

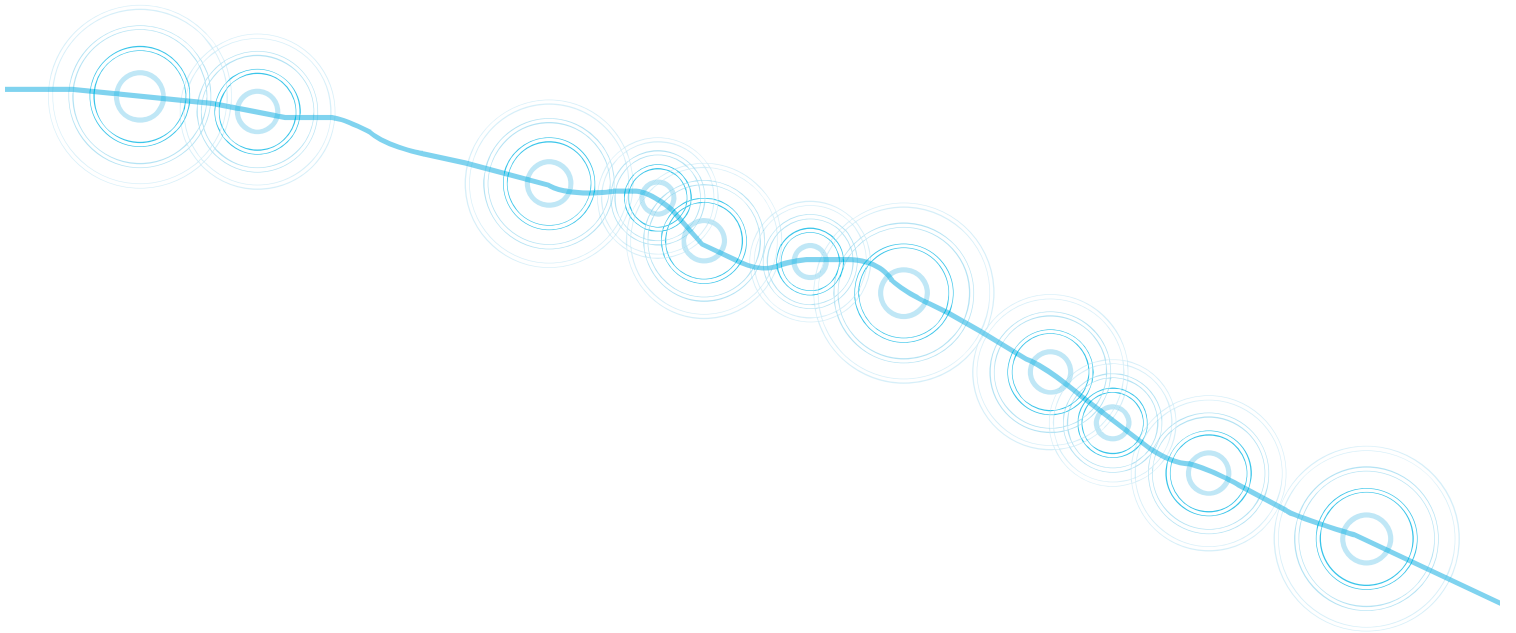
ATTACHMENT D

ATTACHMENT D

**ASHMORE PRECINCT TRAFFIC AND
PARKING ASSESSMENT BY AECOM**

ASHMORE PRECINCT

TRAFFIC AND PARKING ASSESSMENT



Ashmore Precinct

Traffic and Parking Assessment

Prepared for

City of Sydney Council

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

ABN 20 093 846 925

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Executive Summary

AECOM have been commissioned by City of Sydney Council (Council) to undertake an assessment of the proposed Ashmore Precinct, a high density urban renewal area in the Inner West suburb of Erskineville. Once developed, the Ashmore Precinct will increase population and demand on infrastructure, including the local road network.

This report sets out an assessment of the likely impact of the Ashmore Precinct on the local road network across the varying stages of development, and proposes mitigation measures in response to the increase in vehicle travel demand.

This report provides Council with an understanding of the issues surrounding the development of the Ashmore Precinct, considering future network growth, traffic issues, parking and public transport implications and required network upgrades in order to ensure that the operation of the local road network remains satisfactory during and on completion of the precinct's development.

The Ashmore Precinct itself is anticipated to be constructed in stages, as highlighted in **Table 1.1**. At completion the precinct will contain approximately 3,485 dwellings and a total population of approximately 6,300 people. The end state peak hour traffic generation at full development of the precinct, network capacity permitting, is anticipated to be approximately 1,000 trips in the peak hour.

Table 1.1 Proposed Ashmore Precinct Overview

Year	Gross Floor Area (m ²)	Dwellings	Population	Traffic Generation (Peak Hour)
By 2017	92,911	1,394	2,509	404
By 2022	141,492	2,122	3,820	615
By 2027	196,584	2,949	5,308	855
Beyond 2027	232,352	3,485	6,274	1,011

Source: City of Sydney Council; 2012; RMS, 2002

Five precinct development scenarios were modelled to assess the future operation of the road network against the projected traffic volumes. These were as follows:

- Scenario 1 – No Development with Required Infrastructure Improvements (Years Assessed – 2017 and 2022);
- Scenario 2 – Partial Development with Required Infrastructure Improvements (2017 and 2022);
- Scenario 3 – Partial Development with No Network Modifications (2017 and 2022);
- Scenario 4 – Full Development of Ashmore Precinct with Required Infrastructure Improvements (2027); and
- Scenario 5 – Full Development of Ashmore Precinct with Trip Reduction if required (2027).

Even without the Ashmore Precinct proceeding some network modifications are recommended to ensure the continued efficient operation of the local road network. This includes the signalisation of the Mitchell Road / Maddox Street intersection and reconfiguration of the Mitchell Road / Sydney Park Road intersection.

Should the Ashmore Precinct development proceed as planned, a series of infrastructure improvements are recommended for consideration by Council, to be implemented in stages until full development in 2027. These modifications will allow the network to continue to operate efficiently in the future with the additional background traffic growth forecast and traffic resulting from the development of the Ashmore Precinct.

Infrastructure Improvements

1. Network and Geometric Modifications

- Signalisation of Mitchell Road / Maddox Street Intersection;
- Revised lane configuration at Mitchell Road / Sydney Park Road Intersection;
- Parking restrictions on Mitchell Road between Copeland Street and Fountain Street and between Sydney Park Road and Coulson Street;
- Phasing alteration at the intersection of Mitchell Road / Coulson Street / Huntley Street; and
- Right turn movement ban on Harley Street.

The timing of these proposed upgrades is set out in **Table 1.2** and a location plan provided in **Figure 1.1**.

Table 1.2 Implementation of Proposed Network and Geometrical Modifications for Ashmore Precinct

Network Modification	2017			2022			Beyond 2027		
	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Lane configuration of Mitchell Road / Sydney Park Road Intersection	√	√	√	√	√	√	√	√	√
Parking Restrictions on south-eastern side of Mitchell Road between Sydney Park Road and Coulson Street	X	√	√	√	√	√	√	√	√
Phasing alteration Mitchell Rd / Coulson St	X	X	√	X	X	√	X	X	√
Proposed signalisation of Mitchell Road / Maddox Street Intersection	√	√	√	√	√	√	√	√	√
Right turn movement ban implemented on Harley Street	X	X	X	X	√	X	X	√	√
Parking Restrictions on southern side of Mitchell Road between Copeland Street and Fountain Street	X	√	√	√	√	√	√	√	√
Parking Restrictions on northern side of Mitchell Road between Copeland Street and Fountain Street	X	√	X	√	√	√	√	√	√

Key

X Not required √ Required

Source: AECOM; 2013

The implementation of these modifications will result in the permanent removal of at least three on-street parking spaces and parking restrictions being implemented during peak periods impacting 31 spaces.

It should be noted that in order to successfully implement the above modifications co-operation between the State Government and City of Sydney Council is required for the following local roads as they are classified as State roads and do not fall under Council's control:

- Mitchell Road (between Copeland Street and Fountain Street)
- Copeland Street;
- Fountain Street; and
- Sydney Park Road.

Figure 1.1 Proposed Network and Geometrical Modifications for Ashmore Precinct



Source: AECOM; 2013, modified from City of Sydney; 2012

2. On-Street Parking

Adoption of parking controls in the form of a residents' permit parking scheme should be considered to manage parking demand on the streets near the development, in order to preserve parking availability for existing residents. It is recommended that this covers:

- The area immediately to the east of the Ashmore Precinct site, including Lawrence Street, Mitchell Road, Belmont Street, Maddox Street, Hartley Street and Huntley Street; and
- The area north west of the site, including Bridge Street, Malcolm Street, Binning Street and Ashmore Street.

It is recommended that the aforementioned permit area is reviewed, and potentially expanded, following completion of the 2017 stage of the Ashmore Precinct. The success of this parking strategy is also dependent on appropriate levels of enforcement.

3. Public Transport

- Modification to Route 370 (Leichhardt – Coogee) and Route 355 (Marrickville Metro – Bondi Junction) to travel via the intersection of Mitchell Road / Maddox Street, allowing for greater catchment for the service and accessibility for residents;
- Increased service frequency for Route 308 (Marrickville Metro – St Peters – Redfern – City) to allow higher frequency service provision for residents to access the city; and
- Improved hours of operation for all services until 10PM on weekdays to accommodate increased passenger movements. This revised timetable should take effect prior to 2017 in order to define travel behaviours amongst residents from the outset.

Modelling results indicate that in 2017 and 2022, based on the above network and geometrical modifications, the local road network will perform at acceptable levels of service. At full development (Beyond 2027) modelling results indicate a trip reduction of 125 trips from the precinct is required in the AM peak hour. This could be achieved through an increase in public transport and active transport, such as cycling, trip rates.

The recommended network modifications in conjunction with on-street parking and public transport initiatives provide a balanced approach in mitigating the potential impact of the Ashmore Precinct development on the local road network.

Any changes to bus service routing and scheduling would require approval from Transport for NSW (State Transit Authority).

1.0 Introduction

1.1 Background

The 17 hectare Ashmore Precinct site is located within the suburb of Erskineville, in Sydney's Inner West, and is currently occupied by light commercial/industrial land uses. The City of Sydney Council (Council) has identified the locality of Ashmore as an area for urban renewal due to its proximity to compatible surrounding land uses, amenities and public transport linkages, namely Erskineville and St Peters railway stations. Accordingly this renewal will bring about higher densities and population growth to the area. Some development has already occurred in the precinct, with a recent approval for development on the 'Leighton' site.

Council recently received over 900 submissions from the local community on the proposed development, which included issues raised on provision of adequate infrastructure. The impact which any future network modifications will have on parking availability is also a key issue in the local community, something AECOM is aware of having been recently involved in the Alexandria Parking Study Peer Review.

1.2 Study context

Council has commissioned this traffic assessment to investigate future network growth, associated traffic management issues, as well as parking and network upgrades to ensure that the operation of the local area traffic network remains satisfactory after the construction of the Ashmore Precinct. The outcomes of this study will assist the Ashmore Precinct in achieving the goals of Council's policy document Sustainable Sydney 2030, such as:

- Providing integrated transport for a connected city;
- A city of pedestrians and cyclists;
- Vibrant communities and economies; and
- Sustainable development, renewal and design.

1.3 Objectives

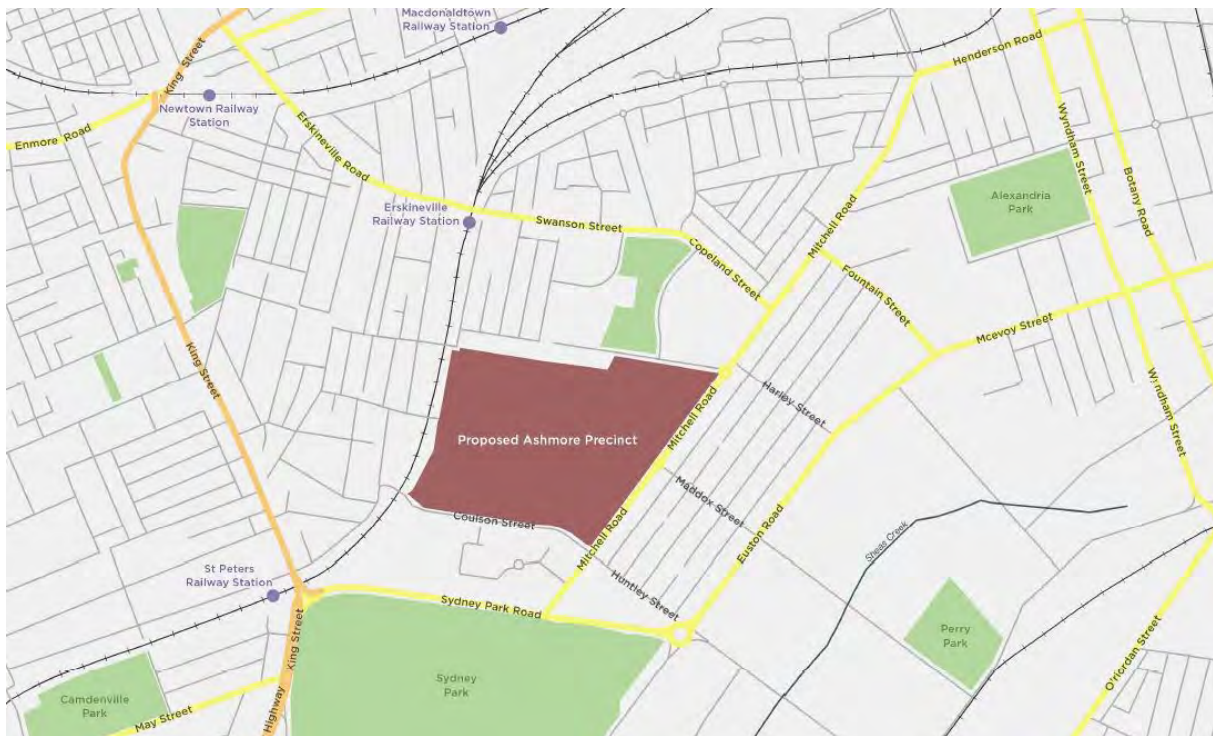
The objectives of the study are to:

- Provide an appraisal of current traffic and transport conditions in the area surrounding the Ashmore Precinct.
- Develop a local traffic / transport assignment for the recommended development scenarios.
- Analyse the potential impacts of the recommended development scenarios on the local road network and on-street parking.
- Provide recommendations for reducing or managing potential impacts arising from development of the Ashmore Precinct, including strategies for improvements to public transport accessibility and capacity.

1.4 Study area

The study area for the Ashmore Precinct is bounded by Copeland Road to the north, Sydney Park Road to the south, Mitchell Road to the east and King Street to the west. The proposed 17 hectare Ashmore Precinct site itself is bounded by Ashmore Street to the north, Coulson Street to the south, Mitchell Road to the east and the Bankstown railway line Copeland Street (Erskineville Road) to the west. **Figure 1.1** provides the context for the development, study area, and surrounding geographical boundaries.

Figure 1.1 Precinct Locality Map



Source: AECOM; 2013

1.5 Report Structure

The remainder of this report is structured as per the following sections:

- **Section 2** provides local area context for the Ashmore Precinct and surrounds encompassing population profile, mode share, available public transport, a review of the local road network and existing intersection performance within the study corridor;
- **Section 3** discusses the proposed Ashmore Precinct development;
- **Section 4** discusses the associated network impacts of the development and proposed geometric modifications and improvements to the network, as a result of the development, and/or required due to background growth along the corridor. The costs, timing, implications and strategies regarding these modifications and improvements are discussed; and
- **Section 5** provides a summary of the report and associated recommendations in relation to the Ashmore Precinct.

2.0 Local Area Context

2.1 Population

In 2011, the suburb of Erskineville had a population of 6,848 within an area of 0.8 square kilometres. The suburb is characterised by high attainment of education, high household incomes and low car ownership compared to the New South Wales and Australian averages.

This is highlighted in the following statistics from the 2011 Census (ABS, 2012).

- Approximately 39 per cent of Erskineville residents have studied at University or a tertiary institution compared with an average of 14 per cent across NSW and Australia;
- Households own, on average, one motor vehicle with 30 per cent of people commuting to work as a 'car driver'. In NSW and across Australia the average is 58-60%. This indicates the area has above average use of public transport, walking and cycling as modes of transport to work.

2.2 Mode Share Data

Travel patterns have been examined using Journey to Work (JTW) data from Travel Zone 281 (the Ashmore site), which was collected in the 2006 and 2011 census. This data shows how people travelled to work on census day, giving a good indication of regular travel patterns taken to work from the Ashmore Precinct. Trip mode is dependent on the location of an individual's dwelling within the travel zone. For example, residents on the eastern side of the travel zone near Mitchell Road are more likely to travel by bus compared to residents on the north-western side of the travel zone who are closer to Erskineville Railway Station.

Table 2.1 shows that 44 per cent of commuters travel to work by train or bus, representing the site's close proximity to two railway stations and bus services along Mitchell Road. From 2006 to 2011 it is evident that there has been a six per cent increase in travel by public transport, four per cent by other modes (including walking and cycling), while there has been a subsequent reduction in car trips of seven per cent.

When compared to journey to work travel data for the greater Sydney region, use of public transport is high from the precinct, with the average public transport use across Sydney at 20 per cent. While car travel is still a significant mode of travel from the Ashmore Precinct at 36 per cent, it is significantly lower than the Sydney average of 60 per cent.

Table 2.1 Journey to Work (JTW) mode share from Travel Zone 281 (Ashmore site)

Station	Proportion of trips (2006)	Proportion of trips (2011)	Difference
Car driver	39%	33%	-6%
Car passenger	4%	3%	-1%
Train	31%	37%	6%
Bus	8%	7%	-1%
Ferry or Tram	0%	0%	-
Other Modes	8%	12%	4%
Worked at home or did not go to work	9%	8%	-1%
Not Stated	1%	0%	-1%

Source: NSW Bureau of Transport Statistics (BTS), 2006 and 2011

2.3 Public and Active Transport

2.3.1 Train services

The Ashmore Precinct is located within walking distance to Erskineville and St Peters Railway Stations, providing access on the Bankstown line to services on the wider Cityrail network. **Table 2.2** shows the frequency of services on the Bankstown line, with a train every 15 minutes in each direction during the weekday peak periods, and during the day on weekends. Train services are every 20 minutes outside of the peak periods.

Table 2.2 Service frequency at Erskineville and St Peters Railway Stations

Service	Peak hour frequency
Bankstown Line (Liverpool or Lidcombe to City Circle via Bankstown)	15 minutes
Bankstown Line (City Circle to Liverpool or Lidcombe via Bankstown)	15 minutes

Source: www.131500.com.au

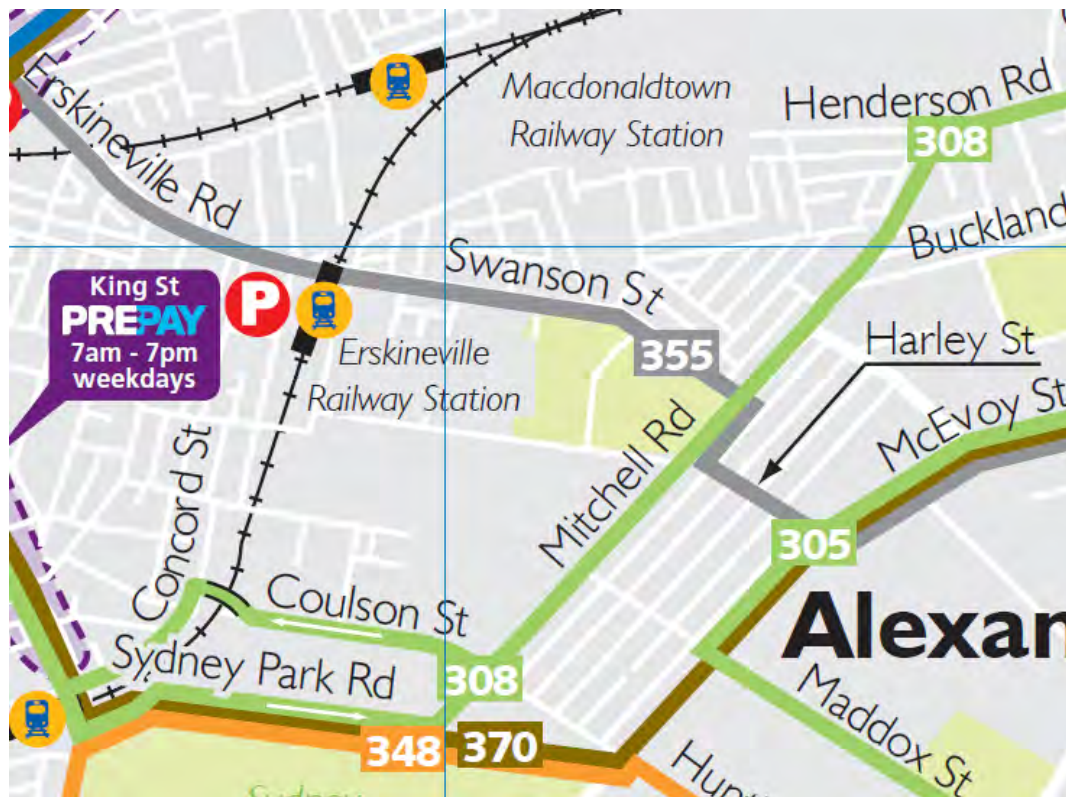
2.3.2 Bus Services

The area surrounding the Ashmore Precinct is served by a number of bus routes operated by Sydney Buses. The following city-bound and cross-suburban services serve the local area:

- 308 (Marrickville Metro – City);
- 355 (Marrickville Metro – Bondi Junction);
- 370 (Leichardt – Coogee); and
- 348 (Wolli Creek – Bondi Junction via UNSW).

Figure 2.1 highlights these routes in the vicinity of the proposed Ashmore Precinct.

Figure 2.1 Bus services in the Erskineville (Ashmore) area



Source: Sydney Buses, 2013

The frequencies of bus services in the local area are summarised in **Table 2.3**. All routes have frequencies of less than 30 minutes during the weekday peak periods; however on the weekend service levels are lower on Route 308 and Route 348 to Wolli Creek and Bondi Junction does not operate.

It should be noted that services cease operating early on weekdays on Route 308. The last city-bound service passes through Erskineville at around 5:20 pm, while the last service out of the City passes through at around 7:20PM on a weekday. There are also only seven services on Saturday and four on Sunday.

There are frequent 10 minute interval weekday services on Route 370 throughout the day, while there are 30 minute weekend services for Routes 370 and 355, an additional cross-suburban service from Marrickville to Bondi Junction.

At present bus service provision to and from the city out of business hours is poor, necessitating the use of private motor vehicles if residents reside away from the railway corridor. Many services are also at capacity and there is anecdotal evidence from the community which suggests that Route 308 is unreliable.

In addition the majority of these bus routes service only the south-eastern area of the precinct. Route 348 is unlikely to be used by Ashmore residents as Route 355 provides a quicker service to Bondi Junction and the 370 service is more frequent and reliable for accessing UNSW and Royal Randwick Hospital.

Table 2.3 Service frequency of bus routes in Erskineville (Ashmore)

Route	Weekday		Saturday		Sunday / Public Holiday	
	Frequency (Peak)	Daily Services	Frequency	Daily Services	Frequency	Daily Services
Route 308	15 minutes	19 services (6:40 – 19:20)	80 minutes	7 services (8:30 – 17:30)	90 minutes	4 services (10:05 – 15:35)
Route 355	30 minutes	27 services (5:40 – 18:45)	30 minutes	20 services (8:35 – 18:40)	30 minutes	20 services (8:35 – 18:40)
Route 370	10 minutes	>50 services (5:50 – 20:30)	30 minutes	27 services (8:25 – 20:25)	30 minutes	27 services (8:25 – 20:25)
Route 348	30 minutes	25 services (7:00 – 19:00)	N/A	N/A	N/A	N/A

Source: www.131500.com.au

2.4 Local road network

2.4.1 Road Hierarchy

2.4.1.1 Sydney Park Road

Sydney Park Road is a sub-arterial State Road connecting the Princes Highway with Mitchell Road and Euston Road, providing a key city and east-bound route from the south and western suburbs. It is a four lane road with a posted speed limit of 60km/h. There is no provision for parking on Sydney Park Road from Monday to Friday due to its sub-arterial role, with one lane of parking permitted on the northern side of the road during the weekend.

2.4.1.2 Fountain Street

Fountain Street is a State Road that provides a link between McEvoy Street and Mitchell Road. This forms part of a key link between McEvoy Street and Newtown via Copeland Street. It is a two lane collector road with a posted speed limit of 50km/h. There is one lane of unrestricted parking in each direction along Fountain Street, with no stopping zones in place within 40 metres of the intersection with Mitchell Road.

2.4.1.3 Mitchell Road

Mitchell Road is a four lane road, with one travel lane and one parking lane in each direction. It is classified as a State Road between Fountain Street and Copeland Street, with a posted speed limit of 50km/h. It is the principal collector which traverses the study area near the Ashmore site and connects Sydney Park Road in the south with Henderson Road in the north, providing a route to and from the CBD and Sydney's north. As well as providing a route to the city for commuters, Mitchell Road is a key collector road for localised trips travelling around Erskineville and Alexandria. Residential land use is present along the corridor, with associated parking using a lane on each side of the road.

2.4.1.4 Copeland Street / Swanson Street / Erskineville Road

The Copeland Street / Swanson Street / Erskineville Road corridor is a State Road which connects Mitchell Road in the east with Newtown in the west via Erskineville village and railway station. It is a two lane collector road with one lane of parking in each direction. The corridor has a posted speed limit of 50km/h.

2.4.1.5 Coulson Street

Coulson Street is a local road connecting Mitchell Road in the east to Concord Street and onward to King Street in the west, providing access across the rail corridor via an underpass. It is a two lane road with a parking lane on the northern side, and a posted speed limit of 50km/h.

2.4.2 Local Traffic Growth

Traffic patterns in the Ashmore area are variable and subject to fluctuation. **Table 2.4** provides a review of traffic growth across the local area network between 2009 and 2012. 2012 count data is provided for both Tuesday (18/9/12) and Thursday (13/9/12) traffic volumes. The comparison of these two days against 2009 volumes highlights the degree of variability across the corridor. Overall, across the Ashmore local area network the survey on Tuesday indicates a fall in traffic volumes whilst the Thursday survey indicates an increase in traffic volumes. It should also be noted that the 2009 data is based on a single count and as such is also subject to the same degree of variability as those undertaken in 2012. In addition at the time of the 2009 counts Maddox Street was closed to traffic due to construction of the desalination pipeline. **Figure 2.2** provides a graphical illustration of traffic growth on the Ashmore Local Area network.

