

Lend Lease (Millers Point) Pty  
Limited

**Barangaroo South - C3  
Commercial Building**

Transport Management and  
Accessibility Plan (TMAP)  
Supplementary- Project Application

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Arup  
Arup Pty Ltd ABN 18 000 966 165

**Arup**  
Level 10  
201 Kent Street  
Sydney  
NSW 2000  
Australia  
arup.com.au



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# 1 Introduction

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This report supports a Project Application submitted to the Minister for Planning pursuant to Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). The Application seeks approval for construction of a commercial building (known as Building C3) and associated works at Barangaroo South as described in the Project Summary Description section of this report.

## 1.1 Background

The 22 hectare Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Stage 2 and Barangaroo Stage 1 (herein after referred to as Barangaroo South).

Lend Lease was successfully appointed as the preferred proponent to develop Barangaroo Stage 1 (otherwise known as Barangaroo South) on 20 December 2009.

## 1.2 Planning History & Framework

On 9 February 2007 the Minister approved a Concept Plan for the site and on 12 October 2007 the land was rezoned to facilitate its redevelopment. The Approved Concept Plan allowed for a mixed use development involving a maximum of 388,300m<sup>2</sup> of gross floor area (GFA) contained within 8 blocks on a total site area of 22 hectares.

Modification No. 1 was approved in September 2007 which corrected a number of minor typographical errors.

On 25 February 2009 the Minister approved Modification No. 2 to the Concept Plan. The Approved Concept Plan as modified allowed for a mixed use development involving a maximum of 508,300m<sup>2</sup> of gross floor area (GFA) contained within 8 blocks on a total site area of 22 hectares.

On 11 November 2009 the Minister approved Modification No. 3 to the Concept Plan to allow for a modified design for the Headland Park and Northern Cove. The Approved Concept Plan as modified allows for a mixed use development involving a maximum of 489,500m<sup>2</sup> of gross floor area (GFA) across Barangaroo as a whole.

On 16 December 2010 the Minister approved Modification No. 4 to the Barangaroo Concept Plan. The Approved Concept Plan as modified allows for approximately 563,965m<sup>2</sup> Gross Floor Area of mixed use development across the entire Barangaroo site.

This Project Application forms one of a series of individual Applications that Lend Lease will be submitting to deliver Barangaroo South. This Project Application is consistent with the established planning framework for the site, including the approved Concept Plan (as modified).

A Project Application (MP10\_0023) has been approved for the bulk excavation and construction of a basement car park to accommodate up to 880 car parking spaces and associated services and infrastructure to support the initial phases of

the future development of Barangaroo South. A Section 75W Modification Application was subsequently submitted seeking to modify MP10\_0023 to extend the area of the approved basement to the south. This modification was approved by the Minister for Planning on 3 March 2011.

A further Section 75W application has been submitted to the Department of Planning and Infrastructure (the Department) and is currently being assessed, which seeks the Minister's approval to modify the depth of the excavation and change the reduced levels of the basement structure, using the same construction methodology as detailed and approved as part of the original project application. This includes:

- reduced excavation and bulk earthworks;
- reduced structural works – foundations, basement levels, perimeter retention system etc; and
- installation of associated services and infrastructure to support the initial phases of the future development of Barangaroo South.

A project application for the first commercial building, known as C4, was submitted to the Department of Planning on 29 October 2010. This application sought consent for construction and use of a new commercial Building C4 with a maximum 98,514m<sup>2</sup> GFA accommodating commercial and retail uses, a child care centre, bicycle parking and associated use and operation of car parking and loading facilities in the basement. Consent was issued by the Minister on 3 March 2011.

A Section 75W application has been submitted to the Department and is currently being assessed which seeks the Minister's approval to modify certain elements of the approved C4 building, including:

- mix of the uses within the building;
- total GFA;
- shape of floor plates of the podium and the tower elements of the building;
- facade details;
- roof treatment; and
- basement layout

### 1.3 Site Location

Barangaroo is located on the north western edge of the Sydney Central Business District, bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development dominated by large CBD commercial tenants.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Stage 2 and Barangaroo South.

The area of land within which development is proposed under this Development Application extends over land generally known and identified in the approved Concept Plan as Block 3 which comprises Lot 5 in DP 876514.

### 1.4 Project Summary Description

This Project Application seeks approval for the construction of a 49 storey building, comprising ground floor retail, a commercial lobby, childcare, podium and office tower, provision for associated cars and bicycle parking and the construction of the surrounding ancillary temporary public domain which includes access streets and landscaping.

## 1.5 Purpose of this Report

This report has been prepared to accompany the Project Application for the C3 Commercial Building at Barangaroo South. It responds to the transport related issues addressed in the DGR MP11\_0044 as summarised in Table 1 .

Table 1 DGR Summary

No.	Issue	Response
1	Justification of proposed quantum of on-site parking for the proposal having regard to the Concept Plan Approval ( as amended ) RTA guidelines and accessibility of the site to public transport, including the proposed light rail expansion	See section 4
2	TMAP with particular regard to: <ul style="list-style-type: none"> <li>transport and traffic management within the overall Barangaroo precinct, including the demonstration of a minimalist approach to car parking provision;</li> <li>pedestrian and cycle access/circulation to meet the likely future demand within the precinct and connections to the external networks;</li> <li>measures to promote public transport usage and pedestrian and bicycle linkages; and</li> <li>any changes to government commitments regarding public transport.</li> </ul>	See Sections 3, 4, 5 and 6
3	Daily and peak traffic movements likely to be generated by the proposed development, including modelling and assessment of the performance of key intersections providing access to the site, and any upgrades (road/intersections) required as a consequence of the proposal. The modelling of peak traffic movements should be undertaken with the LINSIG modelling package in order to properly consider coordinated intersection operation.	See Sections 2 and 3
4	Preparation of a Travel Demand Management Plan that provides an analysis of public transport provision, walking and cycling connections with the vicinity of the proposed site, and measures that will optimise the opportunity provided by the project site's proximity to public transport, including the preparation of a Work Place Travel Plan.	A Travel Demand Management Plan has been prepared as a separate document as outlined in Section 1.6.
5	In relation to construction traffic: <ul style="list-style-type: none"> <li>Cumulative impacts associated with other construction activities on the Barangaroo site;</li> <li>Details of anticipated truck movements to and from the site;</li> <li>Details of access arrangements for workers to/from the site, emergency vehicles and service vehicle movements;</li> <li>Impacts on the temporary cruise ship terminal;</li> <li>Details of any proposed transportation of waste materials via the Harbour and proposed</li> <li>locations for handling materials; and</li> <li>Mitigation measures to reduce impacts on accessibility and amenity.</li> </ul>	A Construction Traffic Management Plan has been prepared as a separate document as outlined in Section 1.6

## 1.6 Document Structure

The diagram below illustrates the document structure established for Traffic and Transport Planning related reporting for the C3 Commercial Building. There are three supporting documents to inform and feed into the required responses to the Director General's Requirements (DGR's). They are:

1. Transport Management and Accessibility Plan (TMAP) Supplementary to Barangaroo TMAP Stage 1 published by the NSW Government in September 2008.
2. Travel Demand Management Plan
3. Construction Traffic Management Plan

These supporting documents are the Project Application reports which respond to the DGR issues relating to Transport.

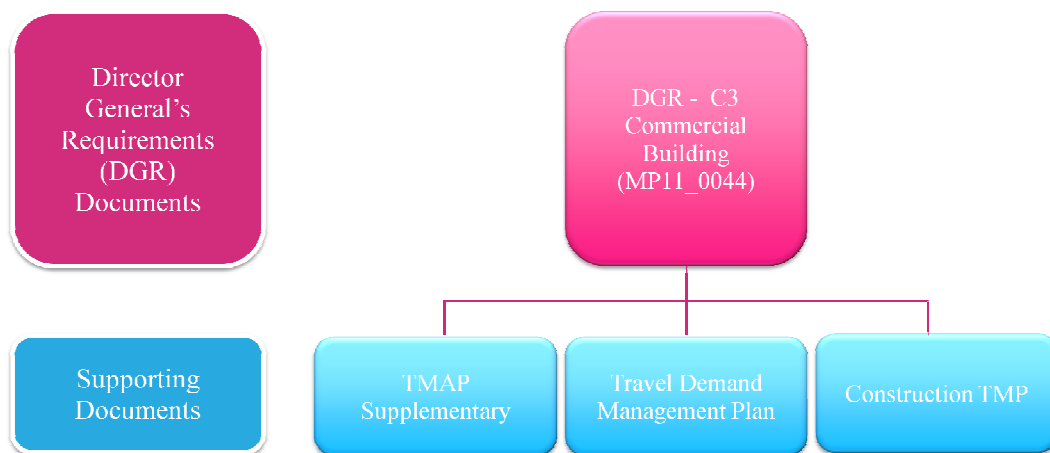


Figure 1 Document Structure



## 2 Key Assumptions

### 2.1 Proposed GFA's

Current planning for Building C3 achieves the following floor space.

Total GFA –Reference **115,291m<sup>2</sup>** comprising:

- Commercial 106,568m<sup>2</sup> (including lobby);
- Retail 7,164m<sup>2</sup>; and
- Childcare Centre 1,559 m<sup>2</sup>

### 2.2 Population

The population numbers are based on the assumption of 1 employee per 20m<sup>2</sup> GFA. This results in a combined number of 5,765 commercial and retail workers. Based on the Census 2006 data around 8.5% of workers do not attend work on a typical day which accounts for holidays, sick days, work from home, etc. which implies that there would be 5,275 workers on site.

