a V/C ratio less than 0.8.

Tables 3.1 and **3.2** provide details of the modelled 2 hour (07:00-09:00) AM peak 2016 inbound or outbound (peak directional) trips on key external access links for revised Option B1 and Option C, based on the following two road network designs:

- 2 lane road network (1 lane in each direction) | 1,000 veh/lane/hr capacity; and
- 4 lane divided road network (2 lanes in each direction) | 1,200 veh/lane/hr capacity.

Table 3.1: 2016 – 2 Hour AM Peak Inbound Trips and V/C Ratios – Option B1

Key Access Road	Peak Directional Trips	V/C Ratios	
		2 Lane	4 Lane Divided
Erskine Park Link Road	2,978	1.49	0.62
Archbold Road	2,001	1.00	0.42
Southern Route	2,494	1.25	0.52
Old Wallgrove Road	2,985	1.49	0.62
Direct Connection	1,309	0.66	0.27
North | South A	1,091	0.55	0.23
North | South B	1,601	0.80	0.33

Table 3.2: 2016 – 2 Hour AM Peak Inbound Trips and V/C Ratios – Option C

Key Access Road	Peak Directional Trips	V/C Ratios	
Erskine Park Link Road	3,377	1.69	0.70
Archbold Road	1,712	0.86	0.36
Old Wallgrove Road	2,284	1.14	0.48
Direct Connection	1,378	0.69	0.29

Table 3.1 shows the volume-to-capacity ratios for Option B1 and the colour coding demonstrates that for the 2 lane road design; the V/C ratios for all roads (except for the Direct Connection and north-south links) are at unacceptable performance levels and the network would operate under heavily congested conditions.

Althought the Direct Connection could operate as a two lane road, considering the proximity of three intersections within a short length of the road, it is concluded that four lanes are required to make the intersections perform at acceptable level of service.

While the two internal north-south link roads could operate as a two lane road, the north-south B road link only just makes it in the acceptable category. Considering the high volume of heavy vehicle usage in the Hub, provision of vehicular access to the adjoining development, and emergency parking, it is concluded that both north south links would be designed as a four lane road.

Table 3.2 shows that the V/C ratios for Option C and the colour coding demonstrates that for the 2 lane road design; the V/C ratios for all roads (except for the Direct Connection) are at unacceptable performance levels and the network would operate under heavily congested conditions.

Although the Direct Connection could operate as a two lane road, considering the proximity of three intersections within a short length of the road, it is concluded that four lanes are required to make the intersections perform at acceptable level of service.

The V/C ratios for the 4 lane divided road design are approximately half of the corresponding 2 lane values, which is a result of doubling the capacity of the road network. For the EPLR road network, the V/C ratios for all access links are equal to or less than 0.8, reflecting un-congested conditions with spare capacity for additional traffic, for the modelling period of 2016.

In development of the 4 lane divided road network for the key external access links in the North West Precinct (NWP), the RTA has taken into consideration the comparison of modelled volume-to-capacity (V/C) ratios, in addition to future land and road network developments for the South West Precincts (SWP) and WSELIA developments that area represented in Option B1.

The concept plan for the Erskine Park Link Road (EPLR) included the preferred option for a 4 lane divided carriageway that will be required to serve the proposed NWP | SWP developments. Analysis of the results for the revised modelling options, based on updated employment forecasts, provides further evidence to support the preferred road network option with 4 lanes for all of the road links, with the potential staging of north-south link A.

Staging
Based on the revised modelling, the internal north-south link A could be constructed in stages as the 2016 V/C ratio for this link is at acceptable performance levels for a 2 lane road design. The link could be constructed in the first stage with 2 lanes and upgraded to 4 lanes in the future. Further information would be available during the project approval stage and detailed future year network modelling would be undertaken to finalise the staging works for the EPLR network.

3.2 Intersection Analysis

The operational performance of key intersections on the Erskine Park Link Road (EPLR) network was assessed using SIDRA Intersection Analysis. SIDRA is a widely accepted analytical tool for evaluating alternative signalised and unsignalised intersection designs in terms of the Degree of Saturation (DoS), queue lengths and Level of Service (LoS) based on the performance criteria summarised in **Table 3.3**.