Table 2.4 Background Traffic Growth

Intersection	Volume	AM Peak Hour		PM Peak Hour	
		Volume	% Change to 2009	Volume	% Change to 2009
Mitchell Rd / Fountain St	2009 (Halcrow Study)	1,476	-	1,583	-
	2012 (18/9/12)	1,492	1%	1,492	-6%
	2012 (13/9/12)	1,559	6%	1,696	7%
Mitchell Rd / Copeland St	2009 (Halcrow Study)	1,547	-	1,799	-
	2012 (18/9/12)	1,580	2%	1,719	-4%
	2012 (13/9/12)	1,659	7%	1,819	1%
Mitchell Road / Harley Street	2009 (Halcrow Study)	1,254	-	1,381	-
	2012 (18/9/12)	1,188	-5%	1,340	-3%
	2012 (13/9/12)	1,266	1%	1,404	2%
Mitchell Rd / Ashmore St	2009 (Halcrow Study)	1,322	-	1,420	-
	2012 (18/9/12)	1,346	2%	1,483	4%
	2012 (13/9/12)	1,404	6%	1,537	8%
Mitchell Rd / Maddox Street	2009 (Halcrow Study)	1,479	-	1,467	-
	2012 (18/9/12)	1,456	-2%	1,570	7%
	2012 (13/9/12)	1,530	3%	1,646	12%
Mitchell Rd Coulson Street / Huntley St	2009 (Halcrow Study)	1,648	-	1,559	-
	2012 (18/9/12)	1,575	-4%	1,516	-3%
	2012 (13/9/12)	1,670	1%	1,569	1%
Overall Ashmore Local Area Network	2009 (Halcrow Study)	8,637	-	9,298	-
	2012 (18/9/12)	8,578	-1%	9,179	-1%
	2012 (13/9/12)	8,987	4%	9,772	5%

Source: Skyhigh; 2012 and Halcrow; 2009



ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT

LOCAL NETWORK AREA TRAFFIC GROWTH

60275815



Assessed Intersection	Volume #	% Change from 2009
2009 (Halcrow Study)	#	%
2012 (18/9/12)	#	%
2012 (13/9/12)	#	%

Proposed Ashmore Precinct

2.4.3 Historical Traffic Volumes

Fluctuating traffic demands are also highlighted when observed across the wider network. Whilst no longer publically available Average Annual Daily Traffic (AADT) trends in the area, prior to 2005, have been reviewed to understand historical traffic patterns. They show a decreasing level of traffic volumes on the surrounding road network. AADT historical traffic volumes in the area are presented in **Table 2.5**.

Table 2.5 Historical traffic volumes (AADT)

Station	Road	Location	1996	1999	2002	2005
V 02.015	City Rd	South of Cleveland St	43,395	44,998	41,411	39,466
V 02.062	Enmore Rd	West of King St	28,241	26,876	26,009	25,208
V 02.396	King St	South of Enmore Rd	24,307	22,747	22,291	22,195
V 18.011	Princess Hwy	South of Yelverton St	58,886	-	53,623	52,763

Source: RMS; 2012

2.5 Existing Ashmore Precinct Land Use

As previously noted the Ashmore Precinct is predominantly used for light commercial/industrial purposes and some residential redevelopment has already occurred. In 2003 a traffic survey, undertaken by Arup (referenced in Halcrow; 2009), indicated the following traffic generation from the Ashmore site:

- In the AM peak a total of 175 vehicle movements;
- In the PM peak a total of 230 vehicle movements.

As part of this study AECOM revisited traffic generation from the precinct. Surveys, undertaken on 16th October 2012, indicate a decline in traffic generation from the site. The following vehicle numbers were recorded:

- In the AM peak a total of 141 vehicle movements;
- In the PM peak a total of 180 vehicle movements.

Existing site traffic generation was subsequently removed from future modelling analysis in order to prevent 'double counting' of private access trips from the Ashmore Precinct.

2.6 Existing Network Performance

A micro-simulation model of the Ashmore Precinct and surrounding road network was constructed using Paramics. In order to ensure the accuracy of future results AM, PM, and Saturday peak models were calibrated against existing intersection turning counts, travel time data and queue length surveys. The details of this calibration process can be found in the report entitled '*Ashmore Traffic and Parking Assessment – Paramics Base Year Model Calibration and Validation Report*' (released 1/11/12).

The capacity of an urban road network is controlled by the throughput of traffic at intersections within that network. Average delay is commonly used to assess the actual performance of intersections, with Level of Service (LoS) used as an index. A summary of the LoS index is shown in **Table 2.6**.

Table 2.6 Level of Service (LoS) Criteria for Intersections

Level of Service	Average Delay/ Vehicle (secs/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 Roundabouts require other control mode	At capacity; requires other control mode
F	>70	At capacity; at signals incidents will cause excessive delays Roundabouts require other control mode	At capacity; requires other control mode

Source: Guide to Traffic Generating Developments, RTA 2002

The existing performance of key intersections, on the local road network surrounding the Ashmore Precinct, is highlighted in **Table 2.7**. **Figure 2.4** provides a graphical illustration of the existing network performance.

In the AM peak the intersection of Mitchell Road / Maddox Street exceeds capacity with an average delay per vehicle of 71.5 seconds. This is equivalent to LoS F which indicates that the roundabout requires an alternate control mode which is not based on priority. Site visits indicated that the queue on the southern approach, under worst case conditions, could extend as far back as the intersection of Mitchell Road / Coulson Street / Huntley Street. **Figure 2.3** provides an illustration of average queuing levels from the Paramics modelling.

Figure 2.3 Mitchell Road / Maddox Street Northbound Queuing (2012 AM Peak)



Source: AECOM; 2013

In relation to overall intersection performance all other intersections recorded a LoS of C or better in the AM peak. Despite this certain approaches were shown to operate at poor LoS values (LoS F) such as the northern approach (Mitchell Road) to the intersection of Mitchell Road / Sydney Park Road and the western approach (Coulson Street) to the intersection of Mitchell Road / Coulson Street / Huntley Street.

In the PM and Saturday peak periods modelling indicates overall network performance is better than the AM peak with all intersections operating at LoS A or B as an average across the corresponding peak hours. Despite this modelling indicates that the following intersection approaches were found to operate at LoS D in either the PM or Saturday peak:

- Buckland Street (Intersection of Mitchell Road / Buckland Street);
- Huntley Street (Intersection of Mitchell Road / Coulson Street / Huntley Street);
- Coulson Street (Intersection of Mitchell Road / Coulson Street / Huntley Street); and
- Mitchell Road north approach (Intersection of Mitchell Road / Sydney Park Road).

A detailed intersection performance summary can be found in **Appendix A**.

Table 2.7 Existing Peak Hour Intersection Performance

Intersection	2012 AM Peak Hour (7:45 – 8:45)		2012 PM Peak Hour (17:00 – 18:00)		2012 Sat Peak Hour (12:15 – 13:15)	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	7	A	11.4	A	4.6	A
Mitchell Rd / Fountain St	11.6	A	17.3	B	13.7	A
Mitchell Rd / Copeland St	28.5	C	24.2	B	24.6	B
Mitchell Rd / Harley St	4.3	A	11.1	A	4.2	A
Mitchell Rd / Ashmore St	5.4	A	4.3	A	4.3	A
Mitchell Rd / Maddox St	71.5	F	8.7	A	26.2	B
Mitchell Rd / Coulson St / Huntley St	33.9	C	10	A	7.2	A
Mitchell Rd / Sydney Park Rd	17.1	B	24.4	B	21.9	B
King St / Concord St	7.8	A	13.9	A	9.2	A
George St / Victoria St	2.1	A	2	A	2.2	A

Source: AECOM; 2013



● Assessed Intersection
 ■ Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 BASE CASE 2012

60275815

Fig. 2.4

3.0 Proposed Development

3.1 Ashmore Precinct

It is proposed that, when fully occupied beyond 2027, the Ashmore Precinct will cater for approximately 6,300 residents who will be housed in 3,485 dwellings. These dwellings (apartments) are based on the following proportions:

- 15 per cent studio;
- 25 per cent one (1) bedroom;
- 40 per cent two (2) bedroom; and
- 20 per cent three (3) bedroom

Table 3.1 provides an indication of the likely staging of development, population and traffic generation for each stage whilst **Figure 3.1** provides an indicative layout plan for the precinct at completion.

Table 3.1 Proposed Ashmore Precinct Overview

Year	Gross Floor Area (m ²)	Dwellings	Population	Traffic Generation (Peak Hour)
By 2017	92,911	1,394	2,509	404
By 2022	141,492	2,122	3,820	615
By 2027	196,584	2,949	5,308	855
Beyond 2027	232,352	3,485	6,274	1,011

Source: City of Sydney Council; 2012

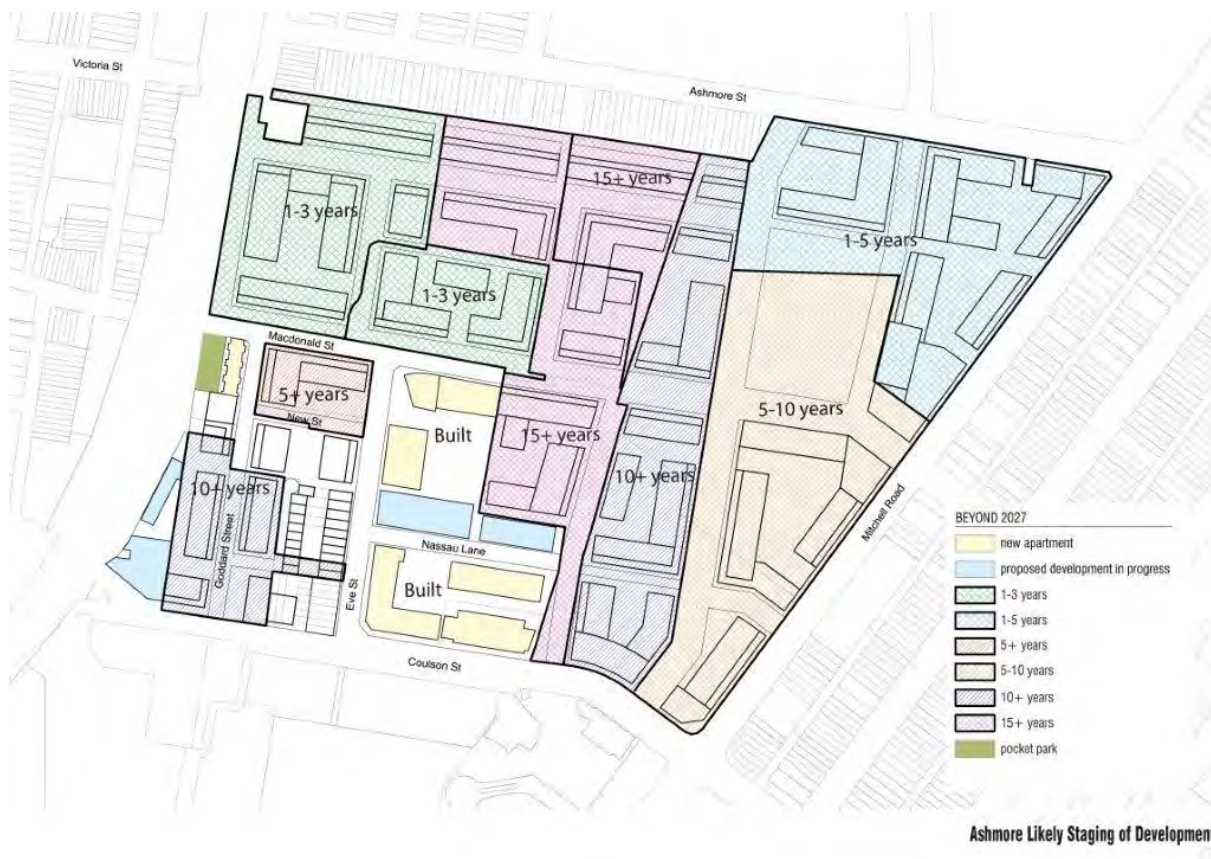
3.1.1 Access Points

The proposed Ashmore Precinct has the following key access points to the local road network:

- Intersection of Mitchell Road / Maddox Street (primary access point);
- Intersection of Coulson Street / Eve Street;
- Macdonald Street; and
- Ashmore Street.

There are also several localised accesses along Coulson Street and Mitchell Road.

Figure 3.1 Proposed Ashmore Precinct Layout



Source: City of Sydney Council; 2013

3.1.2 Traffic Generation and Trip Distribution

The traffic generation for each of the above stages was calculated using a trip rate of 0.29 peak hour vehicle trips per dwelling. This is taken from the RMS' Guide to Traffic Generating Developments (2002). The RMS guide has surveyed high density metropolitan sub-regional centres to determine likely traffic generation in the peak hour and this approach is the typical method of determining traffic generation for developments across NSW. In addition Journey to Work data, as discussed in **Section 2.2**, indicates a trend of decreasing car use in the area with the mode 'Car driver' falling from 39 per cent to 33 per cent.

Using the Ashmore Precinct development dwelling yield table and the RMS trip rate, peak hour trip distribution for the precinct was determined based on the percentages highlighted in **Table 3.2**. For the AM peak hour an 80:20 proportional split was assumed for traffic exiting and entering the site. This proportion was reversed to represent traffic flows to the precinct in the PM peak with volumes split 50:50 in the Saturday peak hour.

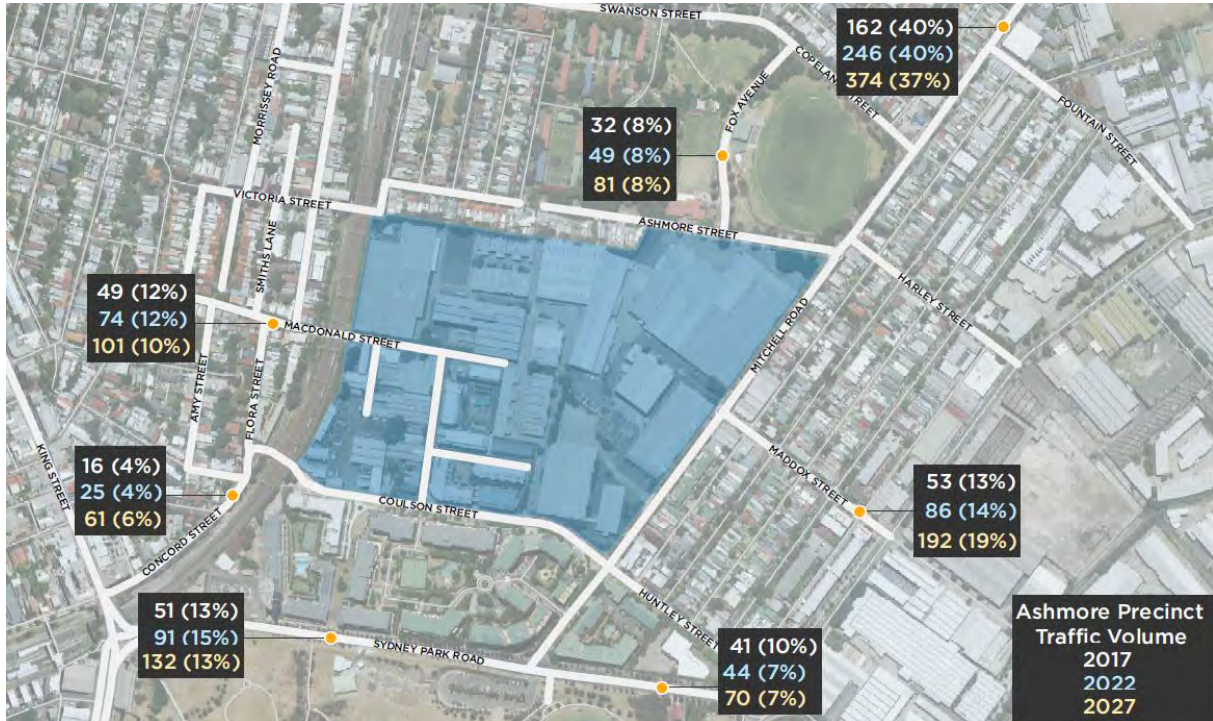
Table 3.2 Trip distribution from site

Station	Proportion of Trips (Outbound)	Proportion of Trips (Inbound)
Sydney City	35%	2%
East	20%	24%
Southeast	6%	4%
South/southwest	10%	49%
North/northwest	17%	13%
North Shore	13%	8%

Source: Bureau of Transport Statistics, 2012

The distribution of peak hour traffic on the local road network for the various analysis years is shown below in **Figure 3.2**. The peak period is defined as a one hour period in the AM peak (7:45-8:45AM), PM peak (5:00-6:00PM), or Saturday peak (12:15-1:15PM) time periods.

Figure 3.2 Proposed Peak Hour Trip Distribution



Source: AECOM; 2013

This distribution highlights that the majority of traffic is anticipated to travel to the east of the precinct along Mitchell Road.

In future years as trip generation from the precinct increases consideration should be given by Council regarding the need to introduce localised traffic calming in certain local residential streets in an effort to reduce ‘rat-running’ through local streets. One such area which could potentially be impacted is Belmont Street and Lawrence Street in the area around Fountain Street. These streets, and associated laneways, provide an alternate route for vehicles wishing to access the Mitchell Road corridor.

In addition the streets to the west of the precinct such as Smiths Lane, Flora Street, George Street and Ashmore Street may also require investigation in future years with regard to potential traffic calming measures.

4.0 Network Impacts and Modifications

4.1 Scenario Testing

In order to provide a detailed understanding of the impact of the proposed Ashmore Precinct, and associated geometric and network improvements required to ensure successful operation of the local road network, five precinct development scenarios were considered for evaluation. These scenarios were grouped into two differing subsets allowing for short term and long term strategic awareness. The first grouping, discussed below, provided a short term assessment. The following scenarios were assessed:

- **Scenario 1 – No Development (Years Assessed – 2017 and 2022):** The central focus of this scenario was the consideration of geometrical and network improvements required to improve the operation of the existing road network. This scenario assumed that the Ashmore Precinct was not constructed in order to indicate the minimum amounts of improvement needed in order to create a well performing local road network.
- **Scenario 2 – Development with Network Modifications (Years Assessed – 2017 and 2022):** Scenario 2 centres on the principle that if the Ashmore Precinct were to be constructed, as per the previous discussed staging plan, what level of geometric improvements and network modifications would be required to ensure satisfactory performance of the local road network.
- **Scenario 3 – Development with No Network Modifications (Years Assessed – 2017 and 2022):** Scenario 3 provides a worst case scenario from which to benchmark Scenario 1 and Scenario 2. Consideration is given to constructing the Ashmore Precinct without allowing for any network or geometric improvements with the exception of signalising the intersection of Mitchell Road / Maddox Street.

The second group of scenarios provided a long term strategic insight into the future implications of a fully developed Ashmore Precinct on the local road network surrounding the precinct. This included an assessment on:

- **Scenario 4 – Full Development of Ashmore Precinct (Year Assessed – 2027):** Operation of the local road network was considered in Scenario 4 under the assumption that the maximum amount of modifications permitted by City of Sydney Council (discussed below in **Section 4.2**) were implemented. The maximum trip generation as indicated in **Table 3.1** was also applied to the scenario.
- **Scenario 5 – Full Development of Ashmore Precinct with Trip Reduction (Year Assessed – 2027):** Despite the capacity improvements offered by the proposed network and geometrical improvements (**Section 4.2.2**) the beyond 2027 trip generation forecast was anticipated to result in unsatisfactory¹ performance levels for certain intersections on the local road network. The role of Scenario 5 was to identify required trip reduction levels, from the Ashmore Precinct, in order to ensure satisfactory operation of the local road network.

NB: All scenarios assumed the operation of the proposed Bunnings Warehouse development on Euston Road.

4.2 Network Improvements

4.2.1 Proposed Network and Geometrical Modifications

Mitchell Road is a secondary route for south-west / north-east movements in comparison to Euston Road and the primary route through the study area. This is an important consideration when factoring in future modifications to the local road network due to the key role Mitchell Road and the surrounding streets have for local residents, particularly with regards to on-street parking. The following network and geometric modifications are proposed in order to ensure the satisfactory operation of Mitchell Road and the surrounding local road network. It is important to note that these modifications have not been incorporated in all of the five scenarios and have only been used where required as a result of road capacity and intersection delay concerns. Discussion of what modifications are proposed during each peak and associated analysis year can be found in **Section 4.2.2**.

¹ For the purposes of this study unsatisfactory performance of an intersection was defined as the overall performance of an intersection being at a Level of Service D or lower.

Mitchell Road / Sydney Park Road

The intersection of Mitchell Road / Sydney Park Road currently experiences queuing on Mitchell Road as a result of insufficient capacity for right turning vehicles. In order to provide an increase in capacity at this location, for both existing vehicles and future vehicles as a result of the Ashmore Precinct, the following two intersection modifications are proposed.

The first is to convert the existing kerb side short lane into a lane which allows for all turning movements. This will require an additional phase for traffic currently exiting from Sydney Park however the frequency at which this phase is required will not impact on the intersection's operation. It is anticipated that due to the low demand from Sydney Park the existing three phase operation, with minor movement modifications, will continue. A concept layout of the proposed intersection modifications is highlighted in **Figure 4.1**. *The implementation of this modification would require consultation with the Roads and Maritime Services (RMS) who are the governing body for traffic signals in NSW.*

The second proposed modification is to introduce parking restrictions, when required, during AM, PM and Saturday peak periods between Sydney Park Road and Coulson Street on the south eastern side of Mitchell Road. The extent to which parking restrictions are proposed is shown in **Figure 4.2**. Currently parked vehicles in this location prevent effective lane utilisation between Coulson Street and Sydney Park Road. The parking removal will convert the existing short turn bay to a full traffic lane and increase the storage ability of the lane from approximately 35m to 120m. When operational the proposed restrictions would equate to the removal of approximately eight 'on-street parking' spaces.

The implementation of this modification would be possible by Council with the approval of the local traffic committee as Mitchell Road, between Copeland Street and Fountain Street, is not classified as a State Road.

Figure 4.1 Mitchell Road / Sydney Park Road Intersection Modification



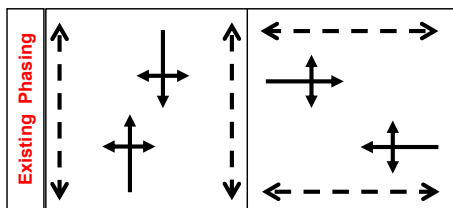
Source: AECOM; 2013, modified from City of Sydney; 2012

Mitchell Road / Coulson Street / Huntley Street

The intersection of Mitchell Road / Coulson Street / Huntley Street currently operates under a two phase arrangement. In future analysis years the increased level of southbound traffic flows are more susceptible to queuing as a result of delays incurred from the existing priority control for right turning vehicles from Mitchell Road to Coulson Street. The introduction of a dedicated right turn phase in the PM peak period for the northern approach removes the likelihood of this queue occurring. **Figure 4.3** and **Figure 4.4** indicate the existing and proposed phasing arrangements at the intersection.

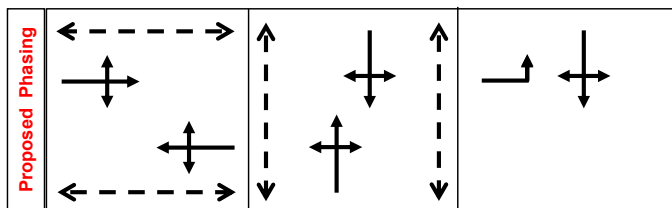
The implementation of this modification would require consultation and approval from the Roads and Maritime Services (RMS) who are the governing body for traffic signals in NSW.