### 2.3 Parking requirements

The parking rate for commercial use is 1 space per 600m<sup>2</sup>. Parking rates for other activities are as per the City of Sydney parking rates.

### 2.4 Mode split

The mode split target for the C3 commercial building is set out in Table 2. The 2006 Census Data for journey to work in the Sydney Inner SLA Zone has been included for comparison purposes.

Table 2 Mode split target

Mode	2006 Census	C3 Mode split target
Car	18.8%	4.0%
Bus/Light rail	22.4%	20.0%
Train	47.6%	63.0%
Ferry	2.7%	1.0%
Other (pedestrian, cyclists, motorcycles, taxi)	8.5%	12.0%
<b>Total</b>	<b>100%</b>	<b>100%</b>

Table 3 shows detailed mode split target for the C3 commercial building.

Table 3 Detailed mode split target breakdown

Mode Detailed	Mode split target		Mode General	%	number
	%	Number			
car driver parking onsite*	2.8%	148	Car	4%	212
car driver parking offsite	0.3%	16			
car passenger of car parked on site	0.6%	32			
car passenger of car parked off site	0.3%	16			
bus	20.0%	1055	Bus	20%	1055
light rail	0.0%	0			
train	63.0%	3323	Train	63%	3323
ferry	1.0%	53	Ferry	1%	53
truck	0.0%	0	Other	12%	634
taxi	1.0%	53			
walk	6.0%	317			
bicycle	4.0%	211			
motorcycle on site	1.0%	53			
motorcycle off site	0.0%	0			
<b>Total**</b>	<b>100.0%</b>	<b>5,275</b>		<b>100%</b>	<b>5,275</b>

\* Car driver at 2.8% mode aligns closely with the car parking provision of 1:600m<sup>2</sup> which permits 178 commercial car spaces. Not all allocated spaces are used every day. For traffic analysis purposes 178 spaces are assumed to generate traffic movements.

\*\* Total may not add due to rounding errors

## 3 Transport and Access to C3 Commercial Building

### 3.1 Vehicular Access

It has been assumed that on the completion of C3 Commercial Building, Globe Street would be in place between Lime Street and Hickson Road and all access points to the car park basement would be operational.

As shown in Figure 2 below, access to the basement car park is proposed to be modified from the current approval and will be via the following arrangements:

- Globe Street will be connected from Lime Street through to the temporary access road to Hickson Road. This temporary road will be constructed to connect the north-south section of Globe Street to Hickson Road on an east-west alignment within the Stage 1A area.
- Entry to the commercial car park is via an extension of Globe Street from Hickson Road, north of Napoleon Street. This serves as an entry and exit. This ramp provides access to commercial car parking levels located on the western and northern sides of the basement.
- An entry to the commercial and residential car park levels is provided via an access adjoining Lime Street in the south-west corner of the basement. This serves as an entry and exit. Entry and exit to the commercial car park can be via the northern or southern accesses as the car park is linked via level B1.
- Entry to the loading dock is via an extension of Globe Street from Hickson Road, north of Napoleon Street. This serves as an entry and exit. A temporary road will be constructed to connect the ramp in the northern side of the basement to Hickson Road generally on this alignment but within the Stage 1A area.

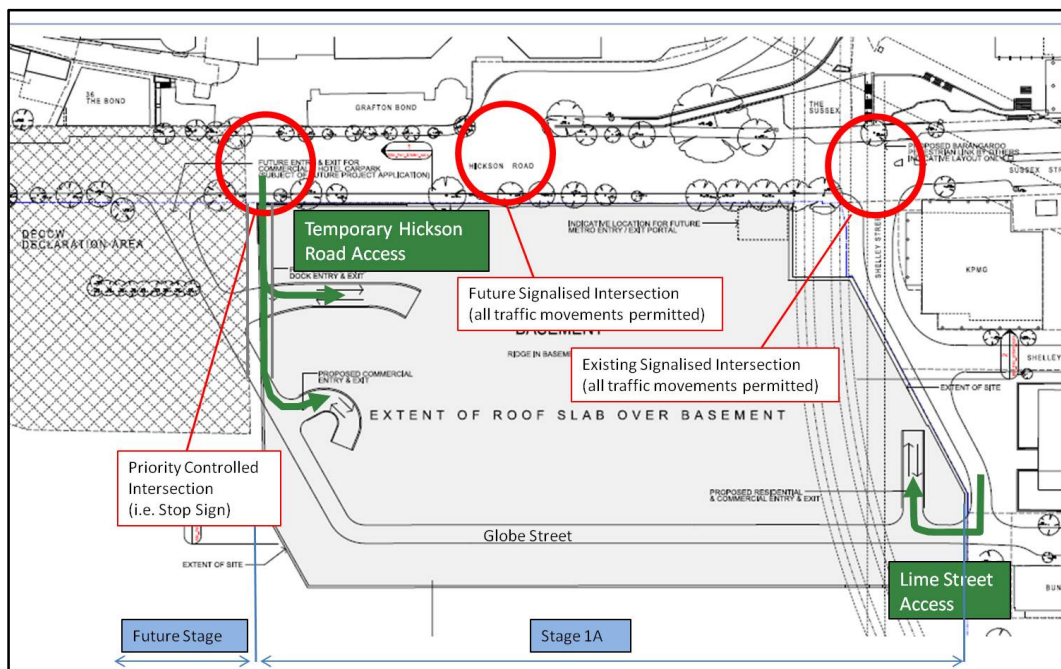


Figure 2 Vehicular access to the basement servicing the C3 Commercial Building

### 3.2 Access by taxi

It is envisaged that taxis will use both Globe Street and Hickson Road for drop off/pick up activity. Sections of No Parking zones will be used initially on Globe Street and Hickson Road to allow for this activity. At a future stage a defined Taxi Zone will be introduced to align with usage patterns and the opportunities available as construction of future stages progresses.

### 3.3 Traffic Generation

The C3 building is forecasted to generate 149 two way vehicle movements in the AM peak hour (8.00 – 9.00am) and 139 in the PM peak hour (5.00 – 6.00pm). When combined with forecast traffic from the C4 and C5 commercial buildings, there is estimated to be 419 and 389 vehicle trips in the AM and PM peak hours respectively. Table 4 shows the traffic generation figures split by trip purpose.

The trip generation rates have been utilised from TMAP September 2008 which included the following common assumptions:

- Commercial and retail trips split 80% in / 20% out during AM and 80% out / 20% in during PM
- Estimated service vehicles based on the new Westpac Building on Kent Street which is considered a comparable commercial building.
- Drop offs and taxis estimated on a mode share targets listed in Table 3
- Traffic generation resulting from the 12 short term on-street parking spaces to be provided on Globe Street has already been included in the C4 and C5 traffic generation forecasts
- Note that numbers may not add up to 100% due to rounding from spreadsheet

Table 4 Traffic Generation in peak hours

Traffic and Parking generation for C3 building			AM Peak Hour				PM Peak Hour			
Trip purpose	Variable	Variable number	trip rate	no of trips	In	out	trip rate	no of trips	In	out
Commercial	car park space	178	0.26	46	37	9	0.26	46	9	37
Retail/Childcare	car park space	18	0.4	7	6	1	0.4	7	1	6
Drop offs	private car			5	3	3		5	3	3
	taxi			51	26	26		51	26	26
Service vehicles				40	20	20		30	15	15
<b>C3 Traffic Generation</b>				<b>149</b>	<b>92</b>	<b>59</b>		<b>139</b>	<b>54</b>	<b>87</b>
C4 and C5 Traffic Generation				270	163	105		250	95	153
<b>Total cumulative traffic generation C3 + C4 + C5</b>				<b>419</b>	<b>255</b>	<b>164</b>		<b>389</b>	<b>149</b>	<b>240</b>

### 3.4 Traffic distribution

Most existing road intersections to the south of Barangaroo, along Sussex Street and within the Sydney CBD generally are controlled by traffic signals. The intersections along Sussex Street, i.e. at Erskine Street, King Street and Market Street are all controlled by traffic signals.

More recently traffic signals have been installed at Shelley Street on Sussex Street. However to the north of Shelley Street, there are no further intersections controlled by traffic signals. It is expected that the Sussex Street/Napoleon Street intersection will be upgraded to include traffic signals at the time of the initial occupancy of the commercial buildings at Barangaroo, expected to occur in 2015. As such this has been analysed as a signalised intersections for the future scenario.

This report examines in detail the current and future stage traffic operations of the five nearest and most relevant intersections to the site for C3 Commercial Building access, namely:

- Hickson Road & Globe Street, **Priority Controlled (Temporary)**
- Napoleon Street & Hickson Road, **Priority Controlled (Existing), Traffic Signals (Future)**
- Sussex Street & Shelley Street, **Traffic Signals**
- Sussex Street & Erskine Street, **Traffic Signals**
- Erskine Street & Shelley Street, **Traffic Signals**

In the AM period vehicles accessing the Barangaroo South precinct are expected to use the following routes:

- 40% via Shelley Street (trips originating from Eastern and Southern Suburbs);
- 30% via Sussex Street (trips originating from Western Suburbs); and
- 30% via Napoleon Street and Hickson Road (trips originating from Northern Suburbs).

In the PM period vehicles leaving the Barangaroo South precinct are expected to use the following routes:

- 70% via Hickson Road and Sussex Street to Eastern, Southern and Western Suburbs; and
- 30% via Napoleon Street to Northern Suburbs

The existing morning and afternoon peak hour intersection traffic volumes at these intersections were surveyed on Tuesday 27<sup>th</sup> April 2010 (a typical weekday outside of school holiday periods). The results of these intersection counts are presented in Figure 3 below.