The volume-to-capacity (V/C) analysis of 2016 modelled link volumes provided further evidence to support the preferred 4 lane divided carriageway road network option, which provides spare capacity for future year traffic growth.

As a result, SIDRA models were developed for the worst case modelling scenario using 2031 AM peak traffic volumes extracted from the Option B1 EMME/2 model, which includes the Hub & WSELIA developments with external road upgrades.

Table 3.3: SIDRA Performance Criteria

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

SIDRA models were developed for the following 3 key intersections on the EPLR:

- Wallgrove Rd | Old Wallgrove Rd;
- Old Wallgrove Rd | New Southern Link Rd; and
- Wallgrove Rd | M7 Motorway Ramp.

Appendix B provides details of the layout and SIDRA results for each intersection, including the modelled cycle time, turning volumes, the performance of each approaching arm and movement, and a summary of the results of each intersection as a whole.

Table 3.4 shows a summary of the results (each intersection as a whole) for the 2031 AM peak SIDRA models, including the Degree of Saturation (DoS), average delay and Level of Service (LoS) for the 3 modelled intersections.

Table 3.4: Intersection Performance – Option B1 2031 AM Peak Hour

Intersection Location	Degree of Saturation (DoS)	Ave Delay (Sec | Vehicle)	Level of Service (LoS)
Wallgrove Rd | Old Wallgrove Rd	0.91	53.4	D
Old Wallgrove Rd | New Southern Link Rd	0.88	32.4	C
Wallgrove Rd | M7 Motorway Ramp	0.90	50.2	D

In summary, the results of the SIDRA modelling indicate that all of the 3 intersections on Erskine Park Link Road network would operate with an appropriate Level of Service, acceptable vehicle delays and will have sufficient capacity to accommodate forecast traffic movements that will be generated by the Hub and WSELIA developments.

The intersection analysis undertaken as part of this study was based on the strategic model and would be reassessed during the project approval stage before finalising the configuration of intersections on the EPLR network.

4.0 Conclusion

The purpose of the supplementary traffic study was to assess the EMME/2 and SIDRA modelling that was undertaken by the RTA as a result of specific traffic related queries raised in submissions following the public exhibition to the concept plan, including:

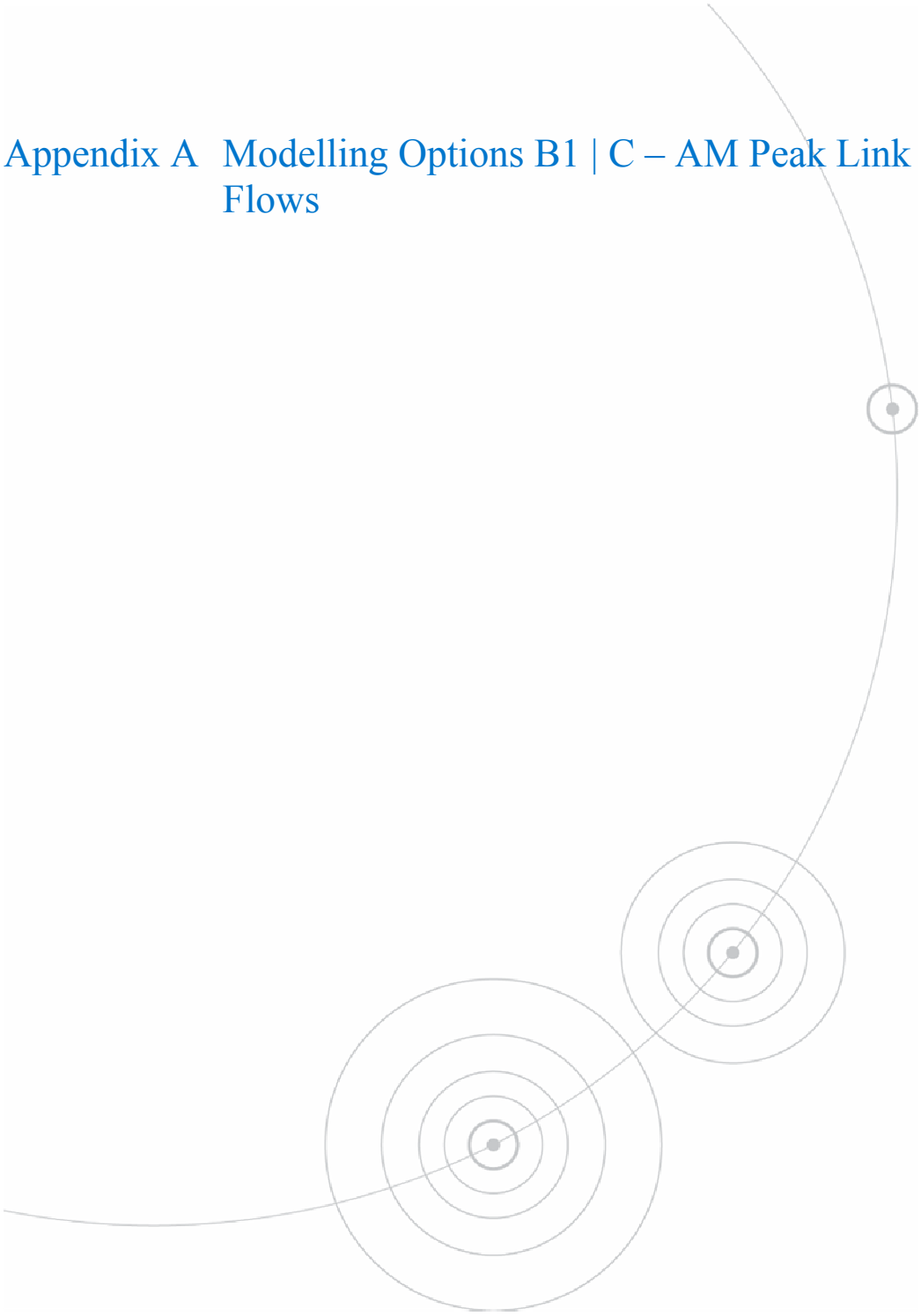
- Overview of the network and intersection modelling prepared by the RTA in response to revised land use assumptions (including WSELIA); and
- Assessment of the impact of revised modelling assumptions to confirm the RTA proposed 4 lane divided carriageway is required and also adequate to serve the proposed SWP | NWP developments.

The concept plan for the Erskine Park Link Road (EPLR) included the 4 lane divided carriageway that will be required to serve the proposed NWP | SWP developments. Analysis of the results for the revised modelling options, based on updated employment forecasts, provides further evidence to support the preferred road network option with 4 lanes for all of the road links, with the potential staging of the internal north-south A link.

The SIDRA intersection modelling also indicates that 3 key intersections on EPLR network would operate with an appropriate Level of Service, acceptable vehicle delays and will have sufficient capacity to accommodate forecast 2031 traffic movements that will be generated by the Hub and WSELIA developments.

The intersection analysis undertaken as part of this study was based on the strategic model and would be reassessed during the project approval stage before finalising the configuration of intersections on the EPLR network.