Figure 4.3 – Mitchell Road / Coulson Street / Huntley Street Existing Phasing



Source: AECOM; 2013

Figure 4.4 – Mitchell Road / Coulson Street / Huntley Street Proposed Phasing



Source: AECOM; 2013

Mitchell Road / Maddox Street

The intersection of Mitchell Road / Maddox Street currently operates with lengthy queues and long average delays during peak periods. The traffic impacts on this intersection in the future are likely to increase as a result of the approved Bunnings Warehouse development on Euston Road. In addition one of the 'main' Ashmore Precinct access point is via a new access which opposes Maddox Street, further increasing traffic volumes at this location. As a result it is recommended to convert the existing roundabout into a signalised intersection. The benefits of the signalised intersection are:

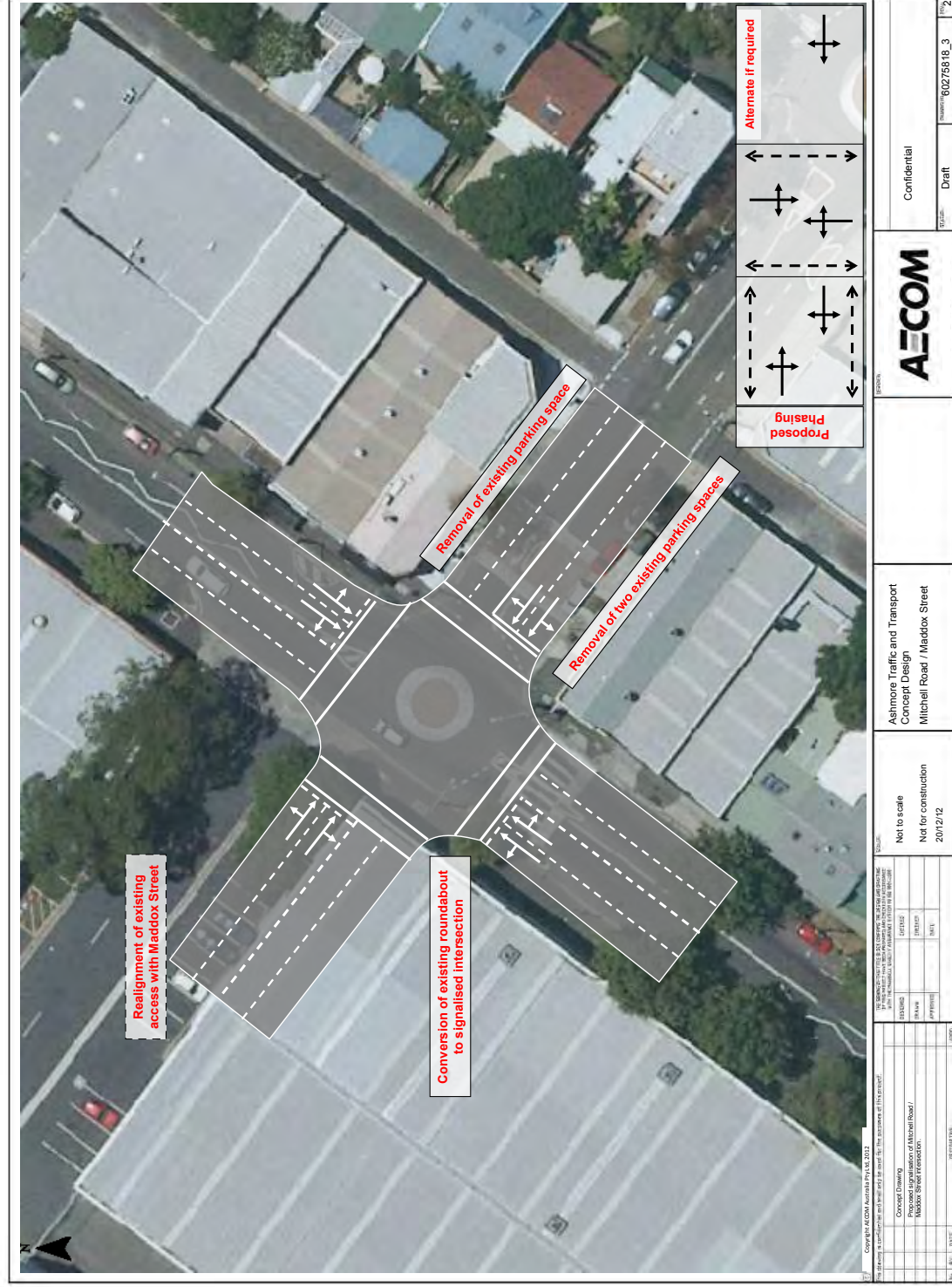
- Removal of delays caused by pedestrians using the existing pedestrian crossing, to vehicles on Mitchell Road, which will increase in future as a result of the development;
- Removal of priority for right turning vehicles on Maddox Street which delay the dominant northbound movement on Mitchell Road. The reverse occurs in the PM peak with regards to delaying vehicles on Maddox Street as a result of the dominant southbound movement on Mitchell Road; and
- Increased capacity to allow for vehicles accessing/egressing the Ashmore Precinct.

A concept illustration of the proposed intersection can be seen in **Figure 4.5**.

In accordance with the Roads and Maritime Services (RMS) Technical Direction 'Stopping and Parking Restrictions at Intersections and Crossings' (2011) it is not permissible to provide parking for vehicles within 20m measured from the adjacent kerb or 10m from the approach stop line. The current intersection layout permits parking on Maddox Street within this specified distance with a total of four parking spaces provided. As a result of signalisation three of these spaces would require removal, two on the southern side and one on the northern side. This would leave one space remaining on the southern side of Maddox Street.

The implementation of this modification would require consultation with the Roads and Maritime Services (RMS) who are the governing body for traffic signals in NSW.

Figure 4.5 – Mitchell Road / Maddox Street Proposed Signalised Intersection



Source: AECOM; 2013, modified from City of Sydney; 2012

Mitchell Road / Harley Street

Currently the intersection of Mitchell Street / Harley Street does not permit right turn movements, with the exception of buses, from Mitchell Road to Harley Street. The right turn from Harley Street to Mitchell Road is permitted and reliant on appropriate levels of gap acceptance on Mitchell Road. As traffic volumes increase in the future, compounded with the proposed network modifications which will increase traffic throughput along the road corridor, the likelihood of acceptable gap acceptance for right turning vehicles will diminish. As a result it is proposed that the right turn from Harley Street to Mitchell Road is banned during peak times. Vehicles wishing to turn right will instead turn south before undertaking a U-turn movement via the existing roundabout at the intersection of Mitchell Road / Ashmore Street. This will also require the re-routing of Route 355 via Maddox Street. *Such an alteration would require approval from Transport for NSW.*

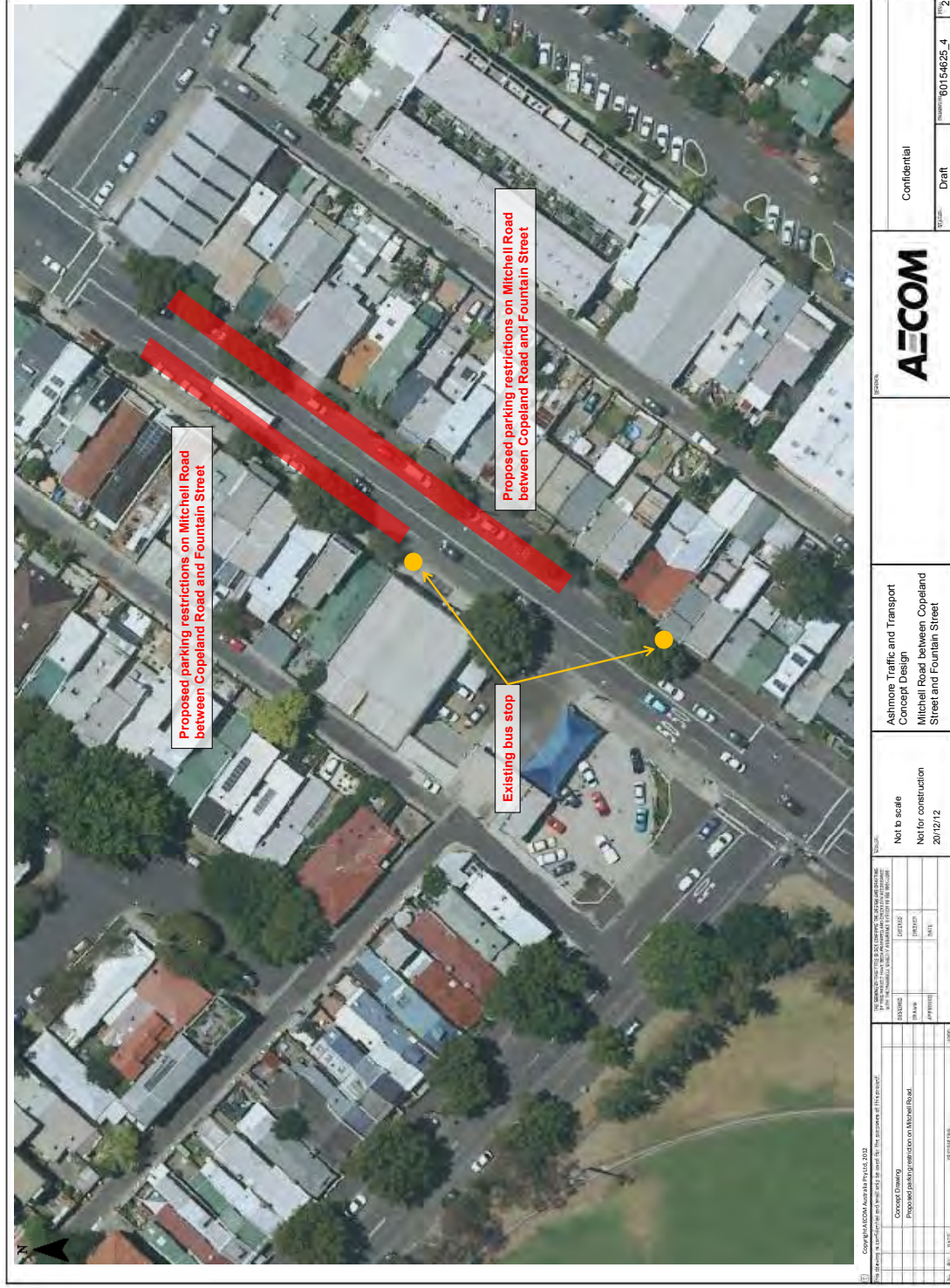
The implementation of this modification may also require consultation with the local traffic committee.

Mitchell Road between Copeland Street and Fountain Street

Currently Mitchell Road is one travel lane in either direction between Copeland Street and Fountain Street with one lane dedicated for parking. This parking restricts throughput at the intersection in peak periods when vehicles travelling on Mitchell Road are held behind queued vehicles turning right to Copeland Street or Fountain Street. In future years, as both background growth (naturally occurring increase in traffic volumes due to wider network trips) and the impact of traffic generated by the Ashmore Precinct increases, the ability of vehicles to bypass turning vehicles would improve the operational efficiency of the local road network. As a result it is proposed that parking be removed or restricted on Mitchell Road between Copeland Street and Fountain Street. This equates to a total distance of approximately 125m or 23 parking spaces (75m, or 14 spaces, on the southern side and 50m, nine spaces, on the northern side). **Figure 4.6** highlights the extent of parking removal/restrictions. For a detailed illustration of the peak period in which parking restrictions are required please refer to **Figure 4.7** through **Figure 4.21**.

The implementation of this modification would require approval from the Roads and Maritime Services (RMS) as Mitchell Road, between Copeland Street and Fountain Street, is classified as a State Road (MR 193).

Figure 4.6 – Parking Restrictions on Mitchell Road between Copeland Street and Fountain Road



Source: AECOM; 2013, modified from City of Sydney; 2012

4.2.2 Implementation of Proposed Network and Geometrical Modifications

The timing associated with the implementation of the proposed network alterations is crucial to ensuring the Ashmore road network operates efficiently. **Table 4.1** provides an indication of when the suggested remedial measures should be adopted. In addition to the below table, **Figure 4.7** to **Figure 4.21** provide a graphical illustration of the modifications required in each of the scenario analysis years.

With regards to priority the proposed signalisation of the Mitchell Road / Maddox Street intersection should be regarded as the most pressing improvement to be implemented on the local road network. Currently the level of service at the existing roundabout indicates the intersection is at or exceeding capacity in the AM peak period. The Ashmore development would require an alternative access control at this location to cater for development traffic. In addition, for work to progress on the Ashmore Precinct, it is important to provide access for residents to proposed dwellings, as is noted in the design plans for the precinct.

All remaining improvement options should be seen as a package of works and where possible implemented in concurrence with each other and, in the case of 2017 upgrades, in addition to the signalisation of the intersection of Mitchell Road / Maddox Street. One of the benefits of the upgrade packages, with the exception of the proposed signalised intersection, is the low cost of implementation (discussed further in **Section 4.2.3**). This further enables their simultaneous introduction to ensure maximum benefits across the local road network.

In the event that it is not possible to implement all modifications in unison the following priority order is recommended with regards to maximising the capacity improvements to the network:

- 1) Signalisation of Mitchell Road / Maddox Street Intersection;
- 2) Lane configuration of Mitchell Road / Sydney Park Road Intersection;
- 3) Parking restrictions on Mitchell Road between Copeland Street and Fountain Street and between Sydney Park Road and Coulson Street²;
- 4) Phasing alteration at the intersection of Mitchell Road / Coulson Street / Huntley Street; and
- 5) Right turn movement ban on Harley Street.

Table 4.1 Implementation of Proposed Network and Geometrical Modifications

Network Modification	Scenario 1			Scenario 2			Scenario 4/5		
	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
2017									
Lane configuration of Mitchell Road / Sydney Park Road Intersection (Figure 4.1)	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A
Parking Restrictions on south-eastern side of Mitchell Road between Sydney Park Road and Coulson Street (Figure 4.2)	✗	✗	✗	✗	✓	✓	N/A	N/A	N/A
Phasing alteration Mitchell Rd / Coulson St (Figure 4.3 and Figure 4.4)	✗	✗	✗	✗	✗	✓	N/A	N/A	N/A
Proposed signalisation of Mitchell Road / Maddox Street Intersection (Figure 4.5)	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A
Right turn movement ban implemented on Harley Street	✗	✗	✗	✗	✗	✗	N/A	N/A	N/A
Parking Restrictions on southern side of Mitchell Road between Copeland Street and Fountain Street (Figure 4.6)	✗	✗	✓	✗	✓	✓	N/A	N/A	N/A

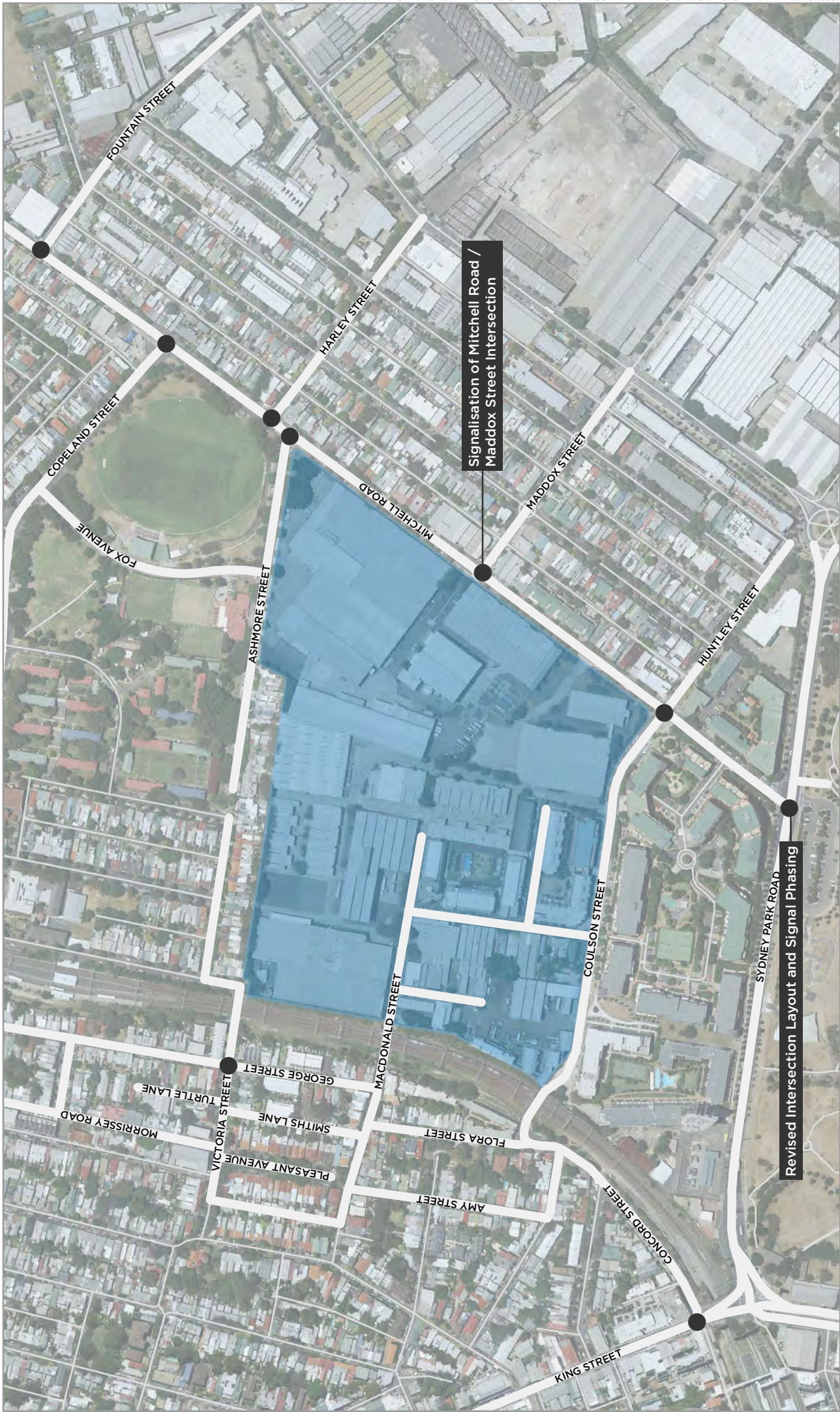
² The exact time periods in which to implement parking restrictions in the AM, PM and Saturday peak periods should be agreed in conjunction with Roads and Maritime Services. It is suggested that the following clearway periods are applied for the relevant peak when required: 6-10AM; 3-7PM; and 10-2PM for Saturday.

Network Modification	Scenario 1			Scenario 2			Scenario 4/5		
	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Parking Restrictions on northern side of Mitchell Road between Copeland Street and Fountain Street (Figure 4.6)	X	X	X	X	✓	X	N/A	N/A	N/A
2022									
Lane configuration of Mitchell Road / Sydney Park Road Intersection (Figure 4.1)	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A
Parking Restrictions on south-eastern side of Mitchell Road between Sydney Park Road and Coulson Street (Figure 4.2)	X	✓	X	✓	✓	✓	N/A	N/A	N/A
Phasing alteration Mitchell Rd / Coulson St (Figure 4.3 and Figure 4.4)	X	X	X	X	X	✓	N/A	N/A	N/A
Proposed signalisation of Mitchell Road / Maddox Street Intersection (Figure 4.5)	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A
Right turn movement ban implemented on Harley Street	X	X	X	X	✓	X	N/A	N/A	N/A
Parking Restrictions on southern side of Mitchell Road between Copeland Street and Fountain Street (Figure 4.6)	X	✓	✓	✓	✓	✓	N/A	N/A	N/A
Parking Restrictions on northern side of Mitchell Road between Copeland Street and Fountain Street (Figure 4.6)	X	✓	X	✓	✓	✓	N/A	N/A	N/A
Beyond 2027									
Lane configuration of Mitchell Road / Sydney Park Road Intersection (Figure 4.1)	N/A	N/A	N/A	N/A	N/A	N/A	✓	✓	✓
Parking Restrictions on south-eastern side of Mitchell Road between Sydney Park Road and Coulson Street (Figure 4.2)	N/A	N/A	N/A	N/A	N/A	N/A	✓	✓	✓
Phasing alteration Mitchell Rd / Coulson St (Figure 4.3 and Figure 4.4)	N/A	N/A	N/A	N/A	N/A	N/A	X	X	✓
Proposed signalisation of Mitchell Road / Maddox Street Intersection (Figure 4.5)	N/A	N/A	N/A	N/A	N/A	N/A	✓	✓	✓
Right turn movement ban implemented on Harley Street	N/A	N/A	N/A	N/A	N/A	N/A	X	✓	✓
Parking Restrictions on southern side of Mitchell Road between Copeland Street and Fountain Street (Figure 4.6)	N/A	N/A	N/A	N/A	N/A	N/A	✓	✓	✓
Parking Restrictions on northern side of Mitchell Road between Copeland Street and Fountain Street (Figure 4.6)	N/A	N/A	N/A	N/A	N/A	N/A	✓	✓	✓

Key

X Not required ✓ Required

Source: AECOM; 2013



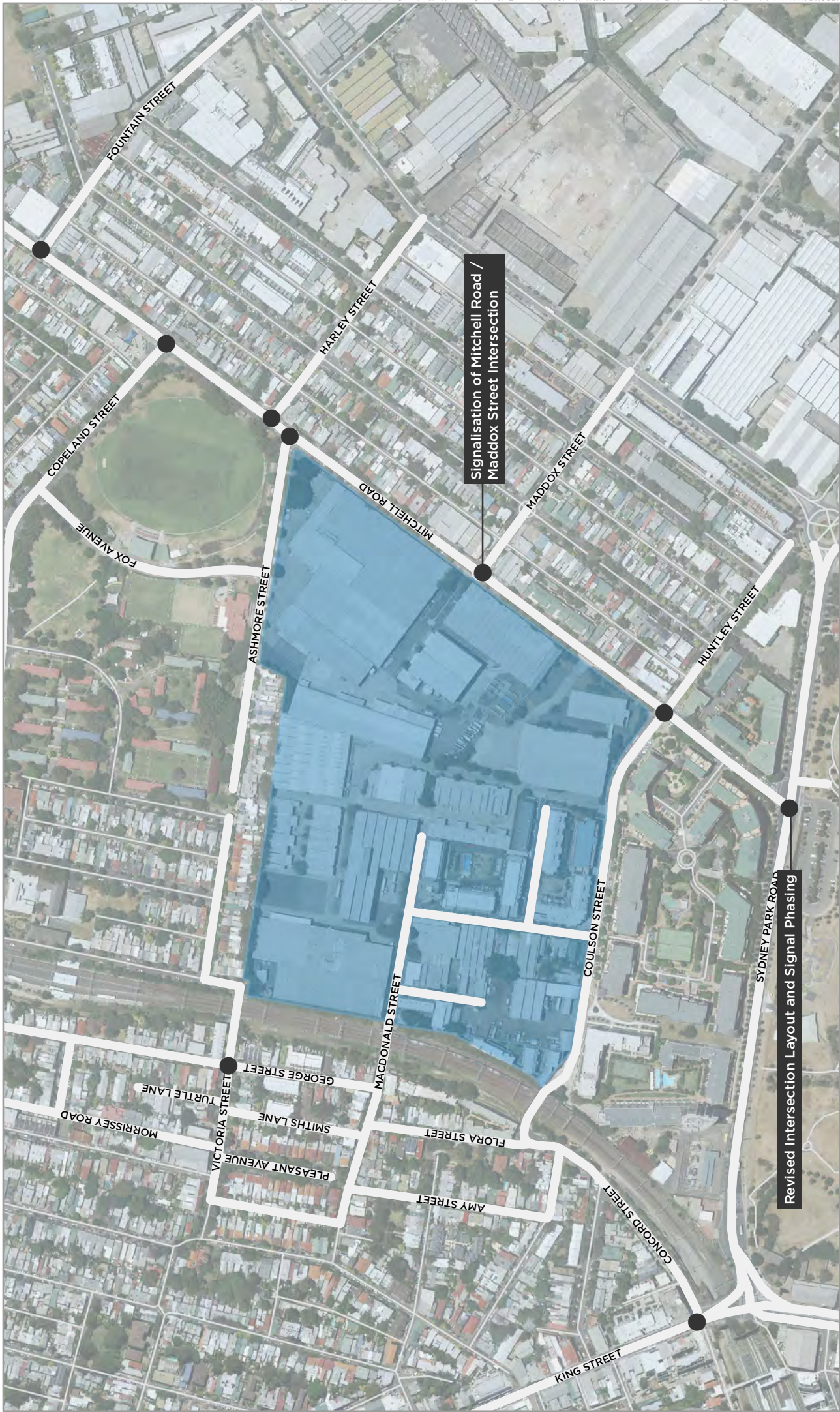
- Assessed Intersection
- Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 1 - NO DEVELOPMENT
 2017 AM

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Fig. 4.7





- Assessed Intersection
- Proposed Ashmore Precinct

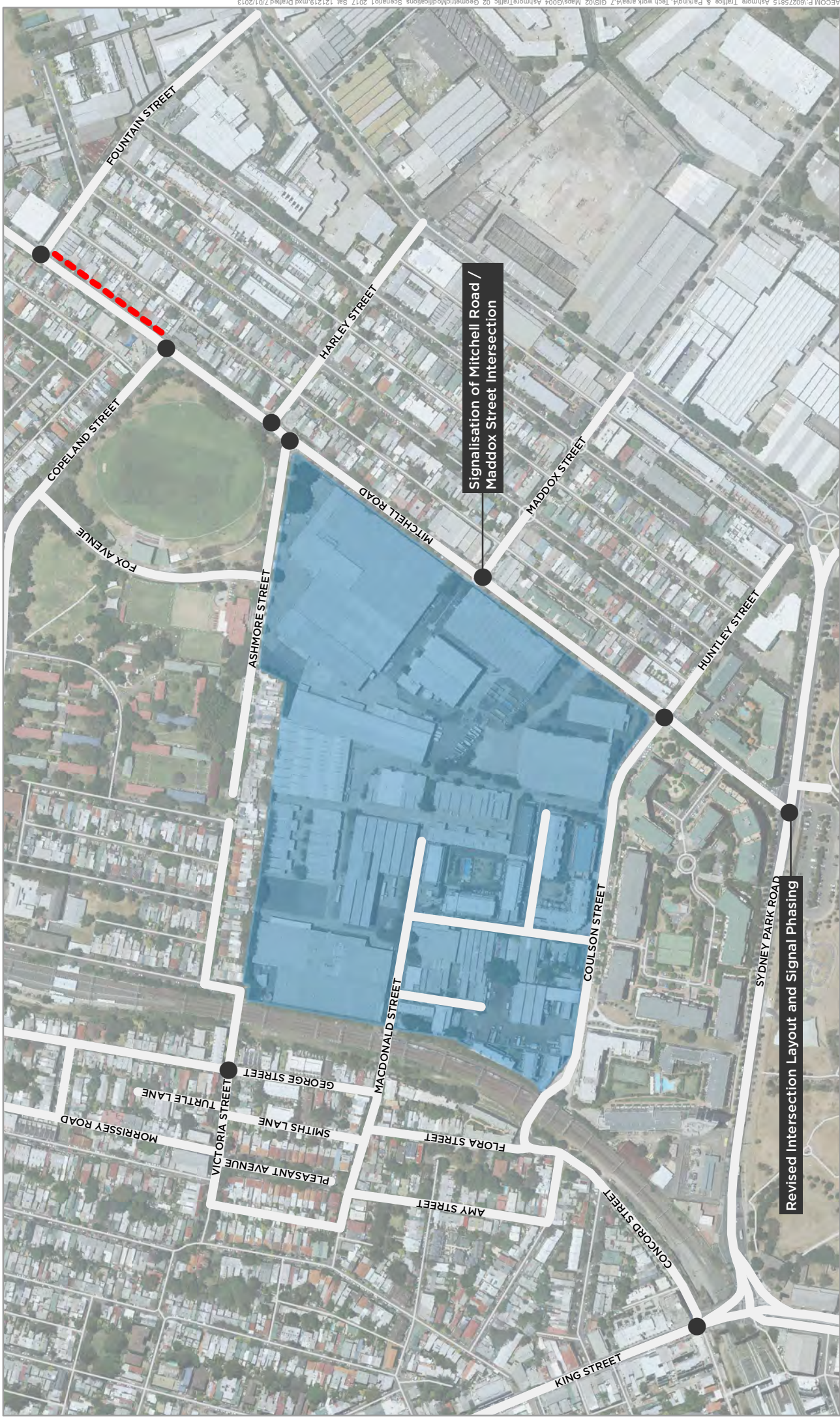
ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 1 - NO DEVELOPMENT
 2017 PM