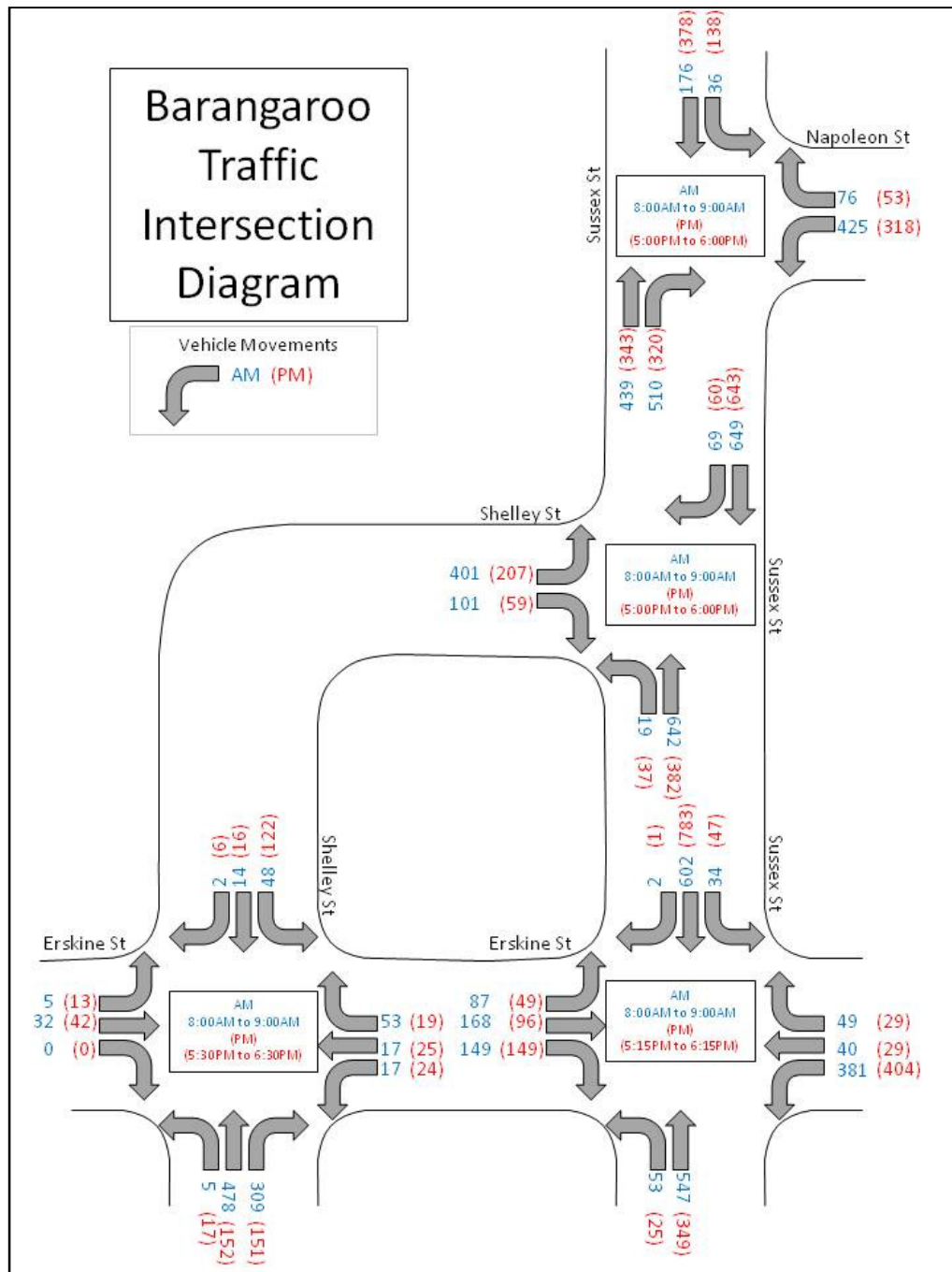


Figure 3 April 2010 Weekday Peak Hour Traffic Volumes

### 3.5 Traffic Assessment

Table 5 shows the intersections which have been assessed based on the intersection analysis program LINSIG, which analyses the flow of traffic through a network of intersections where the traffic signals are linked. Traffic conditions and operations at these intersections are summarised in terms of:

- Level of Service (LOS);
- Degree of Saturation (DOS); and
- Average delay per vehicle (AVD).

Table 5 Existing and Forecast Performance of Key Intersections in Peak Hours

Peak Hour	Intersection	Existing 2011			Forecast C3 + C4 + C5		
		LOS	DOS	AVD (sec)	LOS	DOS	AVD (sec)
AM	Hickson Road & Globe Street	N/A			A	0.61	14
	Hickson Road & Napoleon Street	A	0.65	3	B	0.60	16
	Sussex Street & Shelley Street	A	0.48	11	B	0.57	15
	Sussex Street & Erskine Street	B	0.71	21	B	0.89	25
	Erskine Street & Shelley Street	A	0.57	11	A	0.59	11
PM	Hickson Road & Globe Street	N/A			B	0.78	15
	Hickson Road & Napoleon Street	A	0.67	4	B	0.79	21
	Sussex Street & Shelley Street	A	0.32	8	A	0.43	13
	Sussex Street & Erskine Street	B	0.88	24	C	0.97	33
	Erskine Street & Shelley Street	A	0.25	12	A	0.29	12

LOS - Intersection Traffic Level of Service, DOS - Degree of Saturation, AVD - Average Delay per vehicle

The LINSIG analysis shows that in general the future performance of the key intersections in vicinity of the C3 building is similar to existing conditions.

The analysis indicates the Sussex Street/Erskine Street intersection approaches capacity in the PM peak following the occupancy of the C3, C4 and C5 commercial buildings. The intersection however is forecast to operate at Level of Service C (average vehicle delay of 33 seconds) which is considered acceptable particularly during peak periods in the CBD.

While there is an increase in the average vehicle delay in both peak periods at the Hickson Road/Napoleon Street intersection following the installation of traffic signals, the intersection is forecast to operate satisfactorily at Level of Service B with some spare capacity during the AM and PM peak hours.

Queuing back from the Harbour Bridge approach however does constrain traffic operations in the vicinity of the site in both commuter peaks. Southbound flow on Sussex Street is also constrained in the PM peak as a result of queuing from the Sussex Street/King Street intersection.

The full intersection capacity analysis results are included as **Appendix A** to this report.



## 4 Car Parking

### 4.1 Basement Car Parking

Current planning for Building C3 achieves the following floor space:

**Total GFA – 115,291m<sup>2</sup>**

(commercial 106,568m<sup>2</sup> + retail and community 8,723m<sup>2</sup>)

Commercial parking is provided at 1/600m<sup>2</sup> GFA in accordance with the Barangaroo Concept Plan, which results in 178 spaces.

Retail and child care parking is proposed based on the City of Sydney LEP2005 rates. Based on a total FSA of 430,275m<sup>2</sup> and a site area of 44,160m<sup>2</sup>, the 5,700m<sup>2</sup> of retail can provide up to:

$$\text{Max number of cars} = \frac{8,723 \text{ (Total Other FSA)}}{430,275 \text{ (Total FSA)}} \times \frac{44,160 \text{ (Site Area)}}{50} = 18 \text{ spaces}$$

The car parking areas and access ramp systems are designed in accordance with AS2890.1 – 2004, Off-street car parking.

In the Approved Concept Plan for the site, it is recognised that the parking policy for the development should support public transport and non car (walk/cycle) travel. Low car parking provision is considered important because it will also act to limit potential traffic generation by the site's activity to a level which will not unduly compromise the operation of the CBD's existing road network.

In the evenings and at weekends, the commercial car park will operate as a public car park for a wider range of users visiting the retail, cultural centre, restaurants and bars. Pricing strategies will be in place to provide suitable parking demand management at all times. Public use of the car park will not coincide with peak commuter traffic and hence the surrounding road system will provide suitable capacity for this activity. The provision for differential parking charges for small, medium and large vehicle emission categories will also be explored.

### 4.2 Basement Loading Dock

The Central Sydney DCP 1996 requirements for loading are provided in Table 6.

Table 6 Central Sydney DCP 1996 Loading Requirements

Use	GFA m <sup>2</sup>	Rate	Number of spaces
Office	106,568	1 space/3,300m <sup>2</sup> (0 - 50,000m <sup>2</sup> ) + 1 space/6,600m <sup>2</sup> (50,000 – 100,00m <sup>2</sup> )	24
Retail	7,164	1 space/350m <sup>2</sup>	20
Child Care	1,559	1 space/1,750m <sup>2</sup>	2
<b>Total</b>	<b>115,291</b>		<b>46</b>



Having established the required number of spaces, it is generally accepted that 50 per cent should be for trucks and 50 per cent for vans or similar small delivery vehicles associated with courier activity and small deliveries to retail tenancies.

A more sustainable outcome for the provision of loading and refuse collection will be achieved by managing the dock activities throughout the day. Deliveries will be allocated time slots to ensure efficient use of available docks during the day. The proposed provision can therefore be reduced and a suitable allocation of vehicle sizes has been developed by considering vehicle type and length and the likely frequency to determine a possible configuration as indicated in Table 7.