Appendix A Modelling Options B1 | C – AM Peak Link Flows

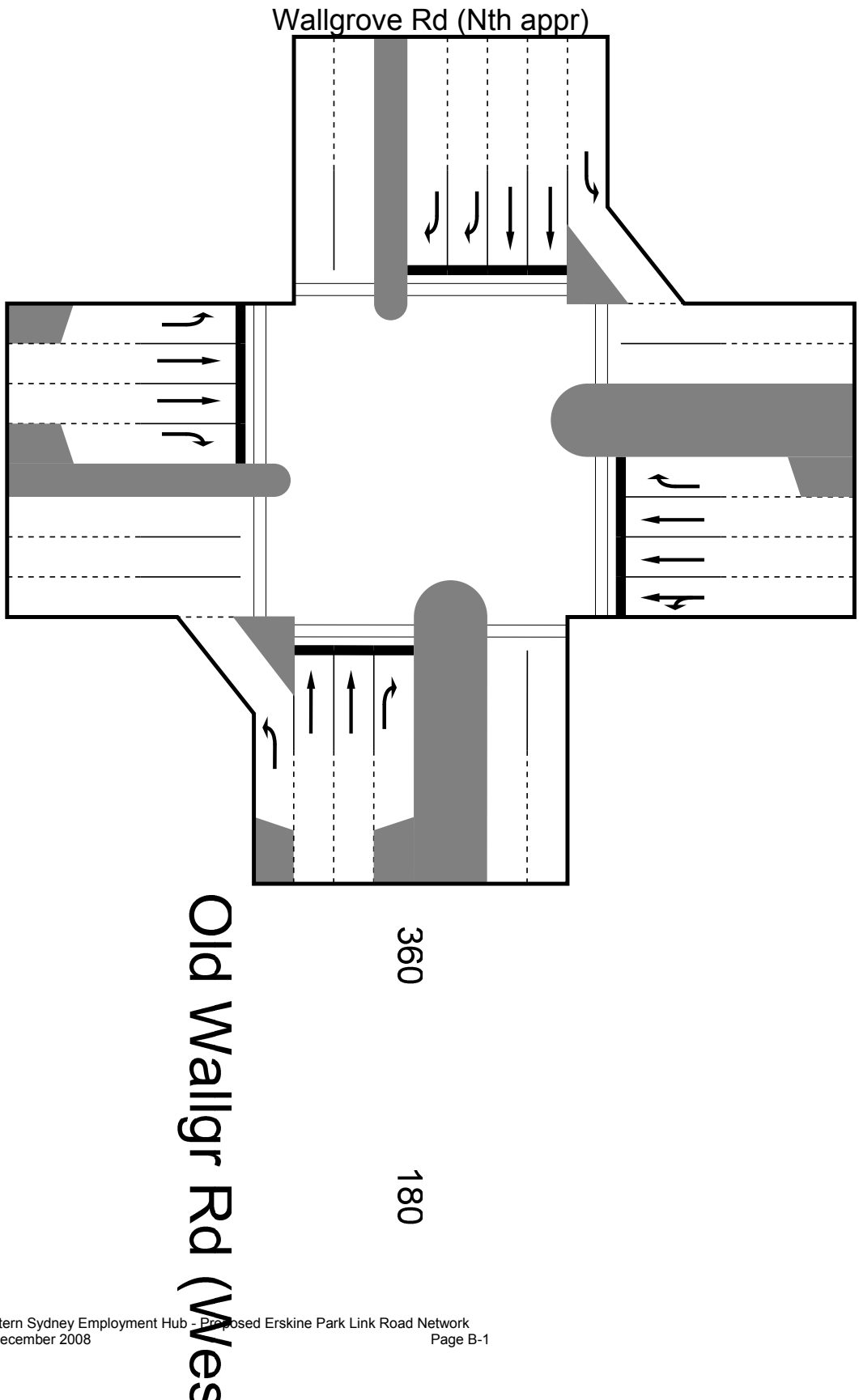


Network Scenarios B1 & C: 2016 2hr (07:00-09:00) AM Peak Link Volumes – Previous | Revised Modelling