60275815

Fig. 4.8



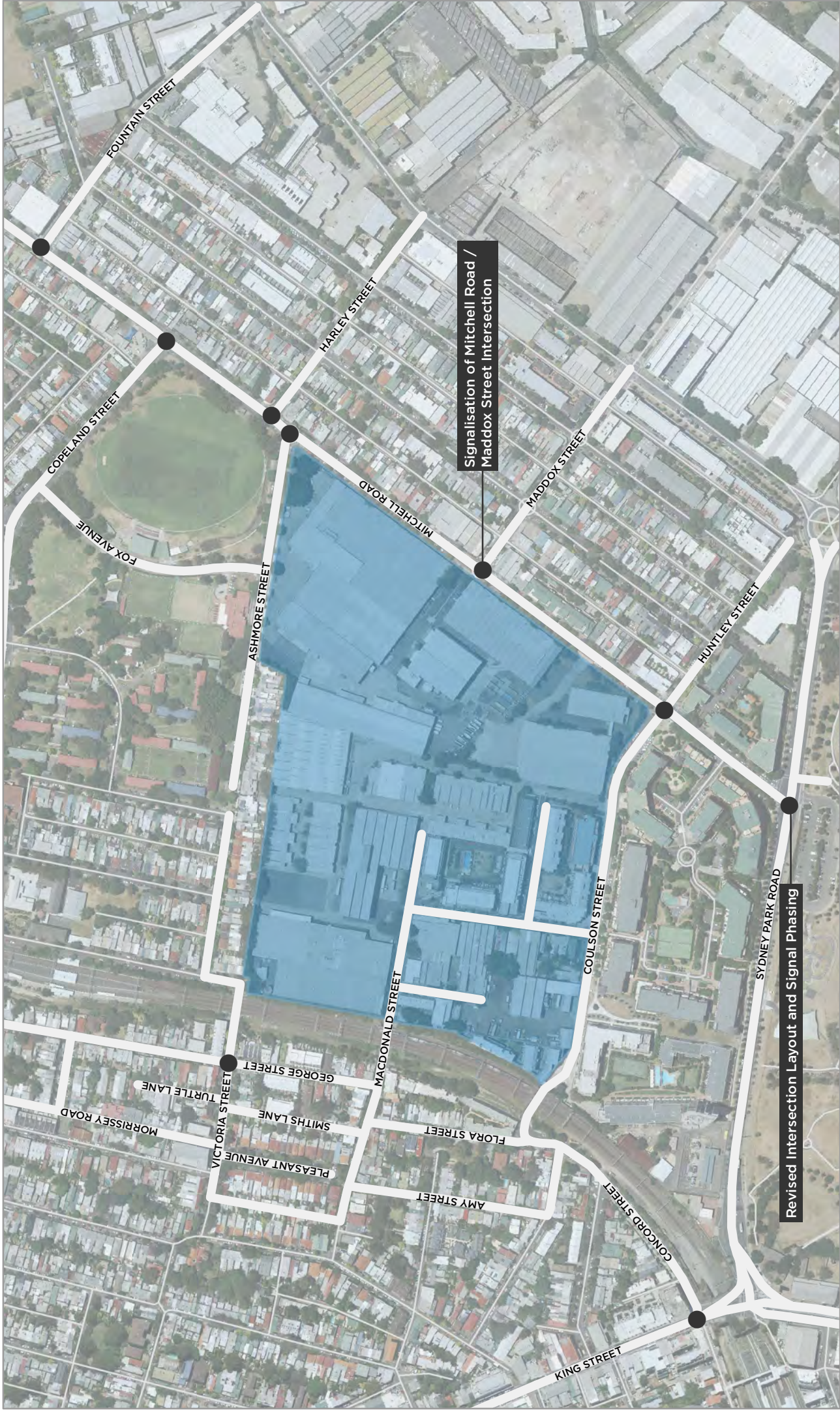
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- Assessed Intersection
- Proposed Ashmore Precinct
- Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 1 - NO DEVELOPMENT
 2017 SAT





- Assessed Intersection
- Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 2 - DEVELOPMENT WITH NETWORK MODIFICATIONS
 2017 AM

60275815

Fig 4.10





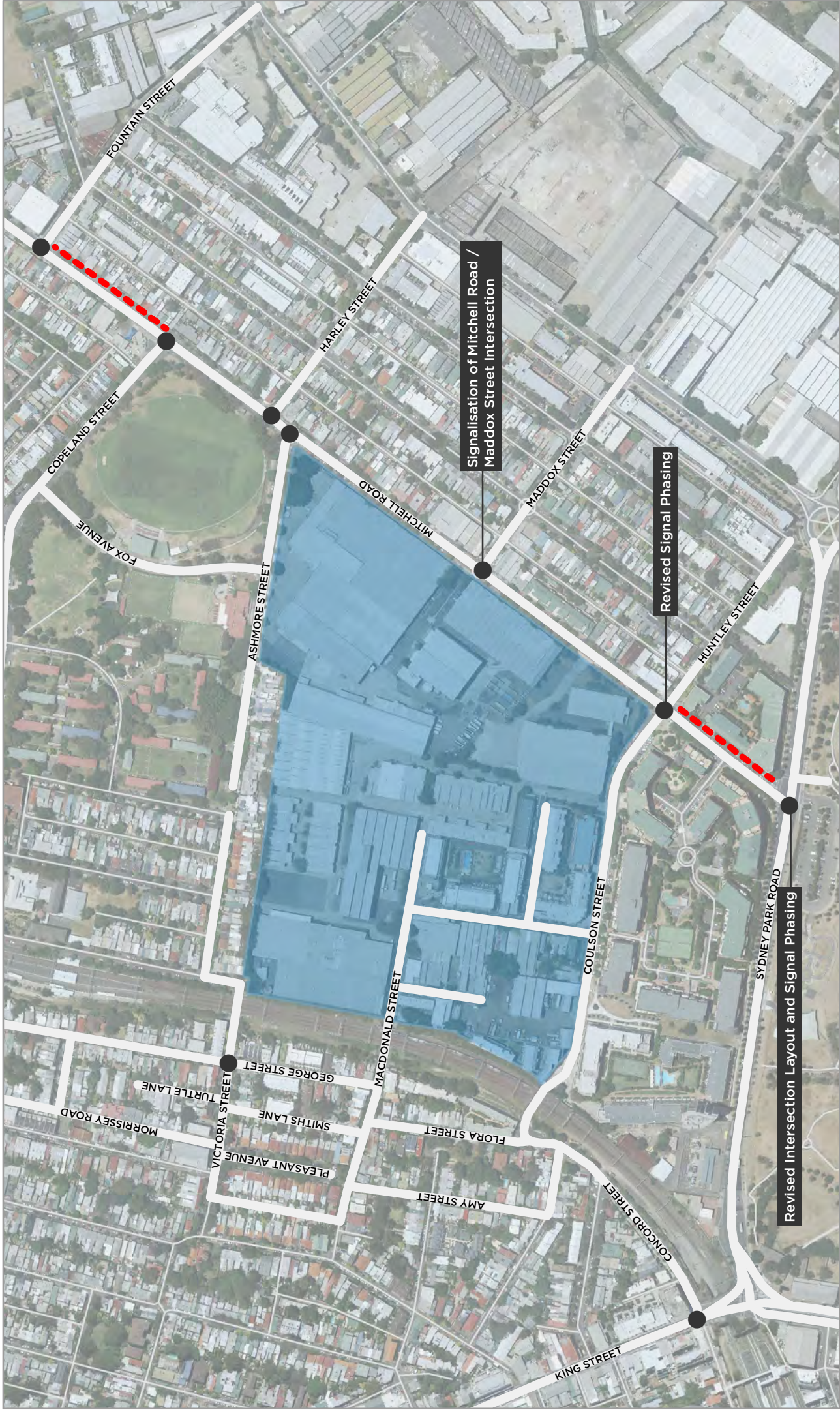
- Assessed Intersection
- Proposed Ashmore Precinct
- - - Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 2 - DEVELOPMENT WITH NETWORK MODIFICATIONS
 2017 PM

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Fig 4.11





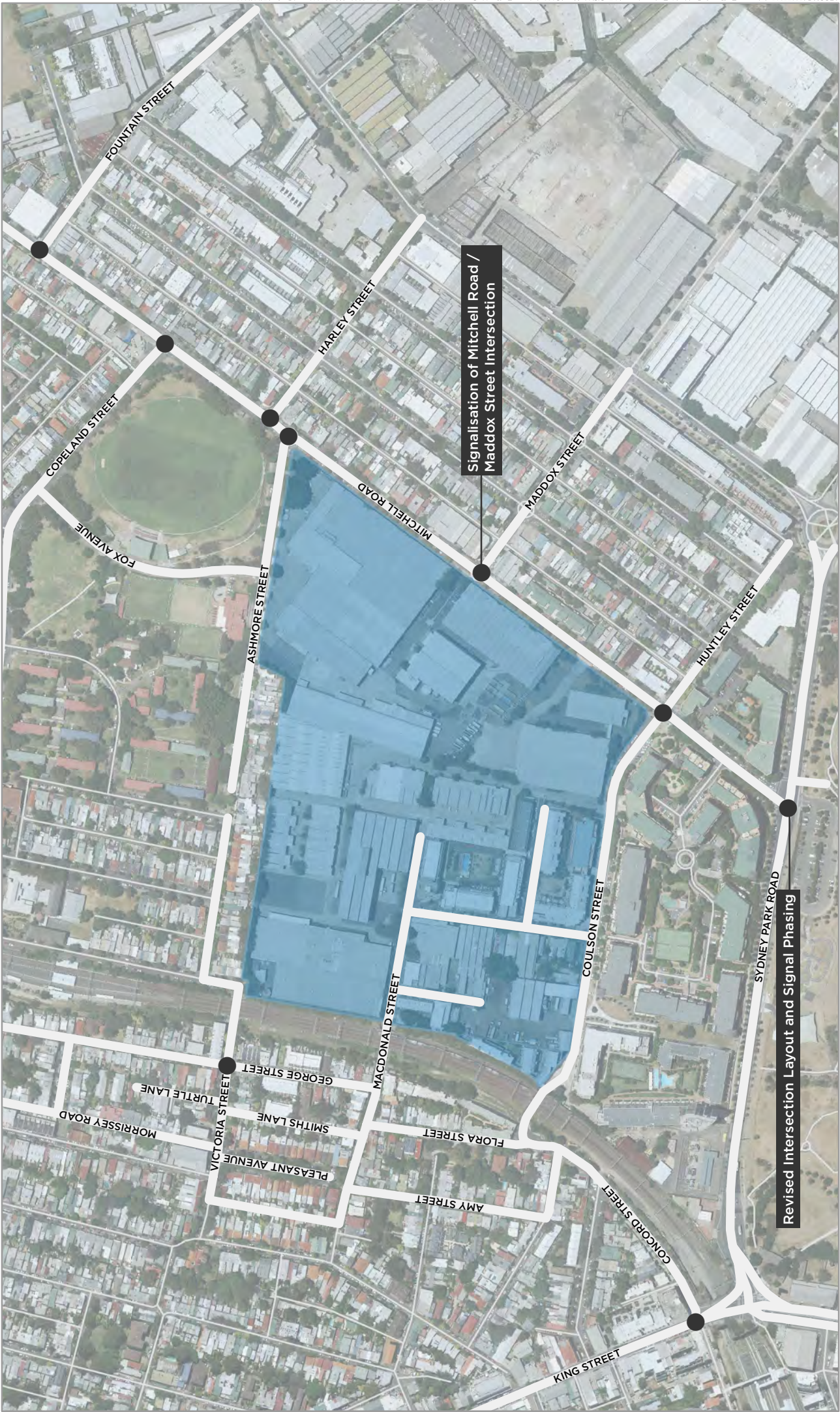
- Assessed Intersection
- Proposed Ashmore Precinct
- Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 2 - DEVELOPMENT WITH NETWORK MODIFICATIONS
 2017 SAT



60275815

Fig 4.12



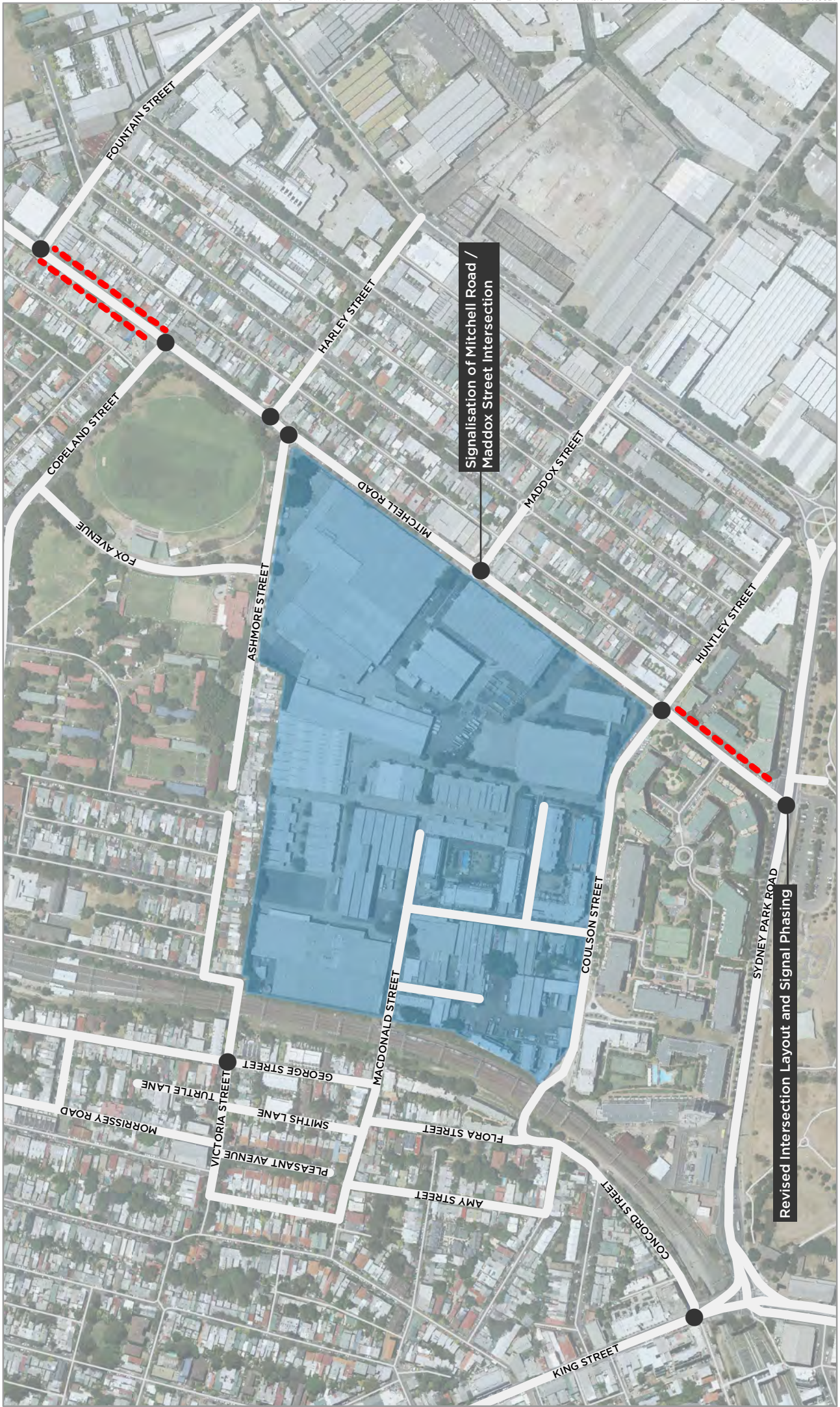
- Assessed Intersection
- Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 1 - NO DEVELOPMENT
 2022 AM



60275815

Fig 4.13



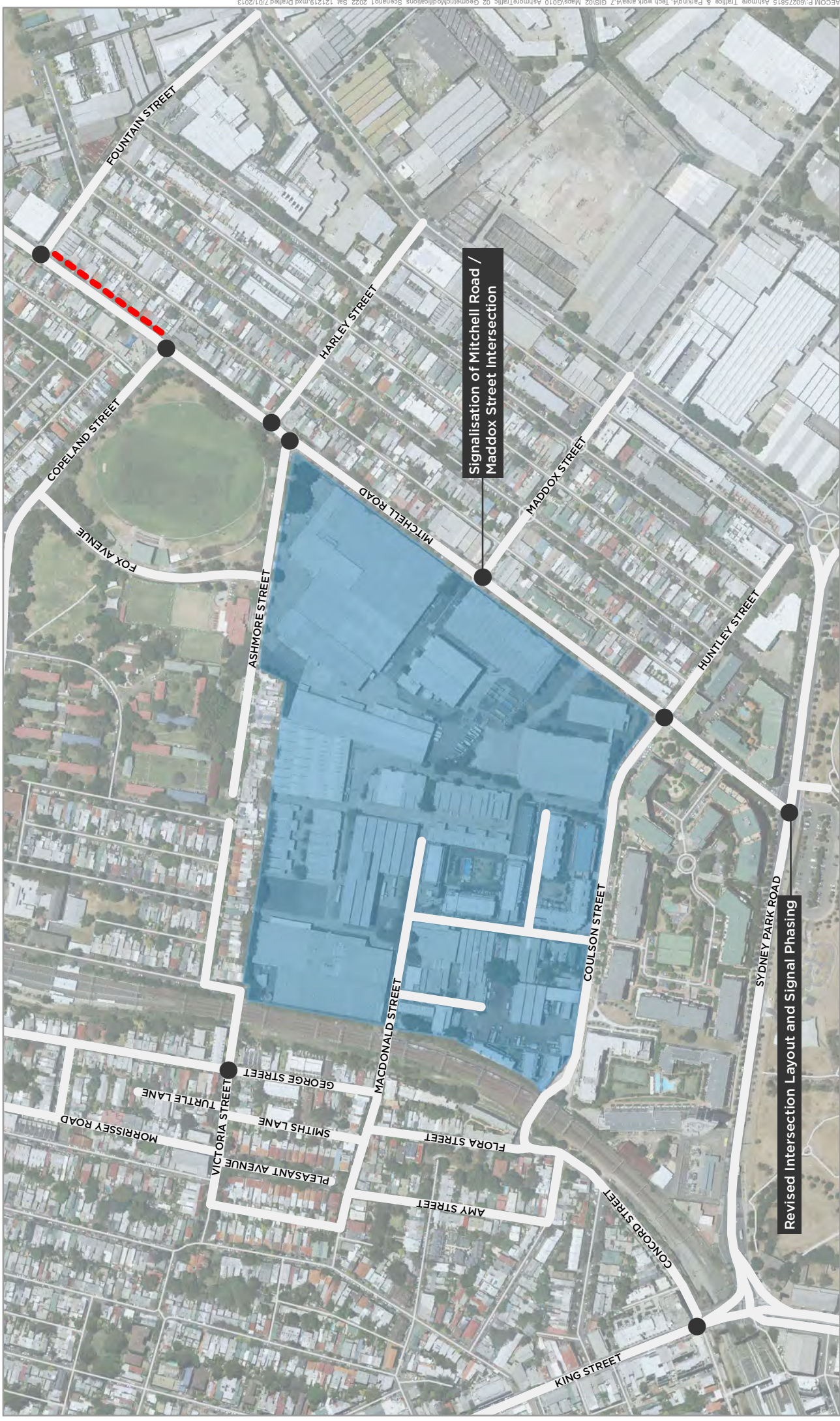
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ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 1 - NO DEVELOPMENT
 2022 PM

Fig 4.14



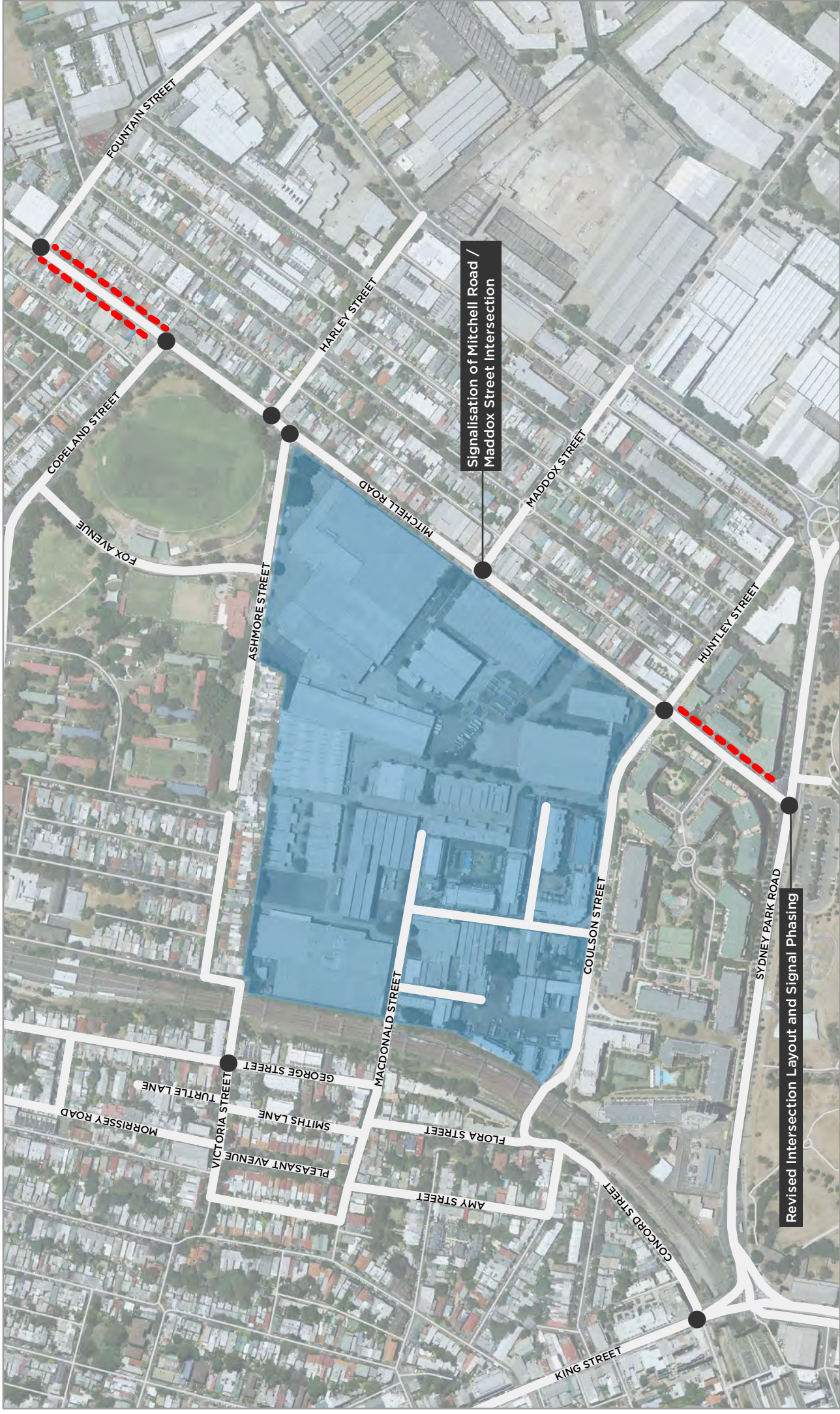
- Assessed Intersection
- Proposed Ashmore Precinct
- - - Parking Restriction



- Assessed Intersection
- Proposed Ashmore Precinct
- Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 1 - NO DEVELOPMENT
 2022 SAT





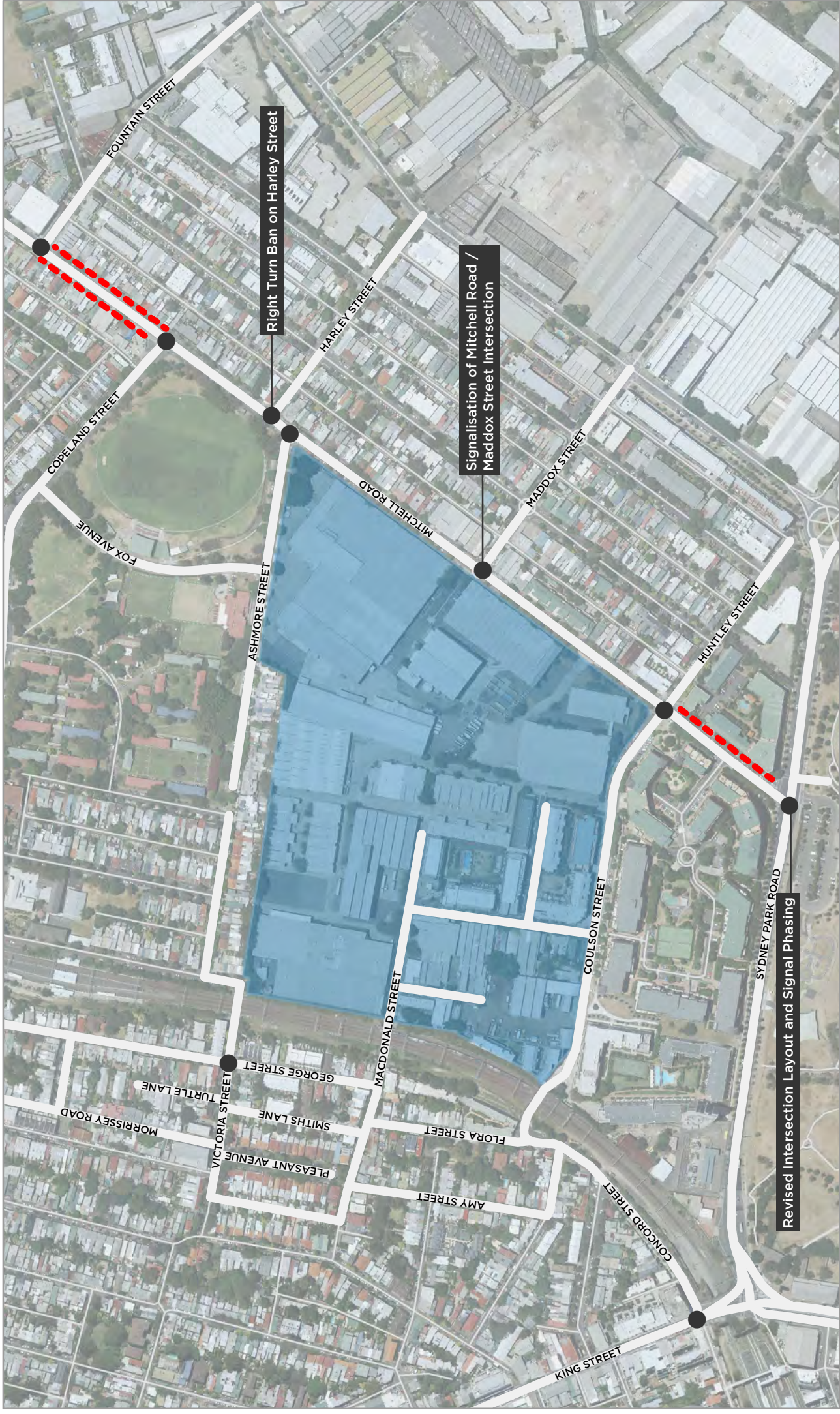
- Assessed Intersection
- Proposed Ashmore Precinct
- Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 2 - DEVELOPMENT WITH NETWORK MODIFICATIONS
 2022 AM