Table 7 Proposed Loading Dock Spaces

Vehicle size	Vehicle length	Use	Allocation	Number of spaces
Heavy rigid truck (HRV)	12.5m	Office / Retail	Delivery Refuse compactor	1 1
Medium rigid truck (MRV)	8.8m	Office / Retail	Delivery Refuse / Recycle	3 1
Small rigid truck (SRV)	6.4m	Office / Retail/ Child Care	Delivery	4
Van/car	5.0m	Office / Retail	Courier/Delivery/ Service	20
Motor cycle/ Bicycle	2.5m	Office / Retail	Courier/Delivery	5
<b>Total</b>				<b>35</b>

### 4.3 On-street parking

There will be approximately 12 short stay on-street car parking bays along Globe Street. Some of these will be defined as a No Parking zone to allow for drop-off and pick-up activity by private vehicles and taxis.

### 4.4 Compliance with RTA Guidelines

Section 5.6 of the RTA Guide to Traffic Generating Developments states that car parking requirements for office and commercial developments vary with the parking policies of local government areas. If the City of Sydney rate was adopted based on the site area then an equivalent parking rate can be calculated. The Barangaroo – Car Parking Considerations report prepared by Masson Wilson Twiney in June 2008 to inform the TMAP September 2008, calculated that an equivalent parking rate of approximately 1 space per 340m<sup>2</sup> GFA would result.

Max number of car spaces permitted  
= Total floor space / 340 = 115,291 / 340 = 339 spaces.

The basement car park associated with the C3 Commercial Building is proposing a much stricter provision of approximately 196 spaces, and thus is compliant with the current RTA guidelines.

## 4.5 Compliance with Concept Plan

The Barangaroo Concept Plan has adopted a parking rate of 1 space per 600m<sup>2</sup> GFA for commercial.

Max number of car spaces permitted (commercial)  
= Total floor space / 600 = 106,568 / 600 = 178 spaces.

Those figures are in accordance with that proposed for the car park, and are thus compliant with the Barangaroo Concept Plan.

## 5 Pedestrians and Cyclists

The C3 commercial building will be mainly accessed by pedestrians walking from railway stations, bus interchanges, ferry wharfs and homes. It is estimated that around 91% of people will be accessing the site on foot. Based on the assumption<sup>1</sup> that 80% of commuters arrive in the three hour peak and out of which 61% arrive in the peak hour it is estimated that 2,295 people would be accessing the C3 commercial building on foot in the peak hour.

There will also be a high proportion of cyclists commuting to the C3 commercial building. It is estimated that around 4% of workers will commute on a bicycle, by applying the same assumptions as above, 101 cyclists would be arriving to the C3 commercial building in the peak hour.

The detailed breakdown of AM peak commuters is shown in Table 8 and amalgamated into people walking, cycling or arriving by vehicle in Table 9.

Table 8 Mode share of people arriving at C3 commercial building

Mode Split	Number of people travelling to work			
	%	Daily	AM peak period (3 hour peak)	AM peak hour
Car driver parking onsite	2.8%	148	118	72
Car driver parking offsite	0.3%	16	13	8
car passenger of car parked on site	0.6%	32	25	15
car passenger of car parked off site	0.3%	16	13	8
bus	20.0%	1,055	844	515
light rail	0.0%	0	0	0
train	63.0%	3,323	2,659	1,622
ferry	1.0%	53	42	26
truck	0.0%	0	0	0
taxi	1.0%	53	42	26
walk	6.0%	317	253	154
bicycle	4.0%	211	169	103
motorcycle on site	1.0%	53	42	26
motorcycle off site	0.0%	0	0	0
<b>Total</b>	<b>100%</b>	<b>5277</b>	<b>4220</b>	<b>2575</b>

\* AM peak hour number of car drivers parking on site includes retail and commercial car drivers, and does not include service vehicles.

<sup>1</sup> The assumption comes from the Modified Concept Plan Traffic Report July 2008 from Section 4.4 which applies to rail, this assumption has also been applied to all modes of transport apart from car driver parking on site in the AM peak hour which is based on traffic generation factors as indicated in Table 4.

Table 9 Number of people arriving at C3 commercial building

Mode Split	Number of people travelling to work			
	%	Daily	AM peak period (3 hour peak)	AM peak hour
walk to C3 commercial building (from home, station, bus stop etc)	90.6%	4,779	3,823	2,330
drive to C3 commercial building (car/motorcycle/taxi/car drop off)*	5.4%	285	228	142
cycle to work	4.0%	211	169	103
<b>Total</b>	<b>100%</b>	<b>5275</b>	<b>4220</b>	<b>2575</b>

## 5.1 Pedestrian Linkages

The C3 building will have pedestrian friendly access with low vehicular traffic and wide footpaths along both Shelley Street and Globe Street adjacent to the precinct.

It is estimated that out of the 91% of people accessing the C3 commercial building on foot will be around 70% rail commuters and around 22% bus commuters. Practically all of the bus and rail commuters will be using the Sussex Street and Shelley Street intersection to access the site. Based on the assumptions from Table 8 this equates to 2,252 people in the peak hour (approximately 38 people per minute).

The Wynyard Station - Kent Street pedestrian tunnel is heavily utilised for train commuter access to the King Street Wharf precinct. The C3 commercial building will introduce a further 1,244 arrivals to Wynyard Station in the AM peak hour.

The remainder 8% of walkers will be the commuters walking from home, ferry wharfs and other locations in the city. It is expected that of the people walking from home around 50% will walk from Darling Harbour along the waterfront and 50% from the Kent Street direction. There would be a small proportion of people accessing the C3 commercial building from the north along Hickson Road.

Figure 4 shows the main pedestrian routes to access the site.

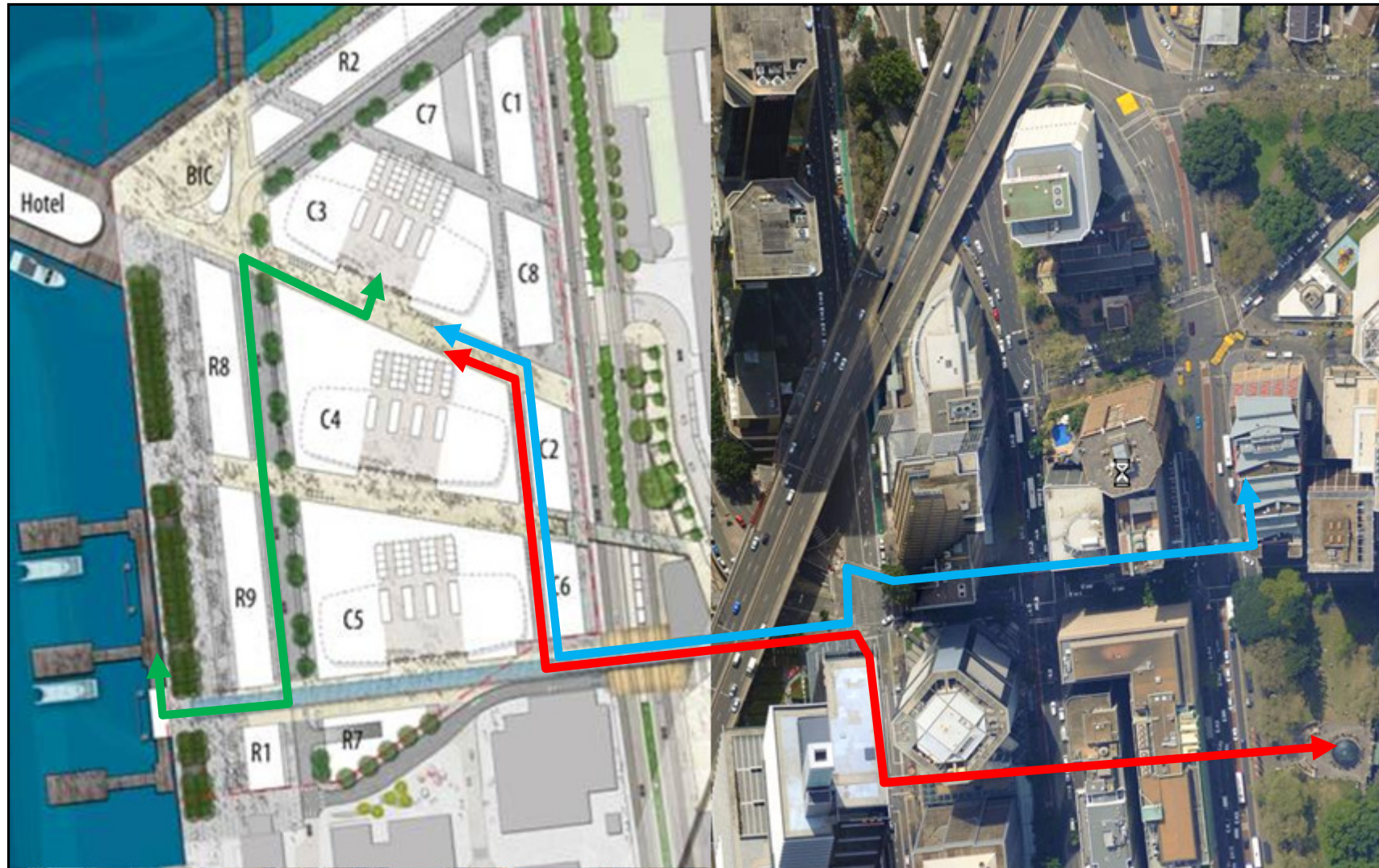


Figure 4 C3 Commercial Building main pedestrian routes



## 5.2 Cycling Access

An area of the basement car park has been allocated to provide for bicycle facilities associated with future C3 development. Access to the bicycle facilities is currently located off the future Shelley Lane via a dedicated bicycle ramp down to Level B1 which provides a safe access environment for cyclists. End of trip facilities such as showers, changing rooms and lockers will be available in close proximity to the bicycle parking area.