Location	North | Eastbound				South | Westbound			
	Option C		Option B1		Option C		Option B1	
	Prev	Rev	Prev	Rev	Prev	Rev	Prev	Rev
Mamre Rd	1,804	**1,491**	1,094	**1,294**	2,132	**3,546**	3,568	**4,736**
Erskine Pk Rd	709	**612**	738	**571**	2,185	**1,944**	2,934	**2,190**
Erskine Pk Link Rd	2,796	**3,377**	2,732	**2,978**	326	**592**	263	**373**
Southern Route	160	**710**	2,834	**2,494**	105	**408**	446	**523**
Archbold Rd	475	**371**	610	**392**	2,386	**1,712**	3,199	**2,001**
Wonderland Dr	200	**206**	202	**204**	935	**1,144**	976	**1,147**
Old Wallgrove Rd	736	**775**	823	**827**	1,724	**1,102**	2,976	**2,305**
Direct Connection (Link 5)	1,200	**1,325**	1,022	**985**	2,319	**1,378**	2,414	**1,309**
Southern Route Ext	-	-	1,054	**1,109**	-	-	3,241	**1,676**
North | South A	-	-	585	**410**	-	-	909	**1,091**
North | South B	-	-	438	**348**	-	-	2,259	**1,601**
Wallgrove Rd Nth	1,934	**2,823**	1,907	**2,796**	3,025	**3,400**	3,486	**3,885**
Nth Link 5	1,591	**1,873**	1,454	**1,791**	1,996	**2,185**	2,120	**2,334**
Sth Link 5	2,377	**2,344**	1,400	**2,130**	2,471	**2,777**	2,203	**2,356**
Wallgrove Rd Sth	2,448	**2,244**	2,806	**2,029**	2,120	**2,290**	2,305	**1,868**
M4	11,784	**12,113**	12,006	**11,961**	7,462	**7,575**	7,522	**7,598**
M7 Nth	4,973	**5,294**	5,084	**5,425**	5,677	**6,247**	7,686	**6,993**
M7 Sth Link 5	5,782	**5,469**	6,612	**5,432**	4,640	**5,246**	5,671	**5,118**
M7 Sth	5,782	**5,469**	6,925	**5,432**	4,640	**5,246**	4,675	**5,118**

Appendix B Strategic Intersection Modelling Results – 2031 AM Peak

Strategic Layout and Analysis: Wallgrove Road | Old Wallgrove Road



SIDRA INTERSECTION

Movement Summary

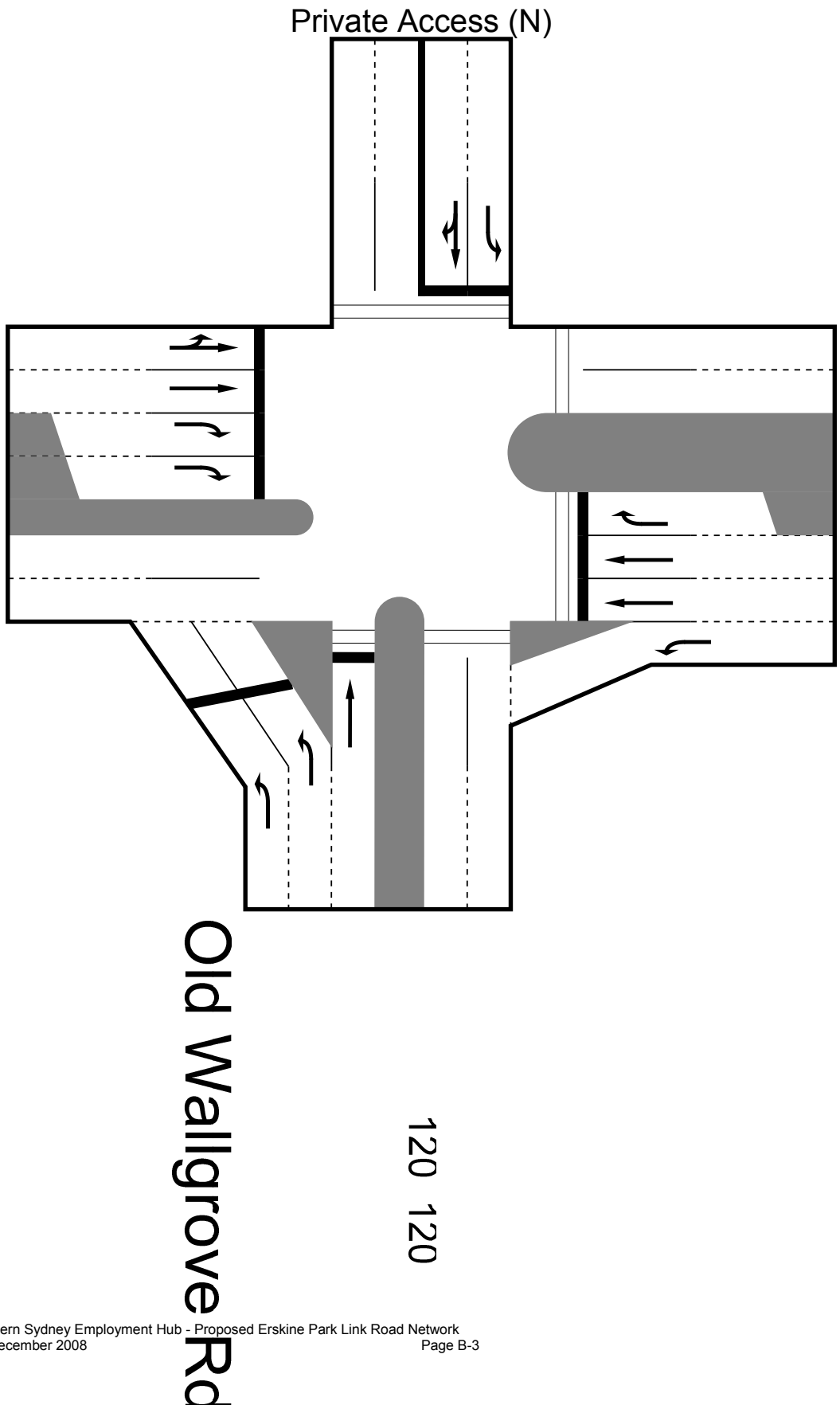
INTERSECTION OF WALLGROVE AND OLD WALLGROVE ROADS - EASTERN CREEK (C0)