60275815

Fig 4.16





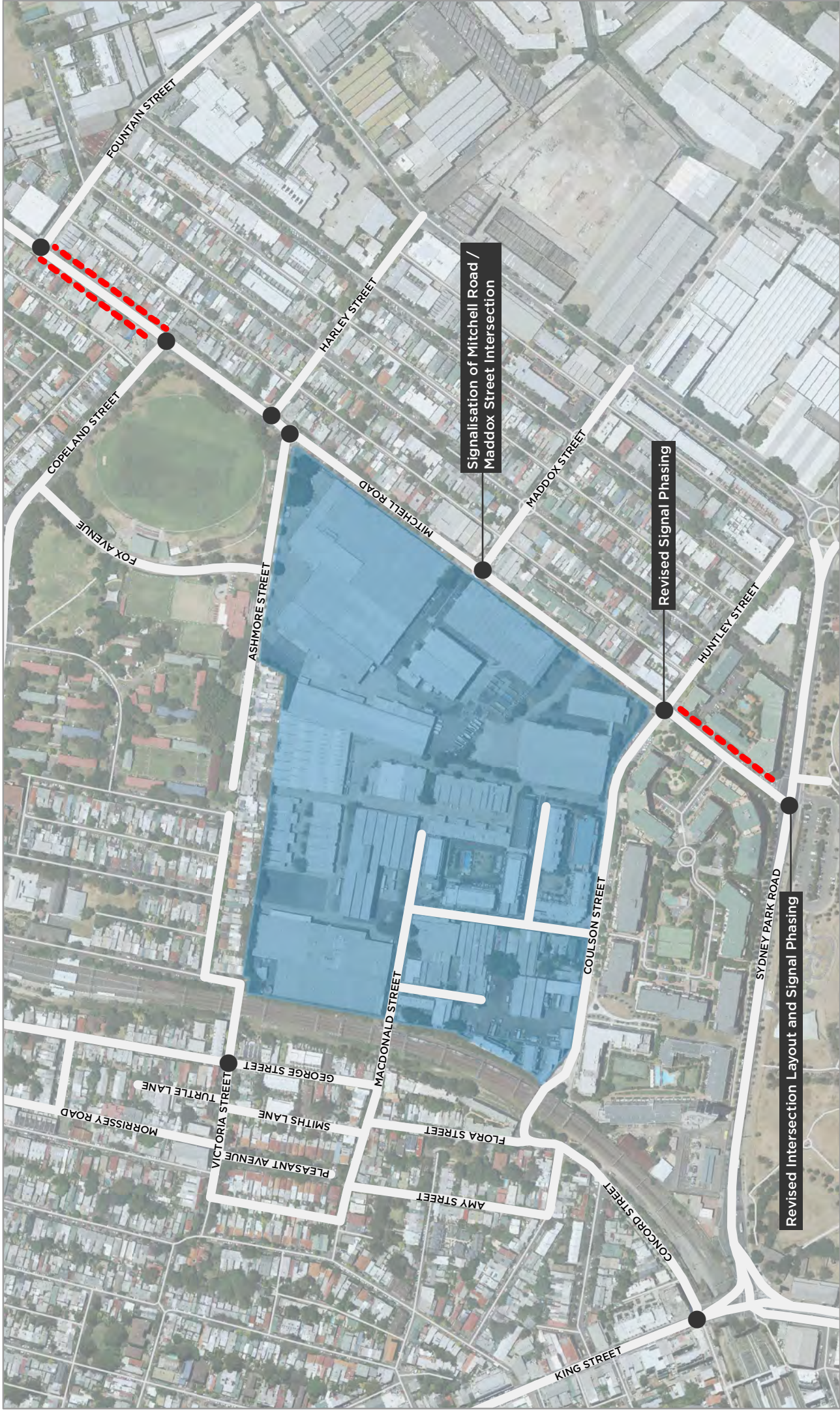
- Assessed Intersection
- Proposed Ashmore Precinct
- Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 2 - DEVELOPMENT WITH NETWORK MODIFICATIONS
 2022 PM

60275815

Fig 4.17

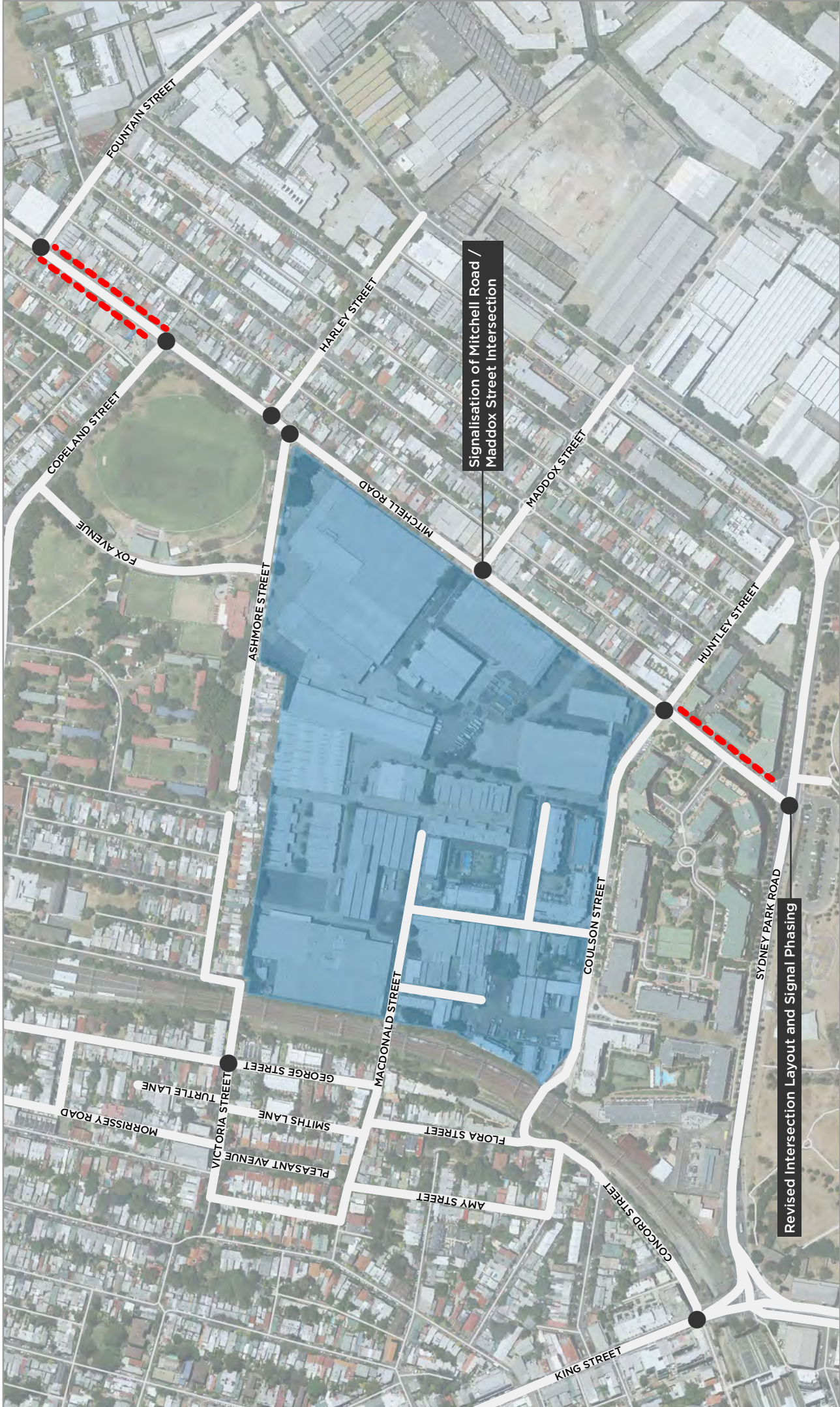




- Assessed Intersection
- Proposed Ashmore Precinct
- - - Parking Restriction

60275815
ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
GEOMETRIC MODIFICATIONS: SCENARIO 2 - DEVELOPMENT WITH NETWORK MODIFICATIONS
2022 SAT
Fig 4.18





- Assessed Intersection
- Proposed Ashmore Precinct
- Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 4/5 - FULL DEVELOPMENT 2027 AM

60275815

Fig 4.19





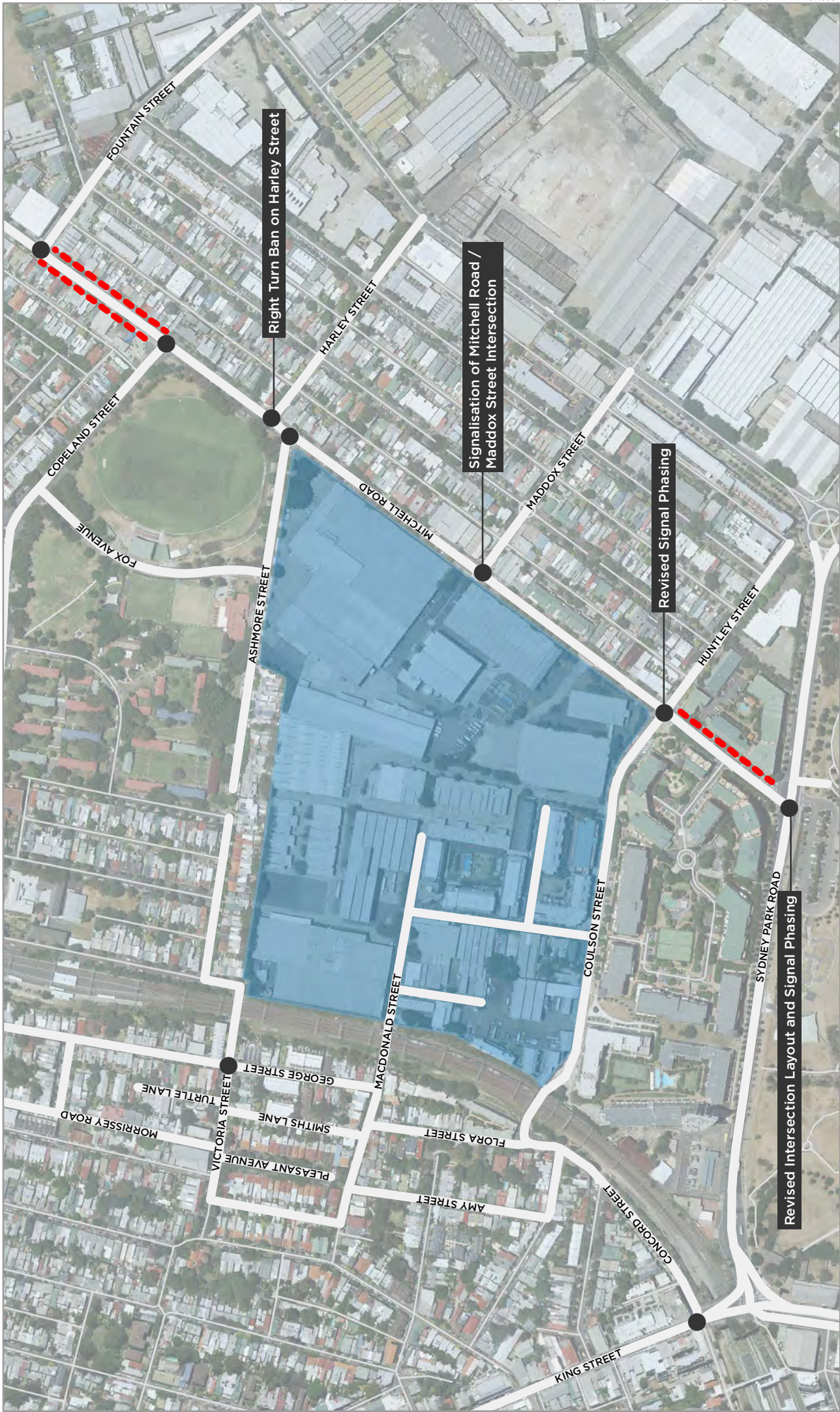
- Assessed Intersection
- Proposed Ashmore Precinct
- Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 4/5 - FULL DEVELOPMENT
 2027 PM



60275815

Fig 4.20



- Assessed Intersection
- Proposed Ashmore Precinct
- Parking Restriction

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 GEOMETRIC MODIFICATIONS: SCENARIO 4/5 - FULL DEVELOPMENT
 2027 SAT



4.2.3 Associated Costs

An indication of the potential costs of the proposed network modifications are provided **Table 4.2**. The costings, which would be subject to further clarification at the detail design stage, are banded into the following indicative groupings:

- Low (< \$ 50,000)
- Medium (\$50,000 - \$250,000)
- High (> \$250,000)

The majority of proposed improvements fall into the 'low' cost category as they involve installation of parking signage, altering SCATS controllers and line markings on the approach to intersections. The only proposed improvement in the 'high' cost category is the proposed signalisation of the Mitchell Road / Maddox Street intersection.

Table 4.2 Indicative Costing of Proposed Network and Geometrical Modifications

Network Modification	Low	Medium	High
	(< \$50,000)	(\$50,000-\$250,000)	(> \$250,000)
Lane configuration of Mitchell Road / Sydney Park Road Intersection (Figure 4.1)	√	N/A	N/A
Parking Restrictions on south-eastern side of Mitchell Road between Sydney Park Road and Coulson Street (Figure 4.2)	√	N/A	N/A
Phasing alteration Mitchell Rd / Coulson St (Figure 4.4)	√	N/A	N/A
Proposed signalisation of Mitchell Road / Maddox Street Intersection (Figure 4.5)	N/A	N/A	√
Right turn movement ban implemented on Harley Street	√	N/A	N/A
Parking Restrictions on Mitchell Road between Copeland Street and Fountain Street (Figure 4.6)	√	N/A	N/A

4.2.4 On-Street Parking Implications

As highlighted above the proposed geometric improvements and intersection modifications will result in the removal/restriction of car parking spaces at the following locations:

- Removal of two parking spaces on the southern side of Maddox Street between Mitchell Road and Belmont Lane;
- Removal of one parking space on the northern side of Maddox Street between Mitchell Road and Belmont Lane;
- Restriction on eight parking spaces on the southern side of Mitchell Road between Sydney Park Road and Coulson Street;
- Restriction/removal of 14 parking spaces on the southern side of Mitchell Road between Copeland Street and Fountain Street; and
- Restriction/removal of nine parking spaces on the northern side of Mitchell Road between Copeland Street and Fountain Street.

Due to car parking restrictions which will be placed on the Ashmore Precinct through the site's Development Control Plan, there is potential for latent parking demand to impact the availability of on-street parking in the surrounding area. To minimise the impact of parking demand on existing local residents' ability to find an on-street

parking space, it is suggested recommendations from *Peer Review of Parking Study for Alexandria Area Adjacent Australian Technology Park* (AECOM, 2012) be implemented.

The key recommendation from the Peer Review³, with regards to the Ashmore Precinct, is highlighted below:

'The implications for neighbouring streets as a result of parking demand generated by the Ashmore Precinct are not yet known, as this will depend on the parking rates agreed for the development. However, regardless of the on-site parking provision agreed for the development, if the adjacent streets remain unrestricted these will enable residents and visitors of the Ashmore Precinct to use this on-street capacity.'

Therefore, it is likely that parking controls [in the form of parking permits] will be required to manage demand on the streets located near the development in order to preserve parking availability for existing residents, in particular:

- *The area immediately to the east of the Ashmore Precinct site, including Mitchell Road, Belmont Street, Maddox Street, Harley Street and Huntley Street; and*
- *The area to the north west of the site, including Bridge Street, Malcolm Street, Binning Street and Ashmore Street*

It is recommended that the aforementioned permit area is reviewed, and potentially expanded, following completion of the 2017 stage of the Ashmore Precinct. The success of this parking recommendation is dependent on appropriate levels of enforcement.

4.3 Future Network Performance

4.3.1 Scenario 1 / Scenario 2 / Scenario 3

As noted in **Section 4.1** the five scenario tests were grouped into two packages, the first of which involved a direct comparison of network performance against the following criteria: required changes to the network to ensure existing/future network deficiencies are resolved in the event that the Ashmore Precinct is not constructed (**Scenario 1**); required changes to the network to ensure future network deficiencies are resolved in the event that the Ashmore Precinct is constructed (**Scenario 2**); and, the impact on the network if the Ashmore Precinct is constructed and no network modifications are implemented (**Scenario 3**). The following section provides a comparison of the network performance at key intersections across the Ashmore local area network for the three scenarios as assessed in the analysis years of 2017 and 2022.

4.3.1.1 2017 AM Peak

The proposed signalisation of the intersection of Mitchell Road/Maddox Street in all assessed AM peak scenarios improves the intersection performance from its existing LoS F to LoS A whilst also reducing delays at Mitchell Road/Huntley Street and Mitchell Road/Sydney Park Road (see **Table 4.3**). This is a result of improved co-ordination along the Mitchell Road corridor.

There is minimal difference between intersection results in the 2017 AM peak due to identical network upgrades, being the introduction of the proposed signalised intersection and lane modification at the intersection of Mitchell Road / Sydney Park Road, across all three scenarios. As such there is minimal queuing difference between Scenario 2 and Scenario 3. **Figure 4.22** and **Figure 4.23** provide a comparison of queuing on the critical south approach to the Mitchell Road / Maddox Street intersection before (2012 existing) and after signalisation (2017).

Modelling results indicate all intersections will operate at LoS B or better in each scenario. A detailed intersection performance summary can be found in **Appendix A**.

³ *Peer Review of Parking Study for Alexandria Area Adjacent Australian Technology Park*, AECOM, 2012

Table 4.3 2017 AM Peak (07:45-08:45)

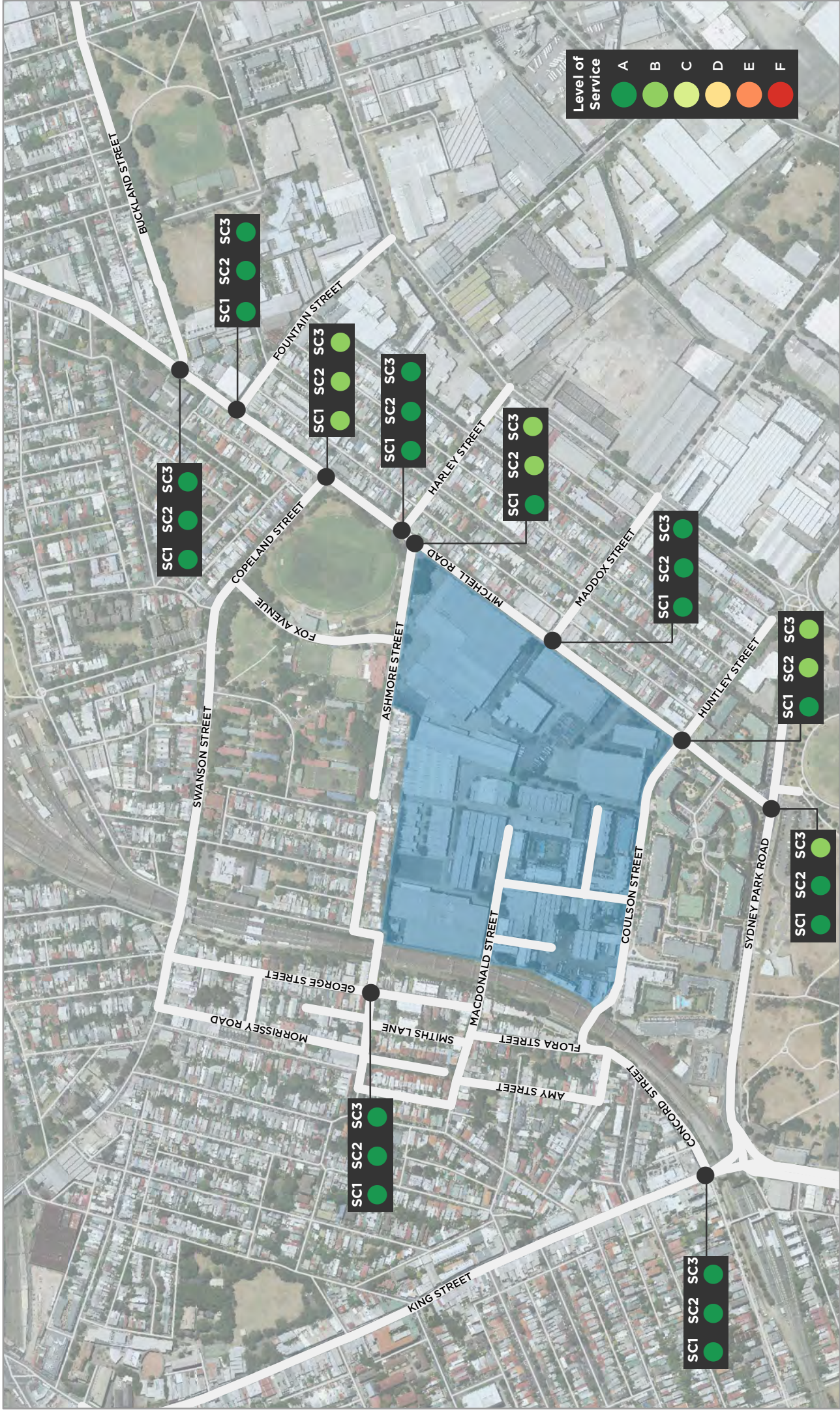
Intersection	Scenario 1		Scenario 2		Scenario 3	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	7	A	7.4	A	7.3	A
Mitchell Rd / Fountain St	12.5	A	12.7	A	13.5	A
Mitchell Rd / Copeland St	26.7	B	27.8	B	27.9	B
Mitchell Rd / Harley St	5	A	8.2	A	8	A
Mitchell Rd / Ashmore St	7.7	A	18.6	B	17.1	B
Mitchell Rd / Maddox St	8.8	A	11.2	A	11.2	A
Mitchell Rd / Coulson St / Huntley St	13.9	A	15	B	13.5	A
Mitchell Rd / Sydney Park Rd	13	A	13.4	A	14.6	B
King St / Concord St	8	A	8.1	A	8.1	A
George St / Victoria St	2.2	A	2.2	A	2.2	A

Source: AECOM; 2013

Figure 4.22 – Mitchell Road / Maddox Street (AM peak – Base Case)

Figure 4.23 – Mitchell Road / Maddox Street (AM peak – Scenario 3)





● Assessed Intersection
 ■ Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 2017 AM PEAK

60275815

Fig 4.24



4.3.1.2 2017 PM Peak

The PM Peak, in Scenario 2 (modifications with Ashmore Precinct), requires the addition of parking restrictions on Mitchell Road between Sydney Park Road and Coulson Street and between Copeland Street and Fountain Street. The modification at the latter location is required due to the restriction in flow which occurs as a result of vehicles queuing behind right turning vehicles at the intersection of Copeland Street. Removing kerbside parking on the southern side of Mitchell Road results in increased throughput of southbound vehicles, which in turn reduces queue lengths and improves intersection performance for the Mitchell Road / Buckland Street, Mitchell Road / Fountain Street and Mitchell Road / Copeland Street intersections. For example the intersection of Mitchell Road / Buckland Street operates at LoS E in Scenario 3 which improves to LoS A in Scenario 2.

Figure 4.25 and **Figure 4.26** illustrate the difference in queue length that results due to implementing parking restrictions on Mitchell Road between Fountain Street and Copeland Street

Figure 4.25 – Mitchell Road / Copeland Street (PM peak – Scenario 2)

Figure 4.26 – Mitchell Road / Copeland Street (PM peak – Scenario 3)



Source: AECOM; 2013



Source: AECOM; 2013

The average delay at the intersection of Mitchell Road / Sydney Park Road is marginally higher in Scenario 1 compared to Scenario 2 despite lower traffic volumes as a result of the non-inclusion of the Ashmore Precinct. This is a result of the proposed geometric modification which removes parking in Scenario 2 between Sydney Park Road and Coulson Street. This provides increased capacity and reduced delays despite the increase in volumes under Scenario 2. A summary of intersection performance results for the 2017 PM Peak is presented in **Table 4.4** and graphically illustrated in **Figure 4.24**.

Table 4.4 2017 PM Peak (17:00-18:00)

Intersection	Scenario 1		Scenario 2		Scenario 3	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	5	A	10	A	66.9	E
Mitchell Rd / Fountain St	15.5	B	13.6	A	29	C
Mitchell Rd / Copeland St	23.4	B	18.7	B	33.1	C
Mitchell Rd / Harley St	21.3	B	42.6	D	41.7	C
Mitchell Rd / Ashmore St	6.4	A	3.9	A	4.1	A
Mitchell Rd / Maddox St	12.7	A	15.7	B	17.7	B
Mitchell Rd / Coulson St / Huntley St	11.3	A	11.1	A	16.6	B
Mitchell Rd / Sydney Park Rd	25.3	B	21.1	B	25.9	B
King St / Concord St	13.9	A	14.1	A	14	A
George St / Victoria St	2	A	2.2	A	2.2	A

Source: AECOM; 2013



● Assessed Intersection
 ■ Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 2017 PM PEAK

60275815

Fig 4.27



4.3.1.3 2017 Saturday Peak

In the 2017 Saturday peak period the traffic associated with the Bunnings development impacts on the operation of the intersections of Mitchell Road / Fountain Street and Mitchell Road / Copeland Street. The proposed Bunnings development will provide a total floor area of 20,101m² and caters for 626 off street parking spaces. The development will increase localised road network congestion resulting in increased average delay for vehicles. In Scenario 2 this effect is compounded by traffic associated with the Ashmore Precinct. This can be seen in Scenario 3 which indicates that Fountain Street operates with a LoS of F during the peak hour assuming no network modifications are implemented.