A minimum of 5% of the commercial population will be provided with bicycle facilities with the total number of bicycle spaces and associated facilities in accordance with the relevant Green Star requirements. This equates to a total provision of 336 bicycle parking spaces<sup>2</sup>. Current planning for the commercial development is targeting the provision of bicycle facilities for 10% of the commercial population which is in excess of the mode share target for cycling and will allow for growth in this mode of travel as the city's bike facilities improve. The additional facilities are likely to be provided in a staged manner making adequate provision for this growth. There will be bike parking available on Globe Street for short term visitor use adjacent to the C3 Commercial Building.

The City of Sydney has recently commenced a roll out of a cycleway network where dedicated cycle lanes are being constructed throughout the CBD as part of its Cycle Strategy and Action Plan 2007-2017<sup>3</sup>.

New separated cycleways along both King Street and Kent Street in close proximity to the Barangaroo precinct have recently been completed. These routes provide a connection between the Anzac Bridge and Sydney Harbour Bridge cycleways. It is anticipated the majority of cyclists will arrive to the Barangaroo precinct using these dedicated off-road facilities.

The main cycling access routes have been shown on Figure 5.

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<sup>2</sup> Based on the a total commercial Net Lettable Area (NLA) of 100,789m<sup>2</sup>, 1 person/15m<sup>2</sup> NLA

<sup>3</sup> Refer City of Sydney's publication entitled Cycle Strategy and Action Plan 2007-1017, City of Villages dated February 2007.



Figure 5 C3 Commercial Building main cycle access paths

## 6 Public Transport

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The Barangaroo South precinct is well located to a number of public transport hubs, including rail, bus and ferry. A future light rail line is proposed along Sussex Street and will complement these existing modes. Public transport accessibility to Barangaroo is a key area where there has been further development since the September 2008 TMAP. At the time of the TMAP assessment, the mode share to public transport was focused on train and bus with a very low ferry mode share. There is now the potential for a number of changes to transport modes to influence the mode of choice to Barangaroo; these being Sydney Light Rail, Heavy Rail and Ferry services.

### 6.1 Sydney Light Rail

In February 2010, the NSW Government announced the proposal for the extension of the light rail network by 10km so passengers can travel directly from Dulwich Hill, through the Inner West and the Sydney CBD to Circular Quay. This is part of the NSW Government's Metropolitan Transport Plan. An extension to the existing Light Rail into the northern part of the Sydney CBD via Sussex Street would service Barangaroo.

The first stage of the inner-west light rail extension is a 5.6km extension running between Lilyfield and Dulwich Hill. It will run from the current light rail terminus at Lilyfield, along the disused freight rail corridor, to Dulwich Hill. Detailed design and construction is forecast to commence by the middle of 2012, with the railway to be operational by early 2014.

It could be expected that public transport patronage to Barangaroo from the inner west would shift mode from bus and rail as a result of these extensions. The extent of this shift could be of the order of 2% to 7% for Barangaroo.

The NSW Government recently released a brief to prepare a Light Rail Strategic Plan for an area approximately 10km in radius from the Sydney CBD to consider light rail extensions as part of a wider integrated light rail network. This plan will specifically investigate the feasibility of extending light rail through the CBD, to the University of NSW and to Sydney University. The integration of existing and planned light rail networks would further enhance patronage by this mode to Barangaroo.

### 6.2 Ferry

Existing commuter ferry services servicing Barangaroo and the CBD in general arrive and depart from both King Street Wharf (number 3) and Circular Quay. The proposed expansion of the King Street/Barangaroo Wharf Ferry terminal to service the western side of the city has the potential to increase ferry mode share. The current TMAP assigns only a 1% mode to ferry for journey to work. Larger tenants in this area have recorded ferry mode share as high as 7% indicating that there is good potential for an increased ferry mode share with increased services and improved frequencies.



### 6.3 Wynyard Walk

The NSW Government's 2011-12 Budget includes \$51 million to start building the Wynyard Walk (previously Barangaroo Pedestrian Link), a direct pedestrian link between the new Barangaroo development and Wynyard Station and transport interchange. The Wynyard Walk, expected to be complete by mid 2015, will provide a high level of access to public transport for the growing western corridor of the CBD, including Barangaroo and the King Street Wharf.

### 6.4 North West/South West Rail Link

The NSW Government is committed to building the North West Rail Link and South West Rail Link, allocating more than \$600 million to continue work on the projects in the 2011-12 Budget which includes:

- \$314 million to develop the 23km North West Rail Link between Epping and Rouse Hill, including \$222 million to buy land;
- \$292 million to continue construction of the South West Rail Link, which includes 10.5km of twin track between Glenfield and Leppington, two new stations at Edmondson Park and Leppington, car parking and a train stabling facility at Rossmore.

The North West Rail Link is planned by the NSW Government to run from Epping Station and end in Rouse Hill in the North West sector. The proposed alignment as of July 2011 is presented in Figure 6.



Figure 6 North West Rail Link Proposed Alignment (Transport NSW)

## 6.5 Improving Public Transport Services and Facilities

The NSW Government's 2011-12 Budget includes a range of improvements to public transport including:

- Roll out of electronic ticketing which will start with ferries in late 2012.
- Improving ferry wharves expand ferry services.
- Delivery of commuter car parks and public transport interchanges, including four new car parks and seven interchanges currently under construction.
- New and upgraded train rolling stock,
- New buses, bus depots and NightRide bus services
- Continued free city centre shuttle bus services

## 7 Conclusion

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The project application for the C3 Commercial Building is lodged under the existing Approved Concept Plan December 2010 (Modification 4). C3 Commercial Building sits within Stage 1 which involves construction of that part of the basement that relates to the approved GFA for blocks 1, 2, 3 (in part), and X, which allows 779 car spaces.

The predominant vehicle routes for access to the site are to be via Sussex Street and Hickson Road. Service vehicles will access the loading dock via an extension of Globe Street from Hickson Road, north of Napoleon Street. A total parking provision of approximately 196 spaces is to be provided for the C3 building, a much stricter provision when compared with the current RTA guidelines.

Traffic modelling of key intersections surrounding the site using LINSIG indicates that in general the future performance of the key intersections in vicinity of the C3 building is similar to existing conditions.

The key area where there has been further development since the TMAP 2008 is in the area of public transport access to the site. At the time of the TMAP assessment, the mode share to public transport was focused on train and bus with a very low ferry mode share. There is now the potential for a number of changes to transport modes to influence the mode of choice to Barangaroo; these being Sydney Light Rail and Ferry services. These alternatives improve the potential to support the mode split towards public transport and the concepts of the TMAP.

The NSW Government's 2011-12 Budget includes investment in new transport services for Sydney including funding for studies into a Light Rail Strategy for the Central Sydney area, commitment to building the North West and South West Rail Links, funding for commencing construction of the Wynyard Walk, improvements to ferry wharves and expansion of ferry services. These will all assist Barangaroo to achieve a high public transport mode share.