AMP 2031

Signalised - Fixed time **Cycle Time = 120 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Wallgrove Rd (Sth appr)										
1	L	50	10.0	0.066	22.3	LOS C	16	0.55	0.70	29.8
2	T	895	10.0	0.885	53.9	LOS D	211	1.00	1.01	17.0
3	R	50	10.0	0.199	45.3	LOS D	25	0.81	0.73	19.5
Approach		**996**	**10.0**	**0.885**	**51.9**	**LOS D**	**211**	**0.97**	**0.98**	**17.5**
Old Wallgrr (East appr)										
4	L	740	10.0	0.898	48.7	LOS D	375	0.98	1.05	25.8
5	T	792	10.0	0.898	60.9	LOS E	375	1.00	1.06	22.5
6	R	91	9.9	0.890	81.3	LOS F	59	1.00	0.98	18.8
Approach		**1623**	**10.0**	**0.898**	**56.4**	**LOS E**	**375**	**0.99**	**1.05**	**23.6**
Wallgrove Rd (Nth appr)										
7	L	195	9.7	0.143	8.6	LOS A	12	0.16	0.64	48.9
8	T	916	10.0	0.900	56.1	LOS E	221	1.00	1.03	23.6
9	R	797	10.0	0.910	72.0	LOS E	209	1.00	1.09	20.3
Approach		**1908**	**10.0**	**0.910**	**57.9**	**LOS E**	**221**	**0.91**	**1.01**	**23.3**
Old Wallgr Rd (West App)										
10	L	502	10.0	0.563	29.6	LOS C	156	0.73	0.83	30.5
11	T	77	10.4	0.098	40.4	LOS D	19	0.76	0.57	25.7
12	R	50	10.0	0.497	71.0	LOS E	32	1.00	0.75	18.2
Approach		**629**	**10.0**	**0.563**	**34.2**	**LOS C**	**156**	**0.76**	**0.80**	**28.3**
All Vehicles		**5156**	**10.0**	**0.910**	**53.4**	**LOS D**	**375**	**0.93**	**0.99**	**22.9**


Private Access (N)
Old Wallgrove Rd
120
120

SIDRA INTERSECTION

Movement Summary

The Intersection of Old Wallgrove and Mini Link Road (C1)