In order to provide increased capacity it is proposed that parking is removed on Mitchell Road between Copeland Street and Fountain Street. Further investigation could be undertaken to determine the specific time periods as modelling has focused only on the peak hour however it is recommended that an initial time period of 10AM to 2PM be trialled. As was noted in the PM peak this will provide increased throughput for southbound vehicles which will reduce the queue in the median lane between Fountain Street and Copeland Street. As a result vehicles turning left out of Fountain Street will be able to enter Mitchell Road.

Another key recommended modification to the network is the implementation of an additional phase at the intersection of Mitchell Road / Coulson Street / Huntley Street as a result of the Ashmore Precinct. The phase provides a dedicated portion of the cycle time to the northern approach (Mitchell Road) to allow right turning vehicles access to Coulson Street. Currently there is limited space to overtake right turning vehicles as a result of on-street parking. Without the additional phase modelling indicates the increased network demand causes queuing to the north along Mitchell Road. This impacts on the operation of the intersections of Mitchell Road / Coulson Street / Huntley Street and Mitchell Road / Maddox Street. Scenario 3 intersection performance results highlight this with an operation of LoS D at both locations. Introduction of the proposed intersection modifications results in an improvement in intersection performance to LoS B.

Figure 4.28 and **Figure 4.29** highlight queuing levels associated with and without the proposed network modifications at the intersection of Mitchell Road / Coulson Street / Huntley Street.

Figure 4.28 – Mitchell Road / Coulson Street (SAT peak – Scenario 2)



Source: AECOM; 2013

Figure 4.29 – Mitchell Road / Coulson Street (SAT peak – Scenario 3)



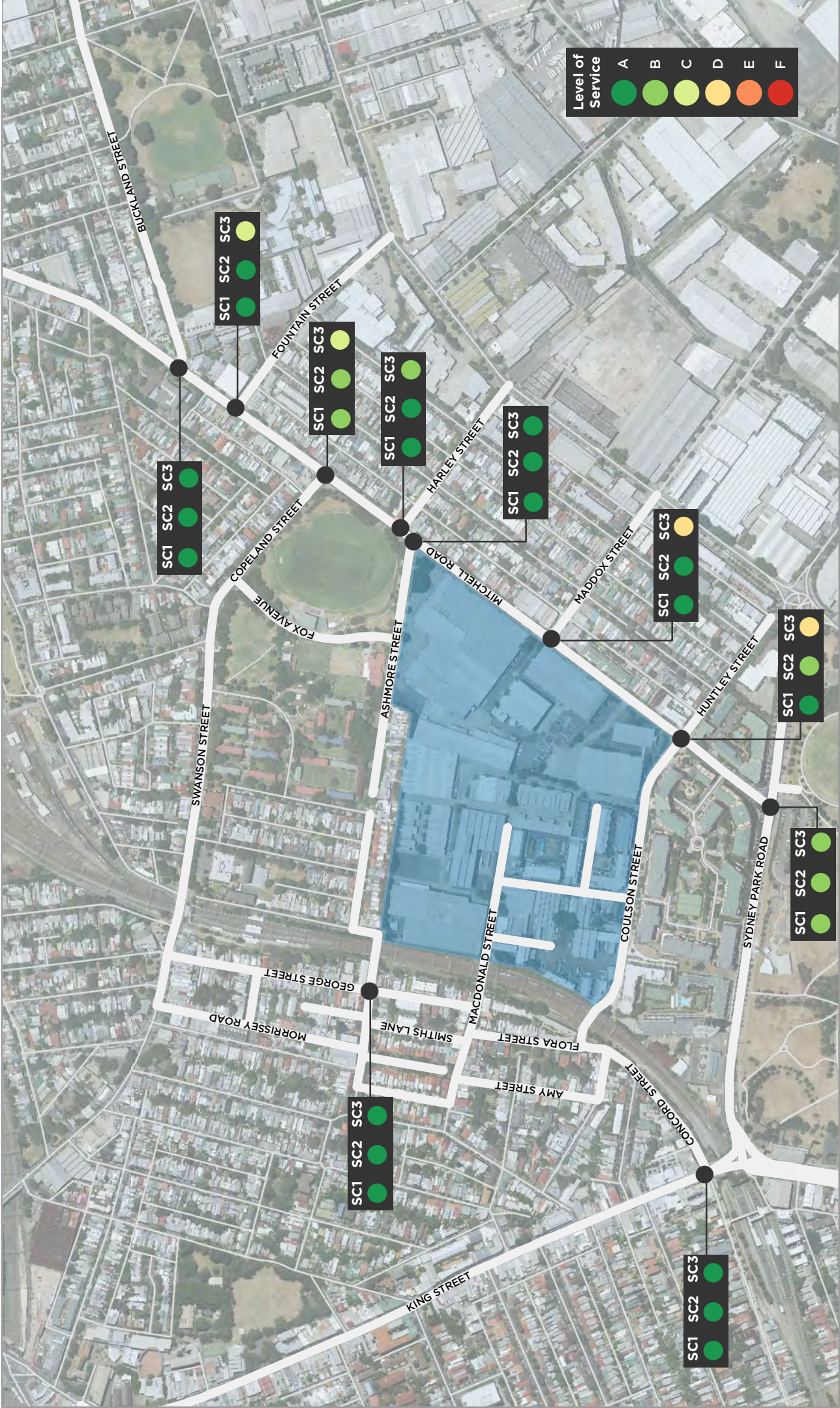
Source: AECOM; 2013

Intersection performance results for the 2017 Saturday Peak are presented in **Table 4.5** and **Figure 4.30**. Under Scenario 2 both intersections operate at LoS B or better. Scenario 1 operates at LoS A at both intersections as a result of lower traffic volumes due to exclusion of the Ashmore Precinct traffic volumes.

Table 4.5 2017 Saturday Peak (12:15-13:15)

Intersection	Scenario 1		Scenario 2		Scenario 3	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	4.4	A	4.8	A	8.8	A
Mitchell Rd / Fountain St	11.7	A	12.5	A	36.8	C
Mitchell Rd / Copeland St	21.5	B	22.7	B	39.5	C
Mitchell Rd / Harley St	5.6	A	11	A	25.6	B
Mitchell Rd / Ashmore St	4.7	A	5.9	A	10.1	A
Mitchell Rd / Maddox St	11.8	A	12.7	A	42.5	D
Mitchell Rd / Coulson St / Huntley St	9.7	A	14.5	B	48.4	D
Mitchell Rd / Sydney Park Rd	18	B	16.9	B	22.8	B
King St / Concord St	9	A	9.7	A	9.3	A
George St / Victoria St	2	A	2.1	A	2.1	A

Source: AECOM; 2013



● Assessed Intersection
 ■ Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 2017 SAT PEAK

60275815

4.30
 Fig



4.3.1.4 2022 AM Peak

The Ashmore Precinct is anticipated to generate approximately 200 additional peak hour trips in 2022 compared to 2017. As a result additional modifications are recommended to ensure the successful operation of the local area network.

Travelling to the Sydney CBD or north of Sydney Harbour for work purposes accounts for approximately 52 per cent of trips from the precinct. By 2022 these trips impact on the intersection of Mitchell Road / Ashmore Street which operates at LoS F. Modelling indicates the capacity issue is not at the intersection itself but occurs at the intersection of Mitchell Road / Fountain Street as vehicles are unable to bypass right turning vehicles. As a result it is proposed to restrict parking on the northern side of Mitchell Road between Copeland Street and Fountain Street. This allows northbound traffic to bypass stored vehicles, in turn increasing the throughput at the intersections of Mitchell Road / Copeland Street and Mitchell Road / Ashmore Street. The intersection performance results for these intersections highlight this improvement in capacity. The average delay for the intersection of Mitchell Road / Ashmore Street improves from LoS F, with a worst approach delay of 103 seconds in Scenario 3 to a LoS of E with a worst approach delay of 60.5 seconds.

Figure 4.31 and **Figure 4.32** indicate queuing levels associated with the proposed network modifications across the Ashmore local area network for Scenario 2 and Scenario 3. It can be seen in **Figure 4.32** that if no network modifications are made in 2022 the network does not operate effectively and incurs widespread queuing.

Figure 4.31 – Local Area Network Queuing (AM peak – Scenario 2)



Source: AECOM; 2013

Figure 4.32 – Local Area Network Queuing (AM peak – Scenario 3)



Source: AECOM; 2013

Modifications introduced to the network in 2017 continue to operate effectively and allow the local road network to perform within capacity, as shown in **Table 4.6** and **Figure 4.33**.

Table 4.6 2022 AM Peak (07:45-08:45)

Intersection	Scenario 1		Scenario 2		Scenario 3	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	7.4	A	15.5	B	21.2	B
Mitchell Rd / Fountain St	12.7	A	10.8	A	23.3	B
Mitchell Rd / Copeland St	28.8	C	23	B	32.3	C
Mitchell Rd / Harley St	5.3	A	30.4	C	38.9	C
Mitchell Rd / Ashmore St	7.7	A	60.5	E	102.9	F
Mitchell Rd / Maddox St	7.7	A	23.3	B	41.4	C
Mitchell Rd / Coulson St / Huntley St	14.2	B	24.3	B	47.1	D
Mitchell Rd / Sydney Park Rd	13	A	13.2	A	18.8	B
King St / Concord St	7.8	A	8	A	8	A
George St / Victoria St	2	A	2.2	A	2.1	A

Source: AECOM; 2013

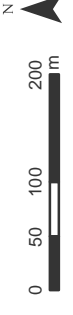


● Assessed Intersection
 ■ Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 2022 AM PEAK

60275815

Fig 4.33



4.3.1.5 2022 PM Peak

As a result of the proposed parking restrictions on Mitchell Road between Copeland Street and Fountain Street there is a higher rate of throughput for southbound traffic in the PM peak as vehicles are not delayed in the median lane behind right turning vehicles at the intersection of Mitchell Road / Copeland Street. The increased throughput of southbound traffic prevents sufficient gap acceptance for traffic turning right from Harley Street to Mitchell Road, thus creating large delays. As a result, in the 2022 PM peak, the right turn movement from Harley Street onto Mitchell Road is proposed to be banned. Once the right hand turn is banned, traffic wanting to travel northbound along Mitchell Road will be able to exit south from Harley Street, and then complete a U-Turn at the roundabout.

The importance of removing the kerbside parking on Mitchell Road between Copeland Street and Fountain Street is highlighted through a comparison of the intersection performance for Mitchell Road / Buckland Street across the various scenarios. **Table 4.7** indicates that Scenario 1, with the least amount of traffic, performs with an average delay of only 5.1 seconds (LoS A). Scenario 2 also performs at LoS A with an average delay of 14.1 seconds however Scenario 3 performs at LoS F with an average delay of 74.8 seconds. The average delay for the Buckland Street approach is 314.4 seconds which can be seen in the detailed intersection performance results in **Appendix A**.

Figure 4.34 and **Figure 4.35** provide an illustration of predicted queuing in the 2022 PM Peak whilst **Figure 4.36** provides a graphical output of the intersection LoS.

Figure 4.34 – Mitchell Road / Fountain Street (PM peak – Scenario 2)



Source: AECOM; 2013

Figure 4.35 – Mitchell Road / Fountain Street (PM peak – Scenario 3)



Source: AECOM; 2013

It should be noted that regardless of whether the Ashmore Precinct is developed modelling indicates that parking restrictions on Mitchell Road between Copeland Street and Fountain Street are recommended for implementation. Intersection performance results for the 2022 PM Peak are presented in **Table 4.7**.

Table 4.7 2022 PM Peak (17:00-18:00)

Intersection	Scenario 1		Scenario 2		Scenario 3	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	5.1	A	14.1	A	74.8	F
Mitchell Rd / Fountain St	13.3	A	14.7	B	31.9	C
Mitchell Rd / Copeland St	18.1	B	21.1	B	47.1	D
Mitchell Rd / Harley St	10.6	A	32	C	36	C
Mitchell Rd / Ashmore St	4.8	A	3.4	A	3.9	A
Mitchell Rd / Maddox St	12.9	A	18.6	B	19.7	B
Mitchell Rd / Coulson St / Huntley St	11.1	A	12.5	A	19.5	B
Mitchell Rd / Sydney Park Rd	22.6	B	21.9	B	25.7	B
King St / Concord St	14.1	A	13.9	A	13.7	A
George St / Victoria St	2.1	A	2.1	A	2.1	A

Source: AECOM; 2013



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ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
2022 PM PEAK

Fig 4.36



Assessed Intersection
Proposed Ashmore Precinct

4.3.1.6 2022 Saturday Peak

Modelling indicates that the Saturday peak period requires no additional network modifications in 2022 over and above those introduced in 2017.

The benefit that the proposed modifications provide to the local area network is highlighted through the comparison of Scenario 2 and Scenario 3 in **Table 4.8** and **Figure 4.39**. The proposed geometric improvements result in an improvement in LoS from:

- D to A at the intersection of Mitchell Road / Fountain Street;
- E to B at the intersection of Mitchell Road / Copeland Street;
- E to B at the intersection of Mitchell Road / Harley Street;
- E to B at the intersection of Mitchell Road / Maddox Street; and
- D to B at the intersection of Mitchell Road / Coulson Street / Huntley Street.

Figure 4.37 and **Figure 4.38** provide an illustration of predicted queuing in the vicinity of Mitchell Road / Fountain Street in Scenario 2 and Scenario 3, respectively.

Figure 4.37 – Mitchell Road / Fountain Street (Sat peak – Scenario 2)



Source: AECOM; 2013

Figure 4.38 – Mitchell Road / Fountain Street (Sat peak – Scenario 3)



Source: AECOM; 2013

Modelling results for the 2022 Saturday Peak are shown in **Table 4.8** and **Figure 4.39** with a detailed intersection performance summary available in **Appendix A**.

Table 4.8 2022 Saturday Peak (12:15-13:15)

Intersection	Scenario 1		Scenario 2		Scenario 3	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	4.5	A	6.8	A	12.9	A
Mitchell Rd / Fountain St	11.5	A	12	A	55.5	D
Mitchell Rd / Copeland St	21.1	B	26.2	B	56.4	E
Mitchell Rd / Harley St	6	A	20.7	B	58.3	E
Mitchell Rd / Ashmore St	5	A	23	B	37.4	C
Mitchell Rd / Maddox St	10.8	A	26.7	B	56.6	E
Mitchell Rd / Coulson St / Huntley St	10.1	A	26.4	B	49.5	D
Mitchell Rd / Sydney Park Rd	17.6	B	17.3	B	22.5	B
King St / Concord St	8.9	A	9.6	A	9.3	A
George St / Victoria St	2.1	A	2.1	A	2.1	A

Source: AECOM; 2013



● Assessed Intersection
 ■ Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 2022 SAT PEAK

60275815
Fig 4.39



4.3.2 Scenario 4 / Scenario 5

The second of the two scenario groupings centres on the full development of the Ashmore Precinct beyond 2027. **Scenario 4** involved an assessment of the projected traffic impacts utilising the maximum amount of required network modifications for each peak period, as discussed previously in **Table 4.1** and **Figure 4.19** to **Figure 4.21**. **Scenario 5** provided an indication of the required trip reduction from the Ashmore Precinct in the event that any intersections result in unsatisfactory⁴ performance levels during the associated peak.

4.3.2.1 Beyond 2027 AM Peak

Modelling results for the Beyond 2027 AM Peak are shown in **Table 4.9** and **Figure 4.42**. A detailed intersection performance summary can be found in **Appendix A**. The results from Scenario 4 indicate that without a trip reduction, the Ashmore Precinct will not be able to be fully developed without severely impacting the road network surrounding the site in the AM peak, including the key Mitchell Road corridor. The intersections of Mitchell Road / Ashmore Street and Mitchell Road / Maddox Street are forecast to operate at LoS F with significant delays which affect the wider network.

In Scenario 5, the network operates efficiently with the number of outbound trips from the Ashmore Precinct reduced to 2027 levels. In addition a key assumption behind the trip reduction was that the internal road network of the precinct linking the east and western components is fully developed, allowing trips from the western side of the precinct to exit via Ashmore Street or Maddox Street. Modelling indicates that the total reduction in trips that will need to be accommodated and shifted onto public transport services or active travel modes in the AM peak to ensure the road network functions adequately is 125. To equate this to dwellings within the Ashmore Precinct requires dividing the 125 trips by the modelled trip rate of 0.29, resulting in a total number of dwellings of approximately 430. This reduction is in addition to trips already allocated to public and active transport, and means additional public transport measures/services must be implemented to ensure the usage of alternatives to driving a motor vehicle.

Furthermore, trip distribution patterns were altered due to congestion on the network to reflect 'real-world' operating conditions whereby drivers will use a balance of equilibrium with respect to delay. This means that when a route with a shorter time is available vehicles will choose to travel via this direction. The redistribution resulted in all westbound trips exiting from the northern precinct access on Ashmore Street travelling on Erskineville Road being directed via Fox Avenue. After the trip reduction and redistribution all intersections are forecast to operate at LoS C or better.

Figure 4.40 and **Figure 4.41** highlight the difference in queue levels across the local area network in the AM peak between Scenario 4 and Scenario 5, respectively. In Scenario 4 vehicles are unable to exit the precinct due to queuing on the Mitchell Road corridor and there is also extensive queuing on Fountain Street. The proposed trip reduction allows vehicles to enter the Mitchell Road corridor, decreasing associated queues on side roads. The purple boxes on the imagery indicate that vehicles are blocked and unable to enter the local road network.

Table 4.9 Beyond 2027 AM Peak (07:45-08:45)

Intersection	Scenario 4		Scenario 5	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	31.2	C	20.3	B
Mitchell Rd / Fountain St	30.9	C	32.4	C
Mitchell Rd / Copeland St	25.8	B	24.1	B
Mitchell Rd / Harley St	24.7	B	13.6	A
Mitchell Rd / Ashmore St	237.8	F	36.8	C
Mitchell Rd / Maddox St	72.7	F	24.8	B
Mitchell Rd / Coulson St / Huntley St	37.1	C	24.6	B
Mitchell Rd / Sydney Park Rd	14.2	B	13.9	A
King St / Concord St	8.7	A	8.8	A
George St / Victoria St	2.2	A	2.2	A

Source: AECOM; 2013

⁴ For the purposes of this study unsatisfactory performance of an intersection was defined as the overall performance of an intersection being at a Level of Service D or lower.

Figure 4.40 – Local Area Network Queuing (AM peak – Scenario 4)



Source: AECOM; 2013

Figure 4.41 – Local Area Network Queuing (AM peak – Scenario 5)



Source: AECOM; 2013



● Assessed Intersection
 Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 BEYOND 2027 AM PEAK

60275815

Fig 4.42



4.3.2.2 Beyond 2027 PM Peak

Modelling results, as shown in **Table 4.10** and **Figure 4.45**, indicate that under full development of the Ashmore Precinct, and with the proposed network modifications as previously highlighted in **Table 4.1** and **Figure 4.20** the network will operate effectively with the exception of the Mitchell Road / Harley Street intersection. Congestion issues arise on Harley Street as vehicles are unable to find appropriate gap acceptance to enter Mitchell Road. No trip reduction was applied in the PM peak though as it was assumed in Scenario 5 that as a result drivers will not queue on this approach as they will seek a route with a faster travel time and therefore one third of drivers on Harley Street turning left (southbound) will redirect to the signalised intersection at Mitchell Road / Maddox Street.

Associated local area network queuing levels can be found in **Figure 4.43** and **Figure 4.44** for Scenario 4 and Scenario 5 respectively. Queuing levels are near identical across both scenarios.

Figure 4.43 – Local Area Network Queuing (PM peak – Scenario 4)



Source: AECOM; 2013

Figure 4.44 – Local Area Network Queuing (PM peak – Scenario 5)



Source: AECOM; 2013

Table 4.10 Beyond 2027 PM Peak (17:00-18:00)

Intersection	Scenario 4		Scenario 5	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	39	C	34	C
Mitchell Rd / Fountain St	20.9	B	20.7	B
Mitchell Rd / Copeland St	32.8	C	29.1	B
Mitchell Rd / Harley St	172.7	F	54.1	D
Mitchell Rd / Ashmore St	5.3	A	4.4	A
Mitchell Rd / Maddox St	22.2	B	22.4	B
Mitchell Rd / Coulson St / Huntley St	9.8	A	10.6	A
Mitchell Rd / Sydney Park Rd	20.8	B	20	B
King St / Concord St	15.1	B	14.3	A
George St / Victoria St	2	A	2	A

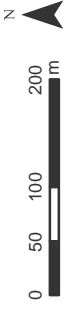
Source: AECOM; 2013



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ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
BEYOND 2027 PM PEAK

Fig 4.45



● Assessed Intersection
■ Proposed Ashmore Precinct

4.3.2.3 Beyond 2027 Saturday Peak

In the Scenario 5 Beyond 2027 Saturday Peak all intersections, with the exception of Mitchell Road / Ashmore Street operate with a LoS of D or better, as shown in **Table 4.11** and **Figure 4.48**. It can be seen that in Scenario 4 the intersection of Mitchell Road / Ashmore Street operates at LoS E.

The trip redistribution pattern at the northern access on Ashmore Street which was used in the Beyond 2027 AM peak scenario for vehicles travelling west on Erskineville Road, was applied to the scenario which resulted in an improvement in LoS from E to C. It is a rational assumption that this would occur given motorists desire to avoid congested areas of the network and the shorter travel time the alternate route would provide. Re-routing of these vehicles provides additional capacity at the intersection of Mitchell Road / Copeland Street which reduces the queue length on Mitchell Road.

Queuing at the intersection of Mitchell Road / Ashmore Street, which operates at LoS E in Scenario 4, is highlighted in **Figure 4.46**. **Figure 4.47** shows the same intersection after the redistribution of vehicles via Eve Street.

Appendix A provides a detailed breakdown of the intersection performance statistics.

Figure 4.46 – Local Area Network Queuing (Sat peak – Scenario 4)



Source: AECOM; 2013

Figure 4.47 – Local Area Network Queuing (Sat peak – Scenario 5)



Source: AECOM; 2013

Table 4.11 Beyond 2027 Saturday Peak (12:15-13:15)

Intersection	Scenario 4		Scenario 5	
	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	6.6	A	4.7	A
Mitchell Rd / Fountain St	13.4	A	11.6	A
Mitchell Rd / Copeland St	32.3	C	26.9	B
Mitchell Rd / Harley St	33.8	C	11.3	A
Mitchell Rd / Ashmore St	61.4	E	41.5	C
Mitchell Rd / Maddox St	44.7	D	27.2	B
Mitchell Rd / Coulson St / Huntley St	34.4	C	22.1	B
Mitchell Rd / Sydney Park Rd	18.7	B	16.6	B
King St / Concord St	10.1	A	10	A
George St / Victoria St	0.2	A	0.2	A

Source: AECOM; 2013



● Assessed Intersection
 ■ Proposed Ashmore Precinct

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 BEYOND 2027 SAT PEAK

60275815

Fig 4.48



4.4 Public Transport Improvements

Public transport and providing for increased mode share other than the private vehicle is an important factor in ensuring the success of the Ashmore Precinct. Currently the existing CityRail trains which service Erskineville Station are at their patronage capacity in the AM/PM peak periods with many trains unable to pick up passengers. As a result many residents of Ashmore will be required to travel to the City earlier / later or travel via bus services which will be required to meet the demand.

The impacts associated with the Ashmore Precinct, in relation to public transport, are threefold:

- **Geometric Improvements:** Currently Route 355 (Marrickville Metro – Bondi Junction) utilises Harley Street to gain access to Mitchell Road. Under the proposed network modifications, in certain scenarios, the right turn movement from Harley Street to Mitchell Road is proposed to be banned. This will have a direct impact on the existing bus route. Regardless of the ban increased traffic volumes will also impede the ability of buses to turn right at the location due to the longer gap acceptance required compared to a standard private vehicle.
- **Accessibility:** Existing public transport provision to the area is poor outside of the peak periods with services to/from the Sydney CBD ceasing after approximately 7PM. Whilst the northern component of the Ashmore Precinct has a close link to Erskineville Station residents on the southern side of the precinct are therefore without reliable nightly public transport. In order to promote a reduction in car usage it is vital to ensure accessibility to services is provided outside of peak times. In addition on a weekend services to the City cease at approximately 5:30PM on a Saturday and 3:30PM on a Sunday.
- **Service Provision:** Scenario 5 identified that, for the AM peak at the full development of the Ashmore Precinct, a total reduction of 125 outbound trips were required in the AM peak. This is equivalent to approximately two bus services per hour alone. It is important to note that this is in addition to an increase in public transport trips that are anticipated to be generated as a result of the precinct's full development.

As a result of the Ashmore Precinct development the following strategies to improve public transport in the area are recommended for investigation:

- **Modification to Route 370 (Leichhardt – Coogee) and Route 355 (Marrickville Metro – Bondi Junction):** It is proposed that Route 355 be redirected via Maddox Street to maximise the priority benefits of the proposed signalisation of the Mitchell Road / Maddox Street intersection, particularly as traffic volumes on Mitchell Road increase. In addition the Ashmore Precinct will provide an enhanced catchment opportunity for the service.

It is also proposed to redirect Route 370 along Mitchell Road before turning right at the intersection of Maddox Street. Again this will provide an increased catchment for the service.

Figure 4.49 highlights the proposed modification to Route 370 and Route 355.

- **Increased Service Frequency/Hours of Operation (Bus Network):**

It is important that an increased service frequency is provided from the early onset of the development to entrench travel patterns. Once an individual chooses a private vehicle as their mode choice it is harder to change that pattern of travel behaviour.