## Appendix A

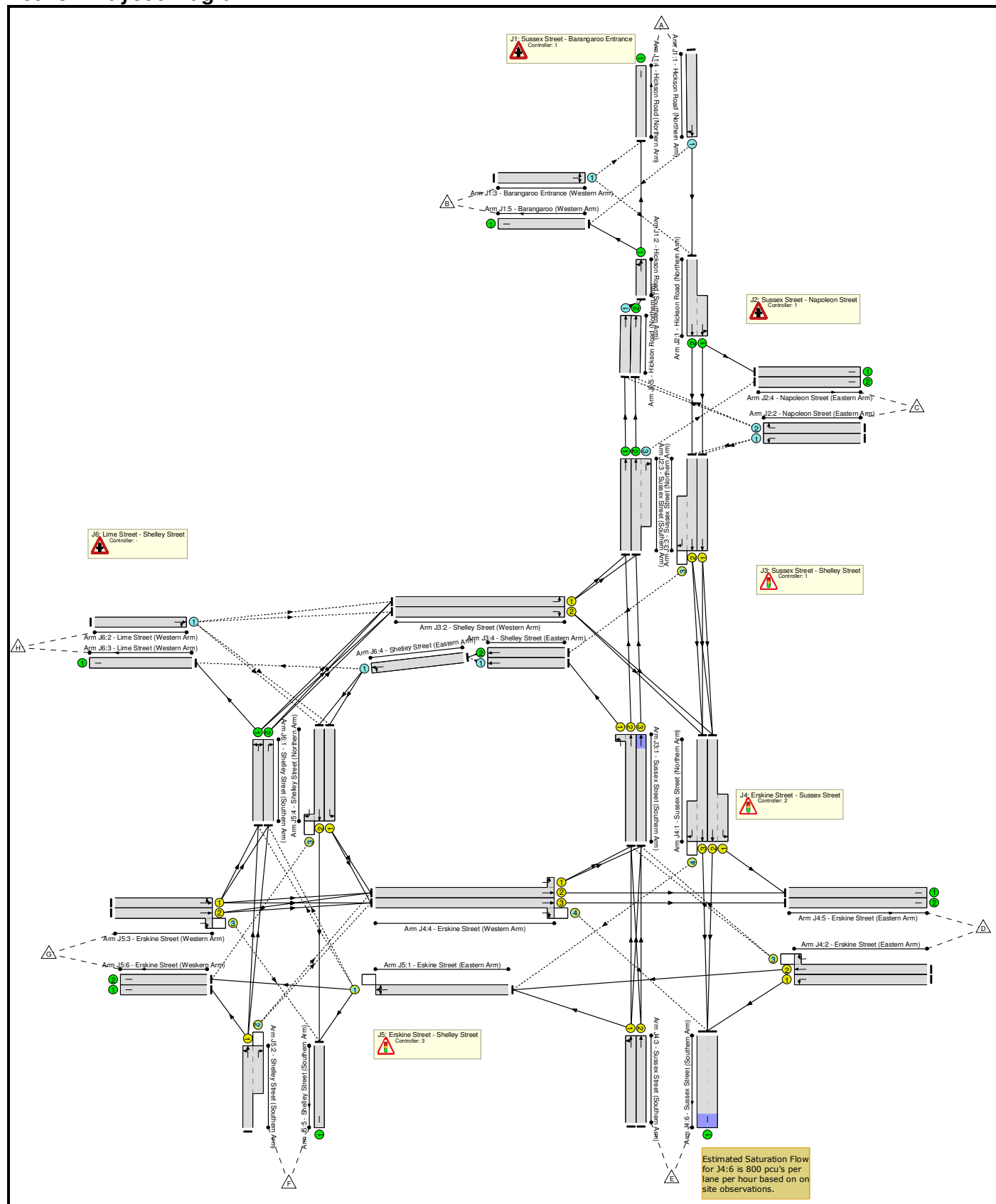
### LINSIG Intersection Results

## Existing Traffic Results

### Project and User Details

<b>Project:</b>	<b>220316 Barangaroo</b>
<b>Title:</b>	<b>C3 Development</b>
<b>Company:</b>	Arup
<b>Address:</b>	Level 10, 201 Kent Street, Sydney NSW 2000
<b>Notes:</b>	Existing Traffic Scenario Model

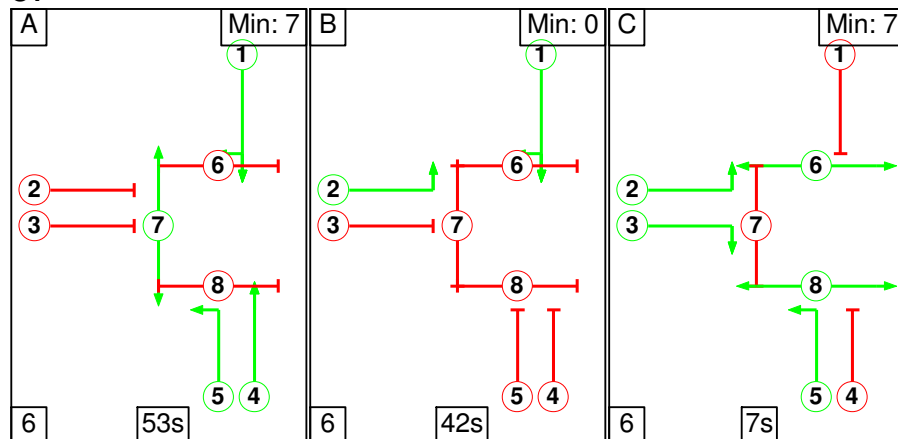
# Network Layout Diagram



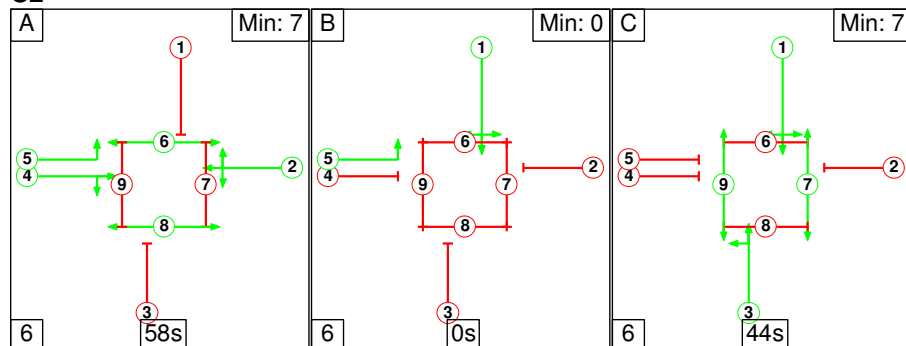
## Stage Sequence Diagram

Scenario 1: 'AM Existing Scenario' (FG7: 'PM Construction HGV', Plan 1: 'Network Control Plan 1')

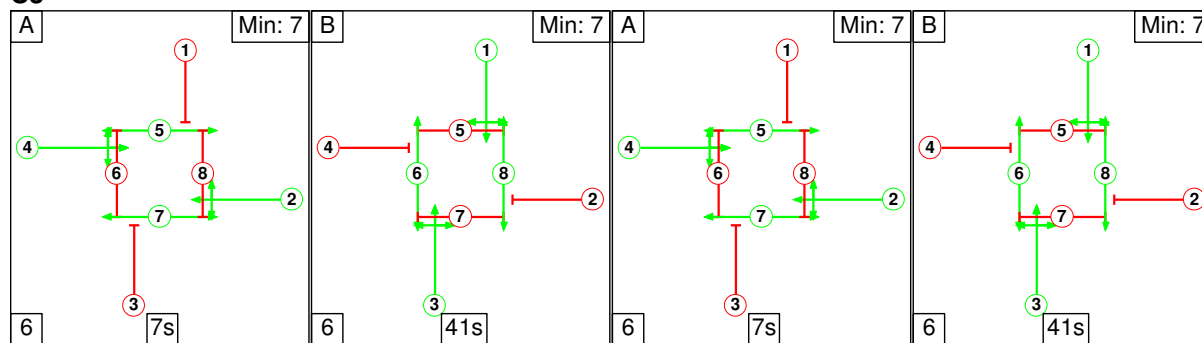
C1



C2



C3



## Network Results

Item	Lane Description	Controller Stream	Full Phase	Arrow Phase	Deg Sat (%)	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Ignoring Random Delay ?
<b>Network: C5 Development</b>	-	N/A	-		70.8%	-	-	-	-	1987	-
<b>J1: Sussex Street - Barangaroo Entrance</b>	-	N/A	-		11.2%	-	-	-	-	0	-
1/1	Hickson Road (Northern Arm) Ahead Right	N/A	-		11.2%	0.1	1.0	217	217	0	-
3/1	Barangaroo Entrance (Western Arm) Left Right	N/A	-		0.0%	0.0	0.0	0	0	0	-
<b>J2: Sussex Street - Napoleon Street</b>	-	N/A	-		65.3%	-	-	-	-	1334	-
1/2+1/1	Hickson Road (Northern Arm) Left Ahead	N/A	-		11.5%	0.1	1.1	217	217	-	-
2/1	Napoleon Street (Eastern Arm) Left	N/A	-		65.3%	0.9	7.6	441	441	441	-
2/2	Napoleon Street (Eastern Arm) Right	N/A	-		10.2%	0.5	5.2	73	73	73	-
3/1	Sussex Street (Southern Arm) Ahead	N/A	-		15.7%	0.1	1.2	282	282	-	-
3/2+3/3	Sussex Street (Southern Arm) Right Ahead	N/A	-		44.7%	13.7	2.5	722	722	538	-
5/1	Hickson Road (Northern Arm) Ahead	N/A	-		29.9%	4.0	3.0	282	282	282	-
5/2	Hickson Road (Northern Arm) Ahead	N/A	-		14.3%	0.1	1.2	257	257	-	-
<b>J3: Sussex Street - Shelley Street</b>	-	N/A	-		47.5%	-	-	-	-	54	-
1/2+1/1	Sussex Street (Southern Arm) Ahead Left	N/A	C1:4 C1:5		34.6%	2.0	10.7	296	296	-	-
1/3	Sussex Street (Southern Arm) Ahead	N/A	C1:4		44.3%	3.7	13.8	415	415	-	-
2/1	Shelley Street (Western Arm) Left	N/A	C1:2		47.5%	7.4	26.5	330	330	-	-
2/2	Shelley Street (Western Arm) Right	N/A	C1:3		0.0%	0.0	0.0	0	0	-	-
3/1	Sussex Street (Northern Arm) Ahead	N/A	C1:1		17.1%	1.7	2.9	282	282	-	-