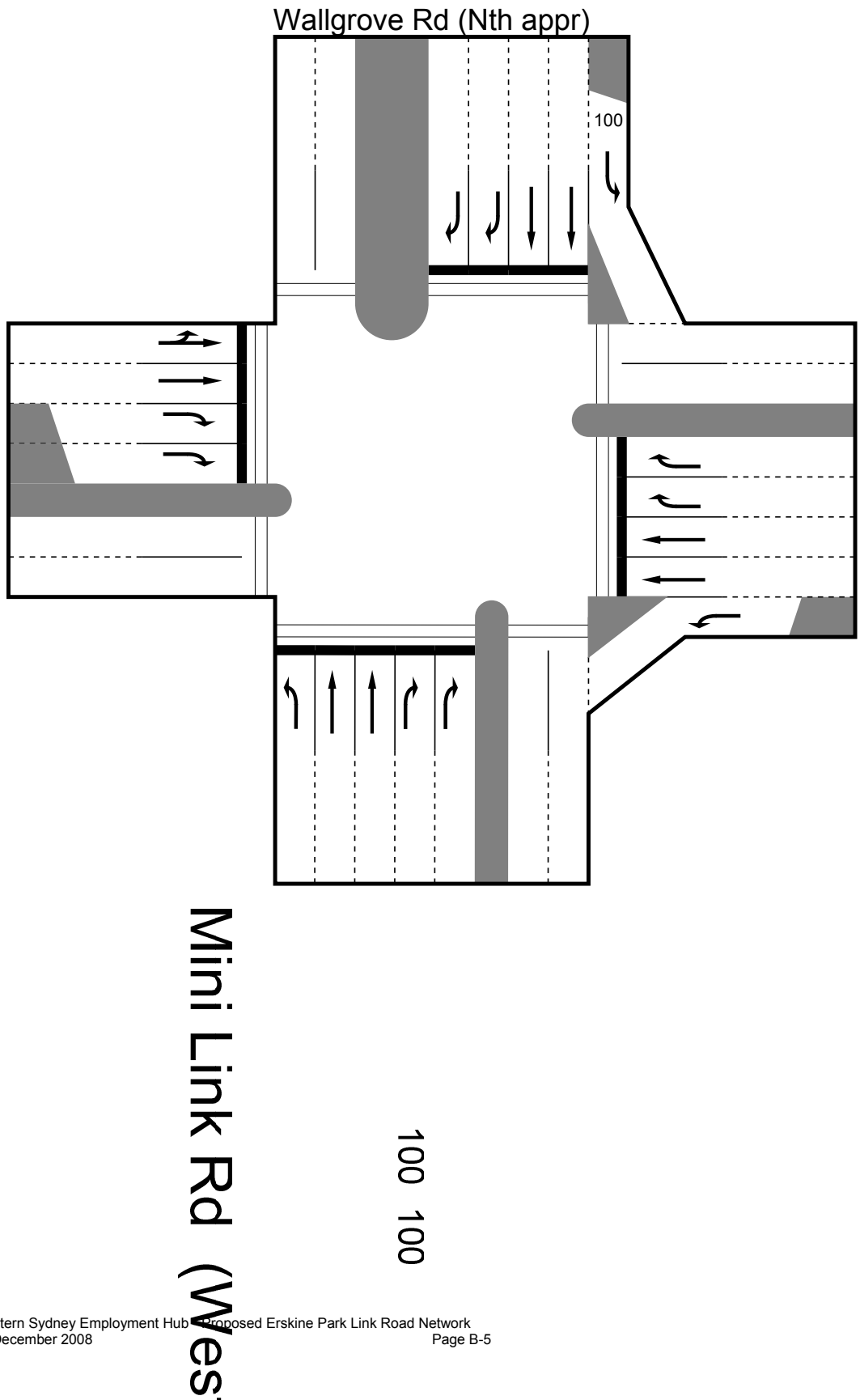
AMP 2031

Signalised - Fixed time **Cycle Time = 140 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Link Rd (S)										
1	L	346	10.1	0.114	9.2	LOS A	18	0.15	0.64	48.3
2	T	67	10.3	0.271	59.3	LOS E	42	0.90	0.70	22.8
Approach		**415**	**10.1**	**0.271**	**17.4**	**LOS B**	**42**	**0.27**	**0.65**	**40.9**
Old Wallgrove Rd (E)										
4	L	3	25.0	0.003	9.8	LOS A	1	0.21	0.61	34.4
5	T	1669	10.0	0.878	28.3	LOS C	356	0.86	0.83	33.8
6	R	5	16.7	0.026	64.8	LOS E	4	0.89	0.67	9.4
Approach		**1680**	**10.1**	**0.878**	**28.4**	**LOS C**	**356**	**0.86**	**0.83**	**33.7**
Private Access (N)										
7	L	7	12.5	0.012	35.0	LOS D	4	0.62	0.69	30.7
8	T	11	10.0	0.195	71.0	LOS E	16	0.98	0.70	20.3
9	R	11	10.0	0.194	79.1	LOS E	16	0.98	0.71	19.0
Approach		**28**	**10.7**	**0.195**	**63.6**	**LOS E**	**16**	**0.88**	**0.70**	**21.9**
Old Wallgrove Rd (W)										
10	L	62	9.7	0.349	31.2	LOS C	97	0.47	0.81	32.4
11	T	602	10.0	0.350	18.9	LOS B	97	0.46	0.42	39.5
12	R	408	10.0	0.861	82.0	LOS F	125	1.00	0.98	8.6
Approach		**1073**	**10.0**	**0.861**	**43.6**	**LOS D**	**125**	**0.66**	**0.66**	**23.4**
All Vehicles		**3196**	**10.0**	**0.878**	**32.4**	**LOS C**	**356**	**0.72**	**0.75**	**30.5**

Strategic Layout and Analysis: Wallgrove Road | M7 Motorway Ramp



SIDRA INTERSECTION

Movement Summary