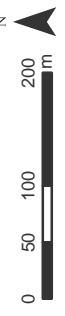
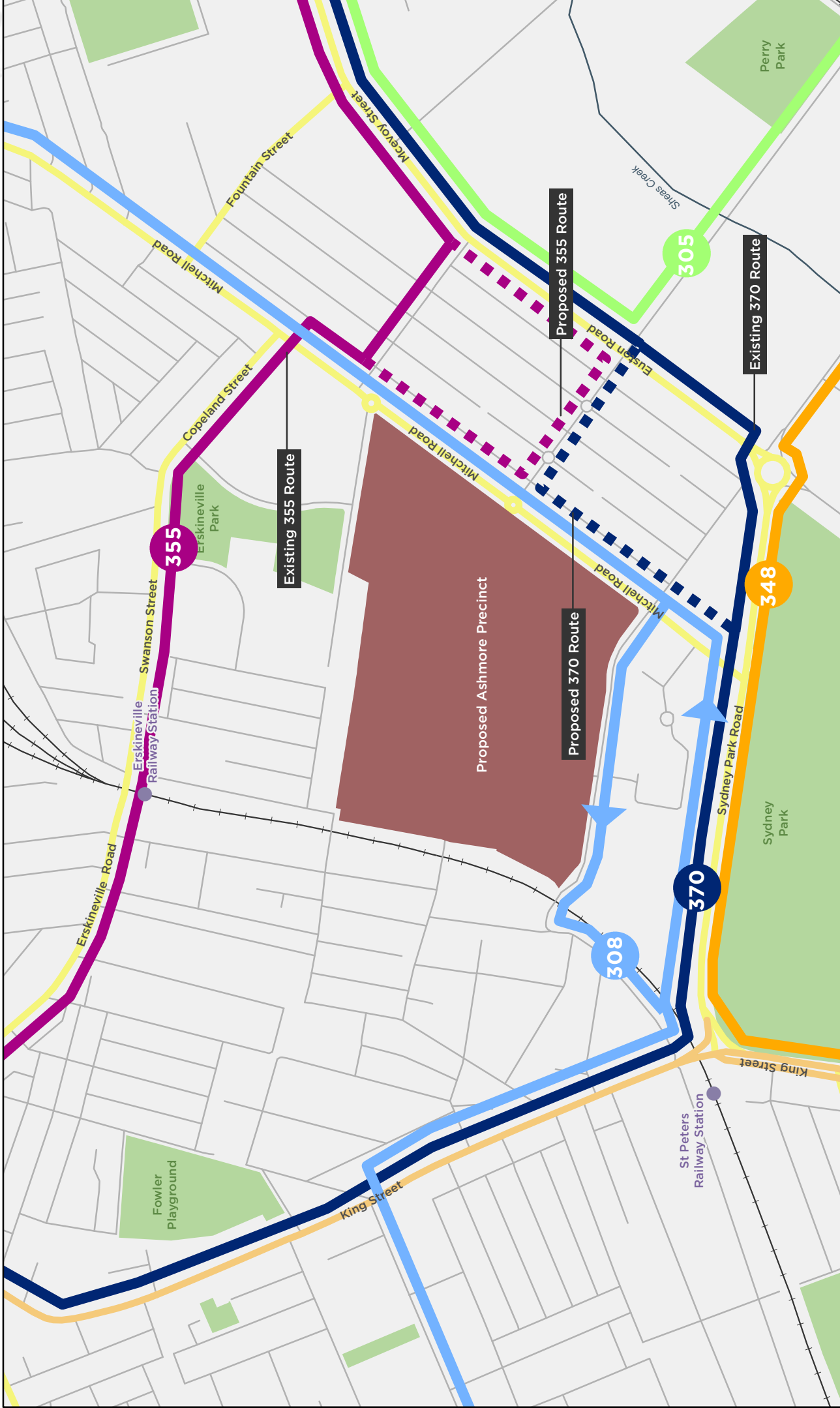
It is proposed that Route 308 (Marrickville Metro – St Peters – Redfern – City) be increased in frequency to at least every 10 minutes during peak hours to cater for increased demands. Prior to 2022, given the capacity of the current CityRail network, an investigation should be undertaken into the feasibility of operating a more direct 308 service to the city which follows Regent Street and Lee Street instead of the existing route through Redfern Street and Chalmers Street. This would provide an excellent interchange opportunity with the recently announced Sydney Light Rail.

In addition it is proposed that the hours of operation for all services shall be extended until 10PM on weekdays to accommodate increase passenger movements. This revised timetable should take effect prior to 2017 in order to reinforce travel behaviours amongst residents.

- **Increased Service Frequency (Train Network):**

Increases to the frequency of train services are required at Erskineville Station during the AM and PM peak periods. The State Government has recently announced additional train services on the Bankstown line from 2013. Whilst it is not known if these services will stop at Erskineville Station it is anticipated that they will, at a minimum, reduce the passenger loads and improve train capacity on existing Erskineville services.

All changes to the bus and train network as well as scheduling require consultation with Transport for NSW and either the State Transit Authority or City Rail. These changes are not the responsibility of City of Sydney Council and would need to be implemented by the NSW State Government.



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5.0 Conclusions and Recommendations

This report has outlined both the local area impacts as well as required geometrical improvements required to construct the Ashmore Precinct, whilst retaining appropriate levels of service on the local road network. The recommended geometrical improvements required on the local road network are:

- 1) Signalisation of the Mitchell Road / Maddox Street Intersection;
- 2) Revised lane configuration at the Mitchell Road / Sydney Park Road Intersection;
- 3) Parking restrictions on Mitchell Road (Copeland Street to Fountain Street and Sydney Park Road to Coulson Street);
- 4) Phasing alteration at the intersection of Mitchell Road / Coulson Street / Huntley Street; and
- 5) Right turn movement ban on Harley Street.

Table 5.1 shows the timing of the required modifications, and the authority responsible for implementation, assuming the staging of the Ashmore Precinct is constructed in 2017, 2022, and beyond 2027 (full development).

Table 5.1 Implementation and Responsible Authority for Ashmore Precinct Proposed Network and Geometrical Modifications Precinct

Network Modification	2017			2022			Beyond 2027		
	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Lane configuration of Mitchell Road / Sydney Park Road Intersection Approval Authority: Roads and Maritime Services	√	√	√	√	√	√	√	√	√
Parking Restrictions on south-eastern side of Mitchell Road between Sydney Park Road and Coulson Street Approval Authority: City of Sydney Council	X	√	√	√	√	√	√	√	√
Phasing alteration Mitchell Rd / Coulson St Approval Authority: Roads and Maritime Services	X	X	√	X	X	√	X	X	√
Proposed signalisation of Mitchell Road / Maddox Street Intersection Approval Authority: Roads and Maritime Services	√	√	√	√	√	√	√	√	√
Right turn movement ban implemented on Harley Street Approval Authority: City of Sydney Council	X	X	X	X	√	X	X	√	√
Parking Restrictions on southern side of Mitchell Road between Copeland Street and Fountain Street Approval Authority: Roads and Maritime Services	X	√	√	√	√	√	√	√	√
Parking Restrictions on northern side of Mitchell Road between Copeland Street and Fountain Street Approval Authority: Roads and Maritime Services	X	√	X	√	√	√	√	√	√

Key

X Not required √ Required

Source: AECOM; 2013

Modelling results indicate that in 2017 and 2022, based on the above network and geometrical modifications, the local road network will perform at acceptable levels of service. At full development (beyond 2027) modelling results indicate a trip reduction of 125 trips from the precinct is required in the AM peak hour.

The network modifications will result in parking restrictions on 31 existing parking spaces throughout the study area and the removal of at least three parking spaces in Maddox Street. It is recommended that the parking permit strategy outlined in the 2012 *Peer Review of Parking Study for Alexandria Area Adjacent Australian Technology Park*⁵ be adopted. The key recommendation from this Peer Review, with regards to the Ashmore Precinct, being:

'The implications for neighbouring streets as a result of parking demand generated by the Ashmore Precinct are not yet known, as this will depend on the parking rates agreed for the development. However, regardless of the on-site parking provision agreed for the development, if the adjacent streets remain unrestricted these will enable residents and visitors of the Ashmore Precinct to use this on-street capacity.

Therefore, it is likely that parking controls [in the form of parking permits] will be required to manage demand on the streets located near the development in order to preserve parking availability for existing residents, in particular:

- *The area immediately to the east of the Ashmore Precinct site, including Mitchell Road, Belmont Street, Maddox Street, Hartley Street and Huntley Street; and*
- *The area to the north west of the site, including Bridge Street, Malcolm Street, Binning Street and Ashmore Street*

It is recommended that the aforementioned permit area is reviewed, and potentially expanded, following completion of the 2017 stage of the Ashmore Precinct. The success of this parking recommendation is also dependent on appropriate levels of enforcement.

In addition to the above geometrical and parking recommendations, the following public transport alterations are suggested to mitigate the impact of the proposed development on the local road network and to provide suitable public transport travel options to the local community:

- Modification to Route 370 (Leichhardt – Coogee) and Route 355 (Marrickville Metro – Bondi Junction) to travel via the intersection of Mitchell Road / Maddox Street, allowing for greater catchment for the service and accessibility for residents;
- Increased Service Frequency for Route 308 (Marrickville Metro – St Peters – Redfern – City) to allow higher frequency service provision for residents to access the city; and
- Improved hours of Operation for all services until 10PM on weekdays to accommodate increased passenger movements. This revised timetable should take effect prior to 2017 in order to reinforce travel behaviours amongst residents.



Table 5.2 details the implementation of proposed parking and public transportation measures as well as the responsible authority for enacting these measures. The alterations to public transportation require approval from Transport for NSW and other State Government agencies as they affect roads and services which are not the responsibility of Council.

⁵ *Peer Review of Parking Study for Alexandria Area Adjacent Australian Technology Park*, AECOM, 2012

Table 5.2 Implementation and Responsible Authority for Ashmore Precinct Proposed Parking and Public Transport Modifications

Network Modification	2017			2022			Beyond 2027		
	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
Local Resident Parking Permit Strategy Approval Authority: City of Sydney Council	√	√	√	√	√	√	√	√	√
Bus Route 370 and Route 355 Modifications Approval Authority: Transport for NSW (State Transit Authority)	√	√	√	√	√	√	√	√	√
Increased Bus Services / Frequency Approval Authority: Transport for NSW (State Transit Authority)	√	√	√	√	√	√	√	√	√
Increased Train Services Approval Authority: Transport for NSW (CityRail)	√	√	√	√	√	√	√	√	√

Key

 Not required  Required

Source: AECOM; 2013

Appendix A

Detailed Intersection Performance Results

Appendix A Detailed Intersection Performance Results

Table A1 Existing Peak Hour Intersection Performance

Intersection	Approach	2012 AM Peak Hour (7:45 – 8:45)		2012 PM Peak Hour (17:00 – 18:00)		2012 Sat Peak Hour (12:15 – 13:15)	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	9.4	A	17.4	B	5.1	A
	Buckland St (East)	35.3	C	48.0	D	36.4	C
	Mitchell Rd (South)	5.2	A	2.0	A	2.0	A
	Overall	7	A	11.4	A	4.6	A
Mitchell Rd / Fountain St	Mitchell Rd (North)	11.8	A	22.2	B	13.2	A
	Fountain St (East)	19.2	B	21.3	B	21.9	B
	Mitchell Rd (South)	8.7	A	9.5	A	8.5	A
	Overall	11.6	A	17.3	B	13.7	A
Mitchell Rd / Copeland St	Mitchell Rd (North)	37.6	C	23.9	B	25.9	B
	Mitchell Rd (South)	16	B	20.6	B	22.4	B
	Copeland St (West)	40.3	C	31.1	C	25.9	B
	Overall	28.5	C	24.2	B	24.6	B
Mitchell Rd / Harley St	Mitchell Rd (North)	2.4	A	3.8	A	2.6	A
	Harley St (East)	4.3	A	11.1	A	4.2	A
	Mitchell Rd (South)	0.8	A	0.8	A	0.8	A
	Overall	4.3	A	11.1	A	4.2	A
Mitchell Rd / Ashmore St	Mitchell Rd (North)	2.2	A	3.0	A	2.7	A
	Ashmore St (West)	5.4	A	4.3	A	4.3	A
	Mitchell Rd (South)	1.0	A	2.3	A	0.7	A
	Overall	5.4	A	4.3	A	4.3	A
Mitchell Rd / Maddox Street	Mitchell Rd (North)	4.4	A	5.1	A	8.7	A
	Maddox St (East)	6.8	A	8.7	A	26.2	B
	Mitchell Rd (South)	71.5	F	4.0	A	7.4	A
	Overall	71.5	F	8.7	A	26.2	B
Mitchell Rd Coulson Street / Huntley St	Mitchell Rd (North)	14.1	A	7.2	A	5.7	A
	Huntley St (East)	35.2	C	42.7	D	31.9	C
	Mitchell Rd (South)	25.1	B	0.9	A	1.3	A
	Coulson St (West)	88.9	F	44.3	D	34.6	D
	Overall	33.9	C	10	A	7.2	A
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	75.2	F	51.1	D	52.8	D
	Sydney Park Rd (East)	15.9	B	23.9	B	12.2	A
	Park Access (South)	34.5	C	23.5	B	23.3	B
	Sydney Park Rd (West)	8	A	18.1	B	16.1	B
	Overall	17.1	B	24.4	B	21.9	B
King St / Concord St	King St (North)	11.5	A	16.3	B	12.4	A
	Concord St (East)	31.3	C	40.8	C	28	B
	King St (South)	2.6	A	5	A	3	A
	Overall	7.8	A	13.9	A	9.2	A
George St /	George St (North)	0	A	0	A	0	A

Intersection	Approach	2012 AM Peak Hour (7:45 – 8:45)		2012 PM Peak Hour (17:00 – 18:00)		2012 Sat Peak Hour (12:15 – 13:15)	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Victoria St	Victoria St (East)	2.1	A	2.1	A	2.2	A
	George St (South)	0	A	0	A	0	A
	Victoria St (West)	0	A	0	A	0	A
	Overall	2.1	A	2	A	2.2	A

Source: AECOM; 2013

Table A2 2017 AM Peak (07:45-08:45)

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	9	A	8.9	A	8.9	A
	Buckland St (East)	36.3	C	37.4	C	37.4	C
	Mitchell Rd (South)	5.5	A	6.3	A	6.2	A
	Overall	7	A	7.4	A	7.3	A
Mitchell Rd / Fountain St	Mitchell Rd (North)	11.1	A	10.3	A	12.9	A
	Fountain St (East)	22.4	B	21.6	B	18.5	B
	Mitchell Rd (South)	9.1	A	10.5	A	12.1	A
	Overall	12.5	A	12.7	A	13.5	A
Mitchell Rd / Copeland St	Mitchell Rd (North)	40.6	C	36.4	C	36.2	C
	Mitchell Rd (South)	14.6	B	16.9	B	16.9	B
	Copeland St (West)	32.8	C	42.4	C	42.8	D
	Overall	26.7	B	27.8	B	27.9	B
Mitchell Rd / Harley St	Mitchell Rd (North)	2.3	A	2.3	A	2.3	A
	Harley St (East)	5	A	8.2	A	8	A
	Mitchell Rd (South)	0.8	A	1.1	A	1.2	A
	Overall	5	A	8.2	A	8	A
Mitchell Rd / Ashmore St	Mitchell Rd (North)	2.2	A	2	A	2.1	A
	Ashmore St (West)	7.7	A	18.6	B	17.1	B
	Mitchell Rd (South)	2.9	A	10	A	10	A
	Overall	7.7	A	18.6	B	17.1	B
Mitchell Rd / Maddox Street	Mitchell Rd (North)	3.4	A	4.5	A	4.6	A
	Maddox St (East)	45.3	D	39.2	C	39.3	C
	Mitchell Rd (South)	4.5	A	6.7	A	6.5	A
	Site Access (West)	28.2	B	35.7	C	35.7	C
	Overall	8.8	A	11.2	A	11.2	A
Mitchell Rd Coulson Street / Huntley St	Mitchell Rd (North)	5.8	A	10.1	A	9	A
	Huntley St (East)	41.7	C	32.9	C	33	C
	Mitchell Rd (South)	3.8	A	7.7	A	4.7	A
	Coulson St (West)	57.2	E	40.2	C	42.1	C
	Overall	13.9	A	15	B	13.5	A
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	54.1	D	53.9	D	54.7	D
	Sydney Park Rd (East)	11.6	A	11	A	11.9	A
	Park Access (South)	46.2	D	60.6	E	34.5	C

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
	Sydney Park Rd (West)	6.7	A	6.4	A	7.8	A
	Overall	13	A	13.4	A	14.6	B
King St / Concord St	King St (North)	11.5	A	11.3	A	11.3	A
	Concord St (East)	30.1	C	30	C	30.7	C
	King St (South)	2.6	A	2.7	A	2.7	A
	Overall	8	A	8.1	A	8.1	A
George St / Victoria St	George St (North)	0	A	0	A	0	A
	Victoria St (East)	2.1	A	2.2	A	2.2	A
	George St (South)	0	A	0	A	0	A
	Victoria St (West)	0	A	0	A	0	A
	Overall	2.2	A	2.2	A	2.2	A

Source: AECOM; 2013

Table A3 2017 PM Peak (17:00-18:00)

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	5.9	A	14.2	A	108.9	F
	Buckland St (East)	41.5	C	43.2	D	196.6	F
	Mitchell Rd (South)	2.2	A	2.1	A	2.3	A
	Overall	5	A	10	A	66.9	E
Mitchell Rd / Fountain St	Mitchell Rd (North)	10.2	A	11.2	A	38.1	C
	Fountain St (East)	30	C	26.9	B	26.2	B
	Mitchell Rd (South)	10.9	A	7.5	A	20.5	B
	Overall	15.5	B	13.6	A	29	C
Mitchell Rd / Copeland St	Mitchell Rd (North)	12.5	A	9.6	A	32.9	C
	Mitchell Rd (South)	40.3	C	32.6	C	23.6	B
	Copeland St (West)	21.1	B	22.3	B	47.7	D
	Overall	23.4	B	18.7	B	33.1	C
Mitchell Rd / Harley St	Mitchell Rd (North)	3	A	6.2	A	6.8	A
	Harley St (East)	21.3	B	42.6	D	41.7	C
	Mitchell Rd (South)	7	A	0.8	A	0.8	A
	Overall	21.3	B	42.6	D	41.7	C
Mitchell Rd / Ashmore St	Mitchell Rd (North)	3	A	3.6	A	3.7	A
	Ashmore St (West)	6.4	A	3.9	A	4.1	A
	Mitchell Rd (South)	4.9	A	1.9	A	2.4	A
	Overall	6.4	A	3.9	A	4.1	A
Mitchell Rd / Maddox Street	Mitchell Rd (North)	9.7	A	14.7	A	17.2	B
	Maddox St (East)	19.8	B	21.4	B	21.8	B
	Mitchell Rd (South)	13.1	A	12.9	A	15.3	B
	Site Access (West)	17.3	B	20.6	B	21.6	B
	Overall	12.7	A	15.7	B	17.7	B
Mitchell Rd Coulson Street /	Mitchell Rd (North)	9.2	A	10.6	A	20.7	B
	Huntley St (East)	43.8	D	43.6	D	43.6	D
	Mitchell Rd (South)	1.6	A	1.6	A	0.9	A

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Huntley St	Coulson St (West)	46.9	D	47.4	D	47.2	D
	Overall	11.3	A	11.1	A	16.6	B
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	33.2	C	29.8	C	43.8	D
	Sydney Park Rd (East)	30.2	C	23	B	24.3	B
	Park Access (South)	60.7	E	50.3	D	19.2	B
	Sydney Park Rd (West)	11.4	A	12.3	A	18.1	B
	Overall	25.3	A	21.1	B	25.9	B
King St / Concord St	King St (North)	17	A	16.6	A	16.6	B
	Concord St (East)	37.1	C	37.8	C	37.9	C
	King St (South)	5	A	5.5	A	5.4	A
	Overall	13.9	A	14.1	A	14	A
George St / Victoria St	George St (North)	0	A	0	A	0	A
	Victoria St (East)	2	A	2.2	A	2.2	A
	George St (South)	0	A	0	A	0	A
	Victoria St (West)	0	A	0	A	0	A
	Overall	2	A	2.2	A	2.2	A

Source: AECOM; 2013

Table A4 2017 Saturday Peak (12:15-13:15)

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	5.4	A	5.6	A	13	A
	Buckland St (East)	37.8	C	42.2	C	47.7	D
	Mitchell Rd (South)	1.9	A	2	A	3	A
	Overall	4.4	A	4.8	A	8.8	A
Mitchell Rd / Fountain St	Mitchell Rd (North)	10.5	A	10.9	A	28.5	C
	Fountain St (East)	19.5	B	20.9	B	70.6	F
	Mitchell Rd (South)	7.4	A	8.5	A	21.9	B
	Overall	11.7	A	12.5	A	36.8	C
Mitchell Rd / Copeland St	Mitchell Rd (North)	17	B	15.6	B	54	D
	Mitchell Rd (South)	22.2	B	25.2	B	26.3	B
	Copeland St (West)	28.1	B	30.5	C	33.9	C
	Overall	21.5	B	22.7	B	39.5	C
Mitchell Rd / Harley St	Mitchell Rd (North)	2.6	A	2.8	A	25.6	B
	Harley St (East)	5.6	A	11	A	12.5	A
	Mitchell Rd (South)	0.8	A	1.2	A	1.3	A
	Overall	5.6	A	11	A	25.6	B
Mitchell Rd / Ashmore St	Mitchell Rd (North)	2.7	A	3	A	8.2	A
	Ashmore St (West)	4.7	A	5.9	A	10.1	A
	Mitchell Rd (South)	1.7	A	3.4	A	7.4	A
	Overall	4.7	A	5.9	A	10.1	A
Mitchell Rd / Maddox Street	Mitchell Rd (North)	6.7	A	7.9	A	46.3	D
	Maddox St (East)	29.5	C	30	C	42.7	D
	Mitchell Rd (South)	11.9	A	11.3	A	39.2	C

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
	Site Access (West)	0	A	24.6	B	27.5	B
	Overall	11.8	A	12.7	A	42.5	D
Mitchell Rd Coulson Street / Huntley St	Mitchell Rd (North)	9	A	10.5	A	52	D
	Huntley St (East)	30.9	C	32.3	C	32.7	C
	Mitchell Rd (South)	5.5	A	12.4	A	38.7	C
	Coulson St (West)	32.6	C	33.2	C	68.9	E
	Overall	9.7	A	14.5	B	48.4	D
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	44.7	D	37.8	C	49.4	D
	Sydney Park Rd (East)	13.1	A	13	A	13	A
	Park Access (South)	43	D	41.3	C	22.1	B
	Sydney Park Rd (West)	11.2	A	10.9	A	18.8	B
	Overall	18	B	16.9	B	22.8	B
King St / Concord St	King St (North)	11.8	A	12.6	A	12.6	A
	Concord St (East)	29.5	C	27.9	B	30.1	C
	King St (South)	2.8	A	3.3	A	3.3	A
	Overall	9	A	9.7	A	9.3	A
George St / Victoria St	George St (North)	0	A	0	A	0	A
	Victoria St (East)	2	A	2.1	A	2.1	A
	George St (South)	0	A	0	A	0	A
	Victoria St (West)	0	A	0	A	0	A
	Overall	2	A	2.1	A	2.1	A

Source: AECOM; 2013

Table A5 2022 AM Peak (07:45-08:45)

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	9.2	A	8.3	A	8.3	A
	Buckland St (East)	35	C	37.4	C	37.4	C
	Mitchell Rd (South)	5.9	A	17.5	B	25.1	B
	Overall	7.4	A	15.5	B	21.2	B
Mitchell Rd / Fountain St	Mitchell Rd (North)	11.4	A	9.1	A	12.6	A
	Fountain St (East)	22.1	B	25.8	B	25.5	B
	Mitchell Rd (South)	9.5	A	6.8	A	25.7	B
	Overall	12.7	A	10.8	A	23.3	B
Mitchell Rd / Copeland St	Mitchell Rd (North)	41	C	24.3	B	34.3	C
	Mitchell Rd (South)	16.8	B	19.3	B	25.1	B
	Copeland St (West)	36.2	C	30.3	C	46.5	D
	Overall	28.8	C	23	B	32.3	C
Mitchell Rd / Harley St	Mitchell Rd (North)	2.3	A	2.2	A	2.7	A
	Harley St (East)	5.3	A	30.4	C	38.9	C
	Mitchell Rd (South)	0.8	A	1.5	A	2.1	A
	Overall	5.3	A	30.4	C	38.9	C
Mitchell Rd /	Mitchell Rd (North)	2.2	A	2.1	A	2.6	A
	Ashmore St (West)	7.7	A	60.5	E	102.9	F

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Ashmore St	Mitchell Rd (South)	3.4	A	31	C	43.7	D
	Overall	7.7	A	60.5	E	102.9	F
Mitchell Rd / Maddox Street	Mitchell Rd (North)	2.7	A	6.3	A	14.6	B
	Maddox St (East)	22.8	B	22.7	B	46.7	D
	Mitchell Rd (South)	7.5	A	29.3	C	50.7	D
	Site Access (West)	13.9	A	31.7	C	51.7	D
	Overall	7.7	A	23.3	B	41.4	C
Mitchell Rd Coulson Street / Huntley St	Mitchell Rd (North)	6.3	A	10.7	A	37.9	C
	Huntley St (East)	40	C	47.9	D	50.7	D
	Mitchell Rd (South)	3.8	A	10.1	A	21.3	B
	Coulson St (West)	58.2	E	79.5	F	130	F
	Overall	14.2	B	24.3	B	47.1	D
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	52.8	D	49.3	D	73.4	F
	Sydney Park Rd (East)	11.5	A	10.8	A	12	A
	Park Access (South)	43.8	D	61.6	E	36	C
	Sydney Park Rd (West)	6.9	A	6.7	A	10.3	A
	Overall	13	A	13.2	A	18.8	B
King St / Concord St	King St (North)	11.2	A	10.8	A	10.8	A
	Concord St (East)	29.8	C	31.6	C	31.5	C
	King St (South)	2.6	A	2.7	A	2.7	A
	Overall	7.8	A	8	A	8	A
George St / Victoria St	George St (North)	0	A	0	A	0	A
	Victoria St (East)	2	A	2.2	A	2.1	A
	George St (South)	0	A	0	A	0	A
	Victoria St (West)	0	A	0	A	0	A
	Overall	2	A	2.2	A	2.1	A

Source: AECOM; 2013

Table A6 2022 PM Peak (17:00-18:00)

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	6.2	A	20.6	B	118.1	F
	Buckland St (East)	39.1	C	39.3	C	314.4	F
	Mitchell Rd (South)	2.1	A	2.1	A	2	A
	Overall	5.1	A	14.1	A	74.8	F
Mitchell Rd / Fountain St	Mitchell Rd (North)	10	A	13.4	A	42.4	C
	Fountain St (East)	29.5	C	27.4	B	37.8	C
	Mitchell Rd (South)	5.7	A	8	A	15.9	B
	Overall	13.3	A	14.7	B	31.9	C
Mitchell Rd / Copeland St	Mitchell Rd (North)	8.6	A	11.4	A	40.3	C
	Mitchell Rd (South)	29.9	C	35.7	C	20.2	B
	Copeland St (West)	20.8	B	26.2	B	101.3	F
	Overall	18.1	B	21.1	B	47.1	D
Mitchell Rd /	Mitchell Rd (North)	2.9	A	7.5	A	5.4	A

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Harley St	Harley St (East)	10.6	A	32	C	36	C
	Mitchell Rd (South)	1	A	1.2	A	5.3	A
	Overall	10.6	A	32	C	36	C
Mitchell Rd / Ashmore St	Mitchell Rd (North)	3.1	A	2.4	A	2.2	A
	Ashmore St (West)	4.8	A	3.4	A	3.9	A
	Mitchell Rd (South)	2.9	A	2.2	A	2	A
	Overall	4.8	A	3.4	A	3.9	A
Mitchell Rd / Maddox Street	Mitchell Rd (North)	10	A	21	B	17.8	B
	Maddox St (East)	19.9	B	21.5	B	29.2	C
	Mitchell Rd (South)	13.4	A	12	A	15.1	B
	Site Access (West)	16.5	B	21.5	B	24.8	B
	Overall	12.9	A	18.6	B	19.7	B
Mitchell Rd Coulson Street / Huntley St	Mitchell Rd (North)	8.6	A	12.9	A	26.3	B
	Huntley St (East)	44.2	D	43.6	D	43.7	D
	Mitchell Rd (South)	1.7	A	1.8	A	0.9	A
	Coulson St (West)	46.5	D	46.2	D	46.4	D
	Overall	11.1	A	12.5	A	19.5	B
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	32.5	C	29.8	C	47	D
	Sydney Park Rd (East)	25.5	B	24.7	B	22.6	B
	Park Access (South)	58.8	E	47.5	D	19.9	B
	Sydney Park Rd (West)	11.2	A	12.2	A	18.5	B
	Overall	22.6	B	21.9	B	25.7	B
King St / Concord St	King St (North)	15.5	B	16.6	B	16.5	B
	Concord St (East)	46.7	D	37.5	C	36	C
	King St (South)	4.4	A	5.3	A	5.3	A
	Overall	14.1	A	13.9	A	13.7	A
George St / Victoria St	George St (North)	0	A	0	A	0	A
	Victoria St (East)	2.1	A	2.1	A	2.1	A
	George St (South)	0	A	0	A	0	A
	Victoria St (West)	0	A	0	A	0	A
	Overall	2.1	A	2.1	A	2.1	A

Source: AECOM; 2013

Table A7 2022 Saturday Peak (12:15-13:15)

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	5.4	A	11.9	A	23.3	B
	Buckland St (East)	36.8	C	35.7	C	51.4	D
	Mitchell Rd (South)	1.8	A	1.7	A	3.2	A
	Overall	4.5	A	6.8	A	12.9	A
Mitchell Rd / Fountain St	Mitchell Rd (North)	10.5	A	14.4	A	40.5	C
	Fountain St (East)	19.8	B	22	B	100.2	F
	Mitchell Rd (South)	6.8	A	4.6	A	41.7	C
	Overall	11.5	A	12	A	55.5	D
Mitchell Rd / Copeland St	Mitchell Rd (North)	16.6	B	21.2	B	61.5	E
	Mitchell Rd (South)	22.4	B	33.8	C	38.2	C
	Copeland St (West)	26.6	B	22.5	B	77.6	F
	Overall	21.1	B	26.2	B	56.4	E
Mitchell Rd / Harley St	Mitchell Rd (North)	2.6	A	12	A	27.1	A
	Harley St (East)	6	A	20.7	B	58.3	E
	Mitchell Rd (South)	0.8	A	2.3	A	2.7	A
	Overall	6	A	20.7	B	58.3	E
Mitchell Rd / Ashmore St	Mitchell Rd (North)	2.8	A	4.5	A	7.2	A
	Ashmore St (West)	5	A	12.3	A	12	A
	Mitchell Rd (South)	1.5	A	23	B	37.4	C
	Overall	5	A	23	B	37.4	C
Mitchell Rd / Maddox Street	Mitchell Rd (North)	6.5	A	22.3	B	57.8	E
	Maddox St (East)	29.6	C	47.6	D	41.4	C
	Mitchell Rd (South)	9.9	A	23	B	64.4	E
	Site Access (West)	0	A	34.8	C	30.7	C
	Overall	10.8	A	26.7	B	56.6	E
Mitchell Rd Coulson Street / Huntley St	Mitchell Rd (North)	9.8	A	28.8	C	74.9	F
	Huntley St (East)	31	C	31.6	C	32.6	C
	Mitchell Rd (South)	5.6	A	21.2	B	29.7	C
	Coulson St (West)	33	C	34.6	C	52.1	D
	Overall	10.1	A	26.4	B	49.5	D
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	46.8	D	34	C	51.3	D
	Sydney Park Rd (East)	12.4	A	14.1	A	14	A
	Park Access (South)	43.3	D	40.9	C	18.2	B
	Sydney Park Rd (West)	10.1	A	12.2	A	17.6	B
	Overall	17.6	B	17.3	B	22.5	B
King St / Concord St	King St (North)	11.8	A	12.3	A	12.3	A
	Concord St (East)	28.6	C	30	C	29.6	C
	King St (South)	2.9	A	3.3	A	3.3	A
	Overall	8.9	A	9.6	A	9.3	A
George St / Victoria St	George St (North)	0	A	0	A	0	A
	Victoria St (East)	2.1	A	2.1	A	2.1	A
	George St (South)	0	A	0	A	0	A
	Victoria St (West)	0	A	0	A	0	A

Intersection	Approach	Scenario 1		Scenario 2		Scenario 3	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
	Overall	2.1	A	2.1	A	2.1	A

Source: AECOM; 2013

Table A8 Beyond 2027 AM Peak (07:45-08:45)

Intersection	Approach	Scenario 4		Scenario 5	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	9.4	A	9.2	A
	Buckland St (East)	36.6	C	37	C
	Mitchell Rd (South)	38.3	C	23.4	B
	Overall	31.2	C	20.3	B
Mitchell Rd / Fountain St	Mitchell Rd (North)	8.9	A	9.6	A
	Fountain St (East)	114.3	F	118.5	F
	Mitchell Rd (South)	14	A	16.2	A
	Overall	30.9	C	32.4	C
Mitchell Rd / Copeland St	Mitchell Rd (North)	26.8	B	26.5	B
	Mitchell Rd (South)	20.5	B	19.6	B
	Copeland St (West)	38	C	30.8	C
	Overall	25.8	B	24.1	B
Mitchell Rd / Harley St	Mitchell Rd (North)	2.3	A	2.4	A
	Harley St (East)	24.7	B	13.6	A
	Mitchell Rd (South)	1.8	A	1.3	A
	Overall	24.7	B	13.6	A
Mitchell Rd / Ashmore St	Mitchell Rd (North)	2.3	A	2.2	A
	Ashmore St (West)	237.8	F	36.8	C
	Mitchell Rd (South)	49.6	D	26.2	B
	Overall	237.8	F	36.8	C
Mitchell Rd / Maddox Street	Mitchell Rd (North)	13.4	A	6.1	A
	Maddox St (East)	69.4	E	26.3	B
	Mitchell Rd (South)	57	E	24.7	B
	Site access (West)	218.9	F	55	D
	Overall	72.7	F	24.8	B
Mitchell Rd Coulson Street / Huntley St	Mitchell Rd (North)	21	B	19	B
	Huntley St (East)	35.7	C	39.1	C
	Mitchell Rd (South)	21	B	9.3	A
	Coulson St (West)	99.3	F	76.2	F
	Overall	37.1	C	24.6	B
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	59.1	E	61.3	E
	Sydney Park Rd (East)	10	A	11	A
	Park Access (South)	78.3	F	62.8	E
	Sydney Park Rd (West)	6.6	A	5.7	A
	Overall	14.2	B	13.9	A
King St / Concord St	King St (North)	11.5	A	11.7	A
	Concord St (East)	29.8	C	30.6	C
	King St (South)	2.7	A	2.7	A

Intersection	Approach	Scenario 4		Scenario 5	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
	Overall	8.7	A	8.8	A
George St / Victoria St	George St (North)	0	A	0	A
	Victoria St (East)	2.2	A	2.2	A
	George St (South)	0	A	0	A
	Victoria St (West)	0	A	0	A
	Overall	2.2	A	2.2	A

Source: AECOM; 2013

Table A9 Beyond 2027 PM Peak (17:00-18:00)

Intersection	Approach	Scenario 4		Scenario 5	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	56.8	E	49.9	D
	Buckland St (East)	104.2	F	64.8	E
	Mitchell Rd (South)	2.2	A	2.2	A
	Overall	39	C	34	C
Mitchell Rd / Fountain St	Mitchell Rd (North)	18.6	B	17.5	B
	Fountain St (East)	37.2	C	40.4	C
	Mitchell Rd (South)	13.1	A	12	A
	Overall	20.9	B	20.7	B
Mitchell Rd / Copeland St	Mitchell Rd (North)	21.8	B	19.5	B
	Mitchell Rd (South)	34.1	C	34.5	C
	Copeland St (West)	62.1	E	48.5	D
	Overall	32.8	C	29.1	B
Mitchell Rd / Harley St	Mitchell Rd (North)	21.2	B	15.9	B
	Harley St (East)	172.7	F	54.1	D
	Mitchell Rd (South)	1.1	A	1.1	A
	Overall	172.7	F	54.1	D
Mitchell Rd / Ashmore St	Mitchell Rd (North)	2.9	A	2.8	A
	Ashmore St (West)	3.8	A	4.4	A
	Mitchell Rd (South)	5.3	A	4.2	A
	Overall	5.3	A	4.4	A
Mitchell Rd / Maddox Street	Mitchell Rd (North)	26.9	B	27.3	B
	Maddox St (East)	24	B	25.4	B
	Mitchell Rd (South)	11.5	A	10.5	A
	Site access (West)	20.7	B	20	B
	Overall	22.2	B	22.4	B
Mitchell Rd Coulson Street / Huntley St	Mitchell Rd (North)	9.2	A	10	A
	Huntley St (East)	42.9	D	42.6	D
	Mitchell Rd (South)	1.6	A	1.6	A
	Coulson St (West)	47.9	D	46	D
	Overall	9.8	A	10.6	A
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	30.1	C	29.4	C
	Sydney Park Rd (East)	22.8	B	21.4	A
	Park Access (South)	45.3	D	51.3	D

Intersection	Approach	Scenario 4		Scenario 5	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
	Sydney Park Rd (West)	12.2	A	12.2	A
	Overall	20.8	B	20	B
King St / Concord St	King St (North)	17.2	B	16.6	B
	Concord St (East)	40.9	C	37	C
	King St (South)	5.2	A	5.1	A
	Overall	15.1	B	14.3	A
George St / Victoria St	George St (North)	0	A	0	A
	Victoria St (East)	2	A	2	A
	George St (South)	0	A	0	A
	Victoria St (West)	0	A	0	A
	Overall	2	A	2	A

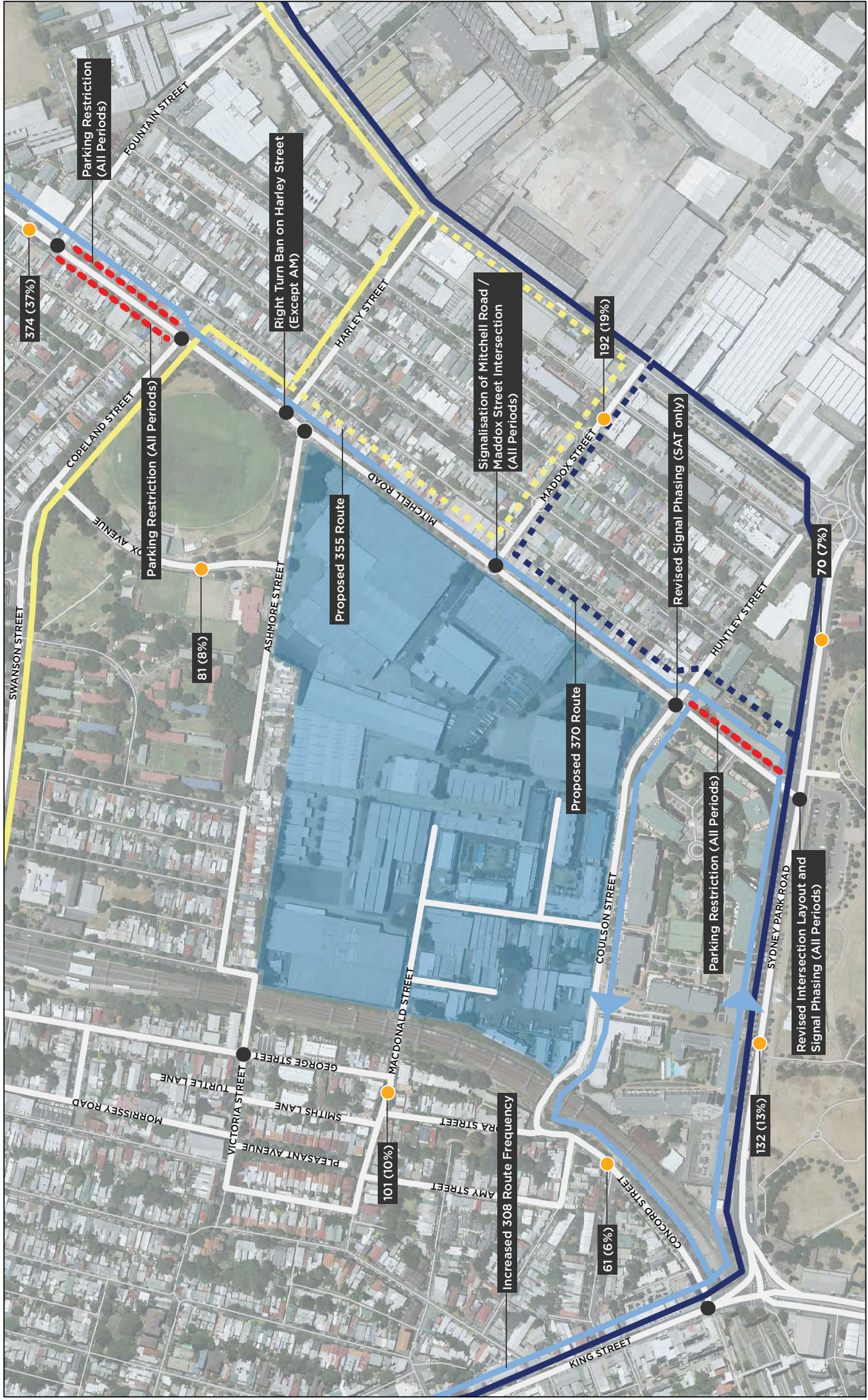
Source: AECOM; 2013

Table A10 Beyond 2027 Saturday Peak (12:15-13:15)

Intersection	Approach	Scenario 4		Scenario 5	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Mitchell Rd / Buckland St	Mitchell Rd (North)	11.1	A	6.8	A
	Buckland St (East)	41.8	C	37.3	C
	Mitchell Rd (South)	1.6	A	1.6	A
	Overall	6.6	A	4.7	A
Mitchell Rd / Fountain St	Mitchell Rd (North)	18.6	B	13.4	A
	Fountain St (East)	22.2	B	20.7	B
	Mitchell Rd (South)	5.4	A	5.8	A
	Overall	13.4	A	11.6	A
Mitchell Rd / Copeland St	Mitchell Rd (North)	36.8	C	28.4	B
	Mitchell Rd (South)	31.1	C	29	C
	Copeland St (West)	26.3	B	20.2	B
	Overall	32.3	C	26.9	B
Mitchell Rd / Harley St	Mitchell Rd (North)	14.6	B	4.3	A
	Harley St (East)	33.8	C	11.3	A
	Mitchell Rd (South)	2.4	A	1.9	A
	Overall	33.8	C	11.3	A
Mitchell Rd / Ashmore St	Mitchell Rd (North)	4.7	A	3.7	A
	Ashmore St (West)	17	B	12.4	A
	Mitchell Rd (South)	61.4	E	41.5	C
	Overall	61.4	E	41.5	C
Mitchell Rd / Maddox Street	Mitchell Rd (North)	38	C	19.9	B
	Maddox St (East)	44.3	D	39	C
	Mitchell Rd (South)	56.5	E	28.1	B
	Site access (West)	31.2	C	30.8	C
	Overall	44.7	D	27.2	B
Mitchell Rd Coulson Street /	Mitchell Rd (North)	30.3	C	16.6	B
	Huntley St (East)	32.9	C	32.3	C
	Mitchell Rd (South)	39.7	C	25.4	B

Intersection	Approach	Scenario 4		Scenario 5	
		Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Huntley St	Coulson St (West)	29	C	29	C
	Overall	34.4	C	22.1	B
Mitchell Rd / Sydney Park Rd	Mitchell Rd (North)	32.2	C	32.8	C
	Sydney Park Rd (East)	16.9	B	13.3	A
	Park Access (South)	49.6	D	45.9	D
	Sydney Park Rd (West)	14.2	A	11.9	A
	Overall	18.7	B	16.6	B
King St / Concord St	King St (North)	12.3	A	12.4	A
	Concord St (East)	30.5	C	28.5	C
	King St (South)	2.9	A	2.9	A
	Overall	10.1	A	10	A
George St / Victoria St	George St (North)	0	A	0	A
	Victoria St (East)	0.2	A	0.2	A
	George St (South)	0	A	0	A
	Victoria St (West)	0	A	0	A
	Overall	0.2	A	0.2	A

Source: AECOM; 2013



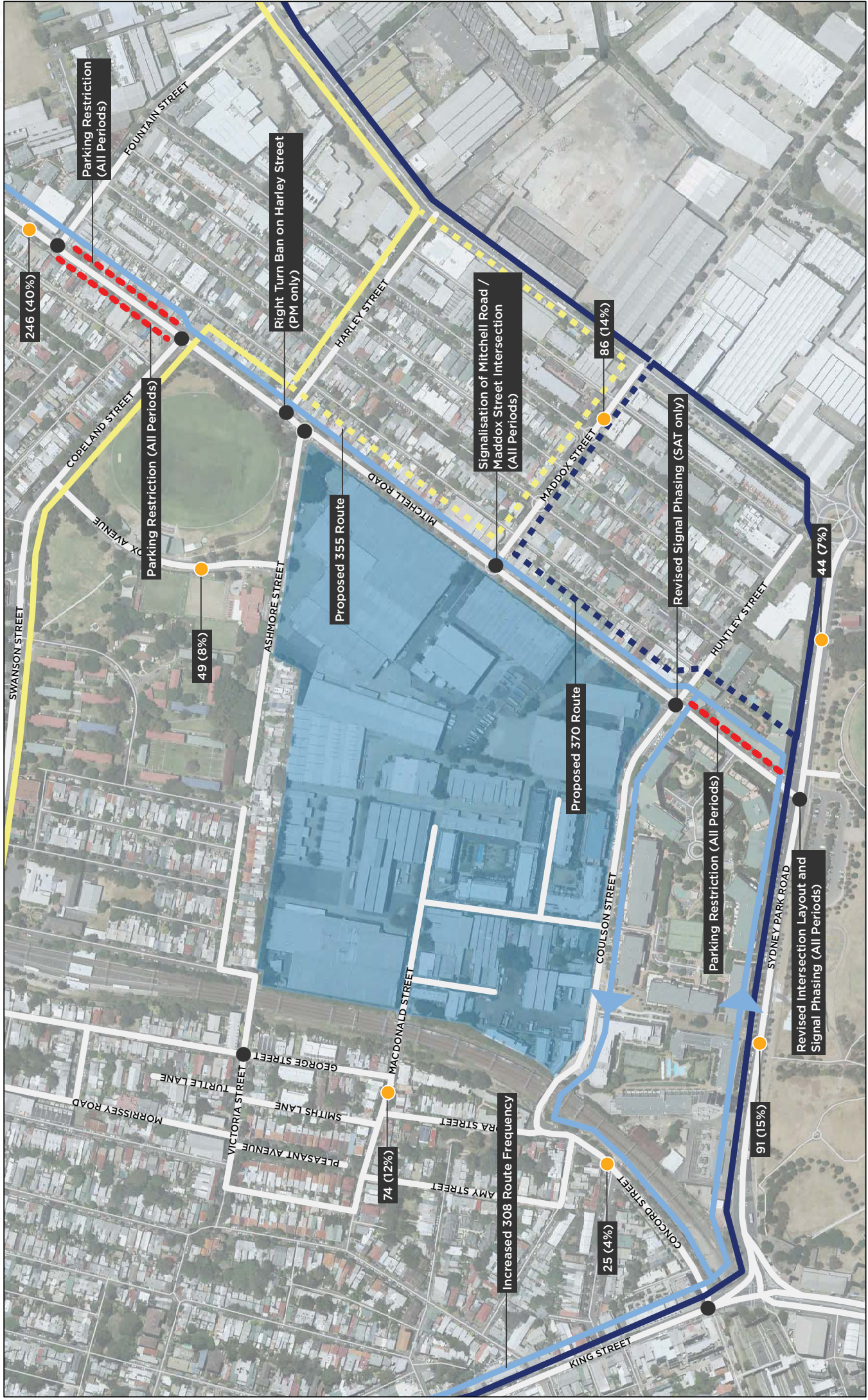
ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
 CONCEPT MASTERPLAN
 BEYOND 2027

60275815

0 50 100 200 m

● Assessed Intersection
 ■ Proposed Ashmore Precinct
 ● Parking Restriction
 ● Ashmore Precinct Traffic Volume (%)

■ Bus Route 308
 ■ Bus Route 355 (existing)
 ■ Bus Route 370 (existing)
 ■ Bus Route 355 (proposed)
 ■ Bus Route 370 (proposed)



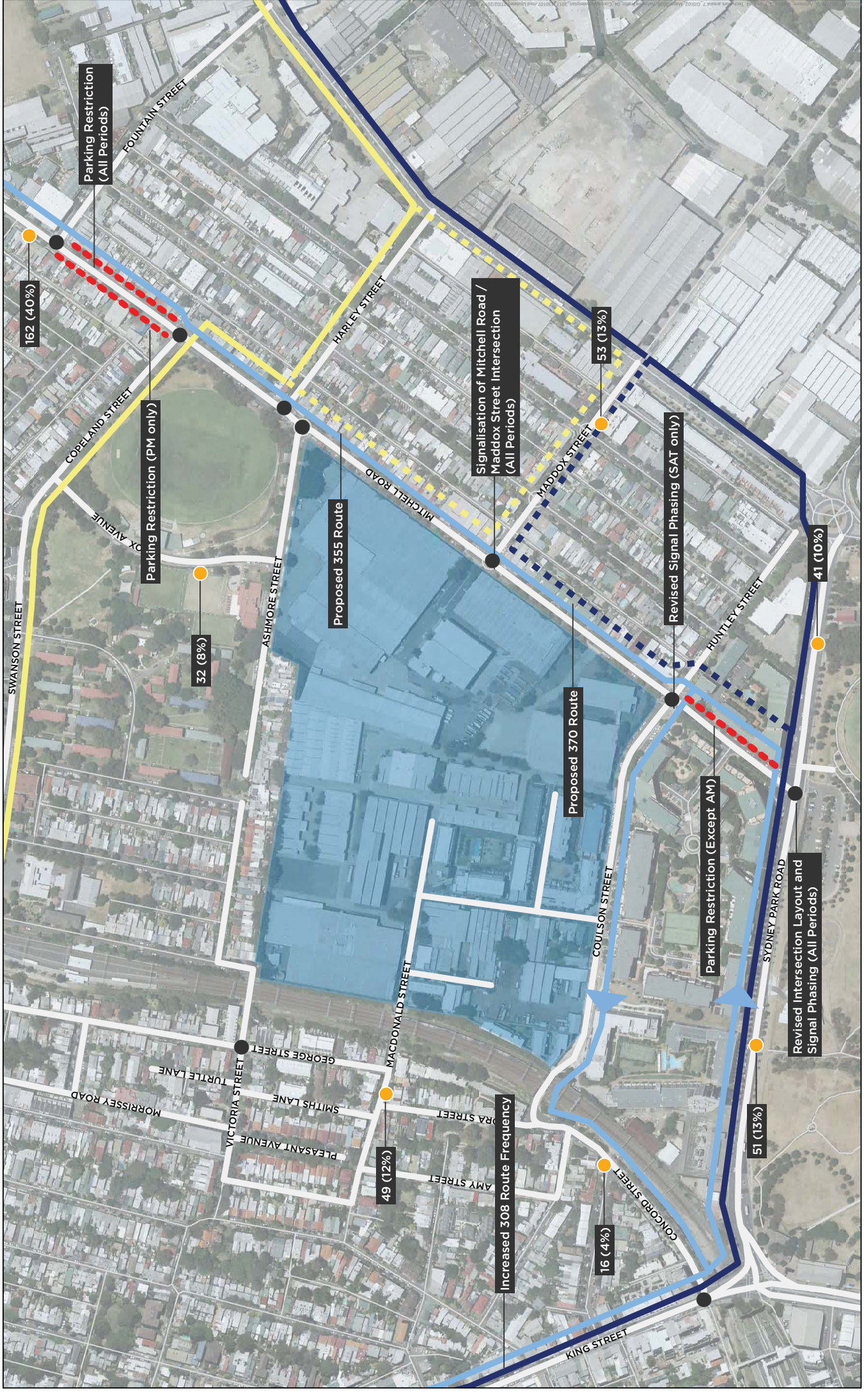
ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
CONCEPT MASTERPLAN 2022

60275815

0 50 100 200 m

Assessed Intersection
 Parking Restriction
 Proposed Ashmore Precinct
 Ashmore Precinct Traffic Volume (%)

Bus Route 308
 Bus Route 355 (existing)
 Bus Route 370 (existing)
 Bus Route 355 (proposed)
 Bus Route 370 (proposed)



60275815

ASHMORE PRECINCT - TRAFFIC AND PARKING ASSESSMENT
CONCEPT MASTERPLAN
2017

0 50 100 200 m

Assessed Intersection
 Proposed Ashmore Precinct
 Parking Restriction
 Ashmore Precinct Traffic Volume (%)

Bus Route 308
 Bus Route 355 (existing)
 Bus Route 370 (existing)
 Bus Route 355 (proposed)
 Bus Route 370 (proposed)