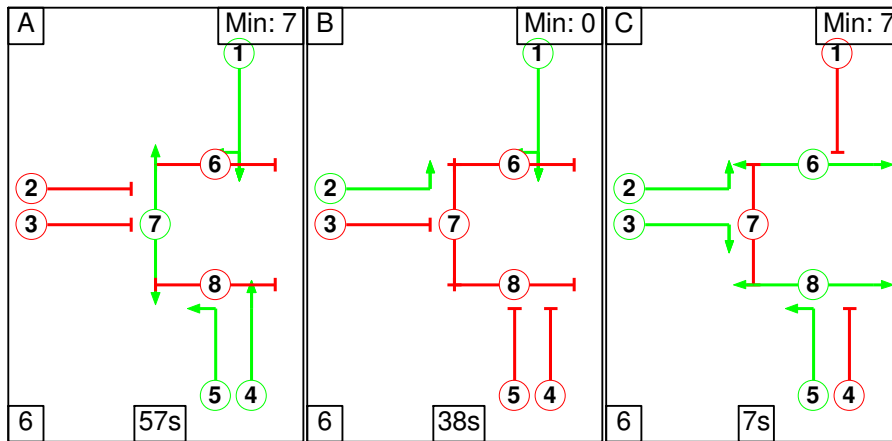
3/2+3/3	Sussex Street (Northern Arm) Ahead Right	N/A	C1:1		19.4%	1.9	3.1	341	341	17	-
4/1	Shelley Street (Eastern Arm) Ahead	N/A	-		3.7%	0.0	1.9	37	37	37	-
4/2	Shelley Street (Eastern Arm) Ahead	N/A	-		1.4%	0.0	0.9	28	28	-	-
<b>J4: Erskine Street - Sussex Street</b>	-	<b>N/A</b>	-		<b>70.8%</b>	-	-	-	-	<b>213</b>	-
1/2+1/1	Sussex Street (Northern Arm) Left Ahead	N/A	C2:1		34.1%	5.2	25.9	288	288	-	-
1/3+1/4	Sussex Street (Northern Arm) Ahead Right	N/A	C2:1		34.5%	6.4	26.1	307	307	2	-
2/1	Erskine Street (Eastern Arm) Left	N/A	C2:2		55.2%	10.3	26.5	421	421	-	-
2/2+2/3	Erskine Street (Eastern Arm) Right Ahead	N/A	C2:2		9.5%	1.0	22.6	72	72	50	-
3/1	Sussex Street (Southern Arm) Ahead Left	N/A	C2:3		28.4%	4.6	33.4	181	181	-	-
3/2	Sussex Street (Southern Arm) Ahead	N/A	C2:3		51.5%	10.8	33.8	402	402	-	-
4/2+4/1	Erskine Street (Western Arm) Left Ahead	N/A	C2:4 C2:5		22.3%	2.9	19.1	200	200	-	-
4/3+4/4	Erskine Street (Western Arm) Ahead Right	N/A	C2:4		48.6%	4.7	43.4	164	164	161	-
6/1	Sussex Street (Southern Arm)	N/A	-		70.8%	8.0	6.1	1133	1133	-	-
<b>J5: Erskine Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>56.9%</b>	-	-	-	-	<b>317</b>	-
1/1	Erskine Street (Eastern Arm) Left Ahead Right	N/A	C3:2		13.7%	0.6	28.4	38	38	10	-
2/1+2/2	Shelley Street (Southern Arm) Right Left Ahead	N/A	C3:3		56.9%	5.0	8.0	805	805	304	-
3/1	Erskine Street (Western Arm) Ahead Left	N/A	C3:4		13.5%	0.3	51.0	12	12	-	-
3/2+3/3	Erskine Street (Western Arm) Ahead Right	N/A	C3:4		8.2%	0.4	30.3	22	22	0	-
4/1	Shelley Street (Northern Arm) Left	N/A	C3:1		2.8%	0.2	4.5	32	32	-	-

4/2+4/3	Shelley Street (Northern Arm) Ahead Right	N/A	C3:1		2.0%	0.1	4.4	28	28	3	-
<b>J6: Lime Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>17.4%</b>	-	-	-	-	<b>69</b>	-
1/1	Shelley Street (Southern Arm) Right Left	N/A	-		11.2%	0.1	1.2	183	183	-	-
1/2	Shelley Street (Southern Arm) Right	N/A	-		17.4%	0.1	1.1	330	330	-	-
2/1	Lime Street (Western Arm) Ahead Right	N/A	-		6.1%	0.0	3.7	32	32	32	-
4/1	Shelley Street (Eastern Arm) Left Ahead	N/A	-		6.5%	0.0	1.9	65	65	37	-
<div> <div>C1</div> <div>PRC for Signalled Lanes (%):</div> <div>89.4</div> <div>Total Delay for Signalled Lanes (pcuHr):</div> <div>5.41</div> <div>Cycle Time (s):</div> <div>120</div> </div> <div> <div>C2</div> <div>PRC for Signalled Lanes (%):</div> <div>63.1</div> <div>Total Delay for Signalled Lanes (pcuHr):</div> <div>16.35</div> <div>Cycle Time (s):</div> <div>120</div> </div> <div> <div>C3</div> <div>PRC for Signalled Lanes (%):</div> <div>58.3</div> <div>Total Delay for Signalled Lanes (pcuHr):</div> <div>2.51</div> <div>Cycle Time (s):</div> <div>120</div> </div> <div> <div></div> <div>PRC Over All Lanes (%):</div> <div>27.1</div> <div>Total Delay Over All Lanes(pcuHr):</div> <div>28.54</div> </div>											

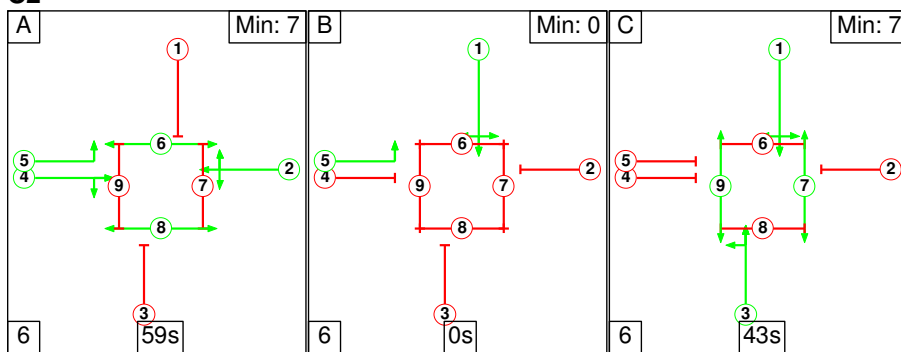
## Stage Sequence Diagram

Scenario 2: 'PM Existing Scenario' (FG5: 'PM Existing Traffic', Plan 1: 'Network Control Plan 1')

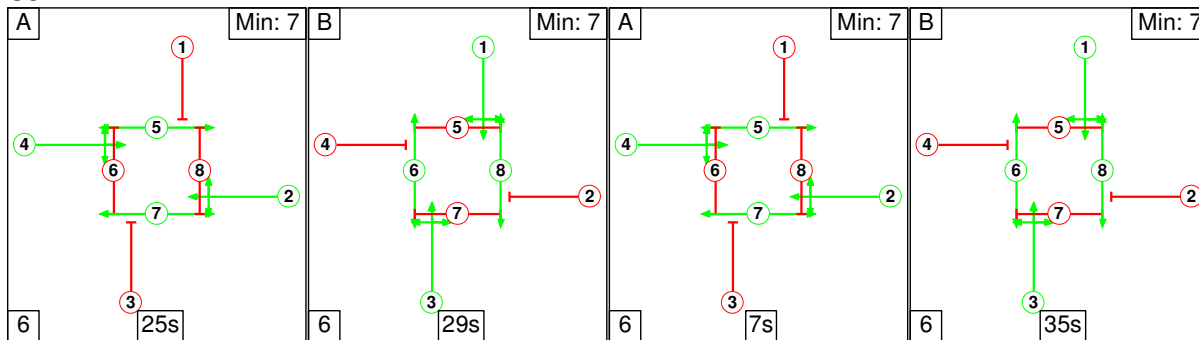
C1



C2



C3



## Network Results

Item	Lane Description	Controller Stream	Full Phase	Arrow Phase	Deg Sat (%)	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Ignoring Random Delay ?
<b>Network: C5 Development</b>	-	N/A	-		87.9%	-	-	-	-	1601	-
<b>J1: Sussex Street - Barangaroo Entrance</b>	-	N/A	-		31.7%	-	-	-	-	0	-
1/1	Hickson Road (Northern Arm) Ahead Right	N/A	-		31.7%	0.2	1.4	615	615	0	-
3/1	Barangaroo Entrance (Western Arm) Left Right	N/A	-		0.0%	0.0	0.0	0	0	0	-
<b>J2: Sussex Street - Napoleon Street</b>	-	N/A	-		66.5%	-	-	-	-	1009	-
1/2+1/1	Hickson Road (Northern Arm) Left Ahead	N/A	-		33.0%	0.2	1.4	615	615	-	-
2/1	Napoleon Street (Eastern Arm) Left	N/A	-		66.5%	1.0	8.7	405	405	405	-
2/2	Napoleon Street (Eastern Arm) Right	N/A	-		5.7%	0.3	3.2	50	50	50	-
3/1	Sussex Street (Southern Arm) Ahead	N/A	-		13.4%	0.1	1.2	242	242	-	-
3/2+3/3	Sussex Street (Southern Arm) Right Ahead	N/A	-		40.6%	11.5	3.9	397	397	312	-
5/1	Hickson Road (Northern Arm) Ahead	N/A	-		24.9%	1.0	2.5	242	242	242	-
5/2	Hickson Road (Northern Arm) Ahead	N/A	-		7.5%	0.0	1.1	135	135	-	-
<b>J3: Sussex Street - Shelley Street</b>	-	N/A	-		32.3%	-	-	-	-	32	-
1/2+1/1	Sussex Street (Southern Arm) Ahead Left	N/A	C1:4 C1:5		20.4%	1.0	8.0	191	191	-	-
1/3	Sussex Street (Southern Arm) Ahead	N/A	C1:4		24.0%	1.7	10.4	241	241	-	-
2/1	Shelley Street (Western Arm) Left	N/A	C1:2		32.3%	5.0	24.9	207	207	-	-
2/2	Shelley Street (Western Arm) Right	N/A	C1:3		0.0%	0.0	0.0	0	0	-	-
3/1	Sussex Street (Northern Arm) Ahead	N/A	C1:1		25.5%	2.7	3.2	420	420	-	-

3/2+3/3	Sussex Street (Northern Arm) Ahead Right	N/A	C1:1		26.5%	2.7	3.2	466	466	32	-
4/1	Shelley Street (Eastern Arm) Ahead	N/A	-		0.0%	0.0	0.0	0	0	0	-
4/2	Shelley Street (Eastern Arm) Ahead	N/A	-		2.6%	0.0	1.0	51	51	-	-
<b>J4: Erskine Street - Sussex Street</b>	-	<b>N/A</b>	-		<b>87.9%</b>	-	-	-	-	<b>179</b>	-
1/2+1/1	Sussex Street (Northern Arm) Left Ahead	N/A	C2:1		49.1%	7.0	28.0	408	408	-	-
1/3+1/4	Sussex Street (Northern Arm) Ahead Right	N/A	C2:1		49.2%	8.6	28.3	427	427	1	-
2/1	Erskine Street (Eastern Arm) Left	N/A	C2:2		59.0%	11.5	26.9	458	458	-	-
2/2+2/3	Erskine Street (Eastern Arm) Right Ahead	N/A	C2:2		3.9%	0.7	17.3	38	38	0	-
3/1	Sussex Street (Southern Arm) Ahead Left	N/A	C2:3		12.2%	1.8	31.8	75	75	-	-
3/2	Sussex Street (Southern Arm) Ahead	N/A	C2:3		38.3%	7.4	31.8	292	292	-	-
4/2+4/1	Erskine Street (Western Arm) Left Ahead	N/A	C2:4 C2:5		17.6%	2.2	14.9	160	160	-	-
4/3+4/4	Erskine Street (Western Arm) Ahead Right	N/A	C2:4		58.2%	5.7	46.0	178	178	178	-
6/1	Sussex Street (Southern Arm)	N/A	-		87.9%	16.4	15.7	1406	1406	-	-
<b>J5: Erskine Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>24.7%</b>	-	-	-	-	<b>198</b>	-
1/1	Erskine Street (Eastern Arm) Left Ahead Right	N/A	C3:2		8.1%	0.7	13.6	48	48	22	-
2/1+2/2	Shelley Street (Southern Arm) Right Left Ahead	N/A	C3:3		24.7%	2.1	10.8	327	327	168	-
3/1	Erskine Street (Western Arm) Ahead Left	N/A	C3:4		7.0%	0.4	25.1	25	25	-	-
3/2+3/3	Erskine Street (Western Arm) Ahead Right	N/A	C3:4		5.3%	0.4	19.1	31	31	0	-
4/1	Shelley Street (Northern Arm) Left	N/A	C3:1		14.0%	1.4	9.7	126	126	-	-

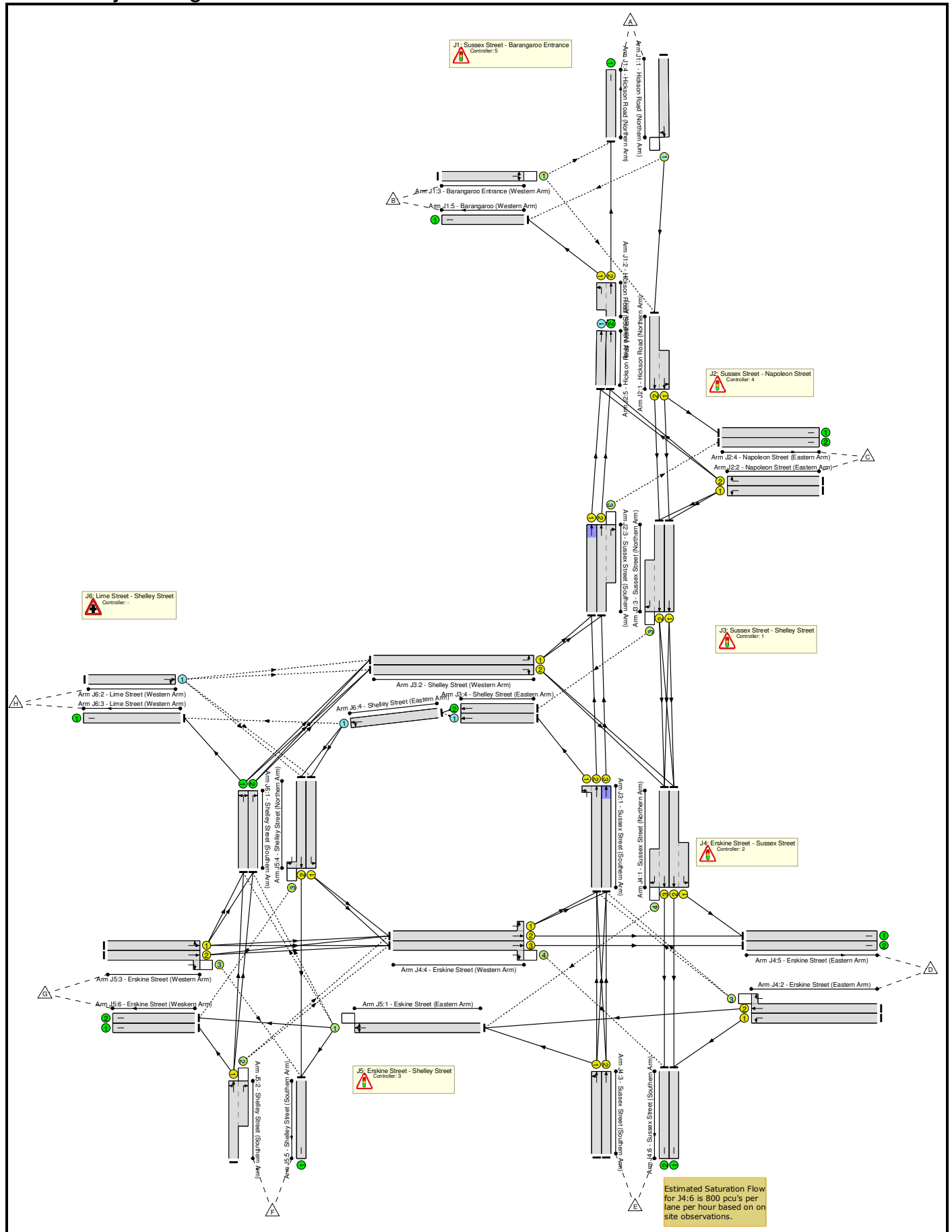
4/2+4/3	Shelley Street (Northern Arm) Ahead Right	N/A	C3:1		3.9%	0.3	8.8	43	43	8	-
<b>J6: Lime Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>29.7%</b>	-	-	-	-	<b>183</b>	-
1/1	Shelley Street (Southern Arm) Right Left	N/A	-		1.5%	0.0	1.1	24	24	-	-
1/2	Shelley Street (Southern Arm) Right	N/A	-		8.2%	0.0	1.0	156	156	-	-
2/1	Lime Street (Western Arm) Ahead Right	N/A	-		29.7%	0.2	4.3	175	175	175	-
4/1	Shelley Street (Eastern Arm) Left Ahead	N/A	-		3.2%	0.0	1.2	51	51	8	-
<div> <div>C1</div> <div>PRC for Signalled Lanes (%):</div> <div>178.3</div> <div>Total Delay for Signalled Lanes (pcuHr):</div> <div>3.34</div> <div>Cycle Time (s):</div> <div>120</div> </div> <div> <div>C2</div> <div>PRC for Signalled Lanes (%):</div> <div>52.5</div> <div>Total Delay for Signalled Lanes (pcuHr):</div> <div>16.32</div> <div>Cycle Time (s):</div> <div>120</div> </div> <div> <div>C3</div> <div>PRC for Signalled Lanes (%):</div> <div>263.7</div> <div>Total Delay for Signalled Lanes (pcuHr):</div> <div>1.94</div> <div>Cycle Time (s):</div> <div>120</div> </div> <div> <div></div> <div>PRC Over All Lanes (%):</div> <div>2.4</div> <div>Total Delay Over All Lanes(pcuHr):</div> <div>30.24</div> </div>											

## Development Traffic Model

### Project and User Details

<b>Project:</b>	<b>220316 Barangaroo</b>
<b>Title:</b>	<b>Future Scenario Option 2</b>
<b>Company:</b>	Arup Pty. Ltd.
<b>Address:</b>	Level 10, 201 Kent Street, Sydney NSW 2000
<b>Notes:</b>	Development Traffic Model

# Network Layout Diagram

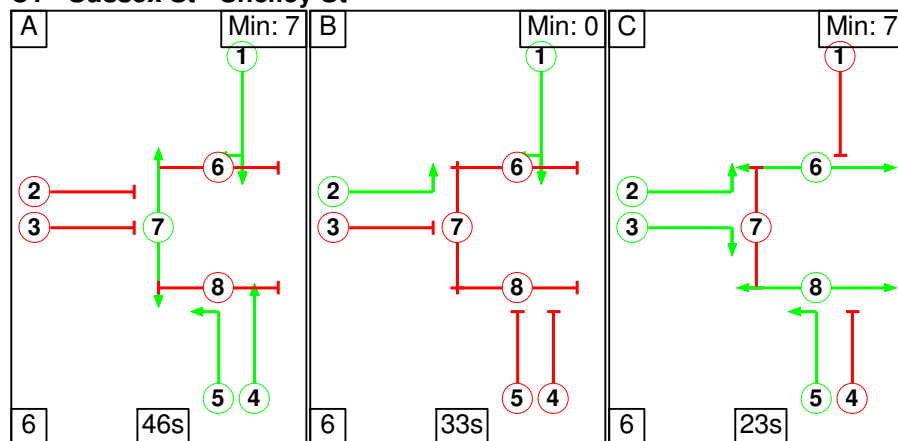