Wallgrove Rd, Mini Link Rd and M7 Ramp Junction at Eastern Creek (E3)

AMP 2031

Signalised - Fixed time **Cycle Time = 130 seconds**

Vehicle Movements

Mov ID	Turn	Dem Flow (veh/h)	%HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Wallgrove Rd (sth appr)										
1	L	202	9.9	0.197	21.9	LOS C	57	0.50	0.76	29.8
2	T	532	10.0	0.340	26.8	LOS C	97	0.72	0.62	26.6
3	R	403	9.9	0.879	79.6	LOS E	118	1.00	1.01	12.9
Approach		**1137**	**9.9**	**0.879**	**44.7**	**LOS D**	**118**	**0.78**	**0.78**	**19.6**
M7 Off/Onload ramp										
4	L	30	10.0	0.038	19.3	LOS B	9	0.48	0.68	39.5
5	T	283	9.9	0.523	56.4	LOS E	77	0.97	0.79	23.5
6	R	363	9.9	0.898	83.2	LOS F	111	1.00	1.03	18.4
Approach		**676**	**9.9**	**0.898**	**69.1**	**LOS E**	**111**	**0.97**	**0.91**	**20.8**
Wallgrove Rd (Nth appr)										
7	L	50	10.0	0.072	12.9	LOS B	10	0.33	0.66	37.9
8	T	1382	10.0	0.883	39.2	LOS D	313	0.94	0.94	21.2
9	R	274	9.9	0.598	67.1	LOS E	77	0.99	0.80	14.7
Approach		**1706**	**10.0**	**0.883**	**42.9**	**LOS D**	**313**	**0.93**	**0.91**	**20.0**
Mini Link Rd (West App)										
10	L	20	10.0	0.720	67.4	LOS E	103	0.99	0.86	18.7
11	T	372	9.9	0.723	59.2	LOS E	103	0.99	0.85	20.4
12	R	139	10.1	0.344	66.6	LOS E	43	0.96	0.77	19.0
Approach		**531**	**10.0**	**0.723**	**61.4**	**LOS E**	**103**	**0.98**	**0.83**	**19.9**
All Vehicles		**4050**	**10.0**	**0.898**	**50.2**	**LOS D**	**313**	**0.90**	**0.86**	**20.1**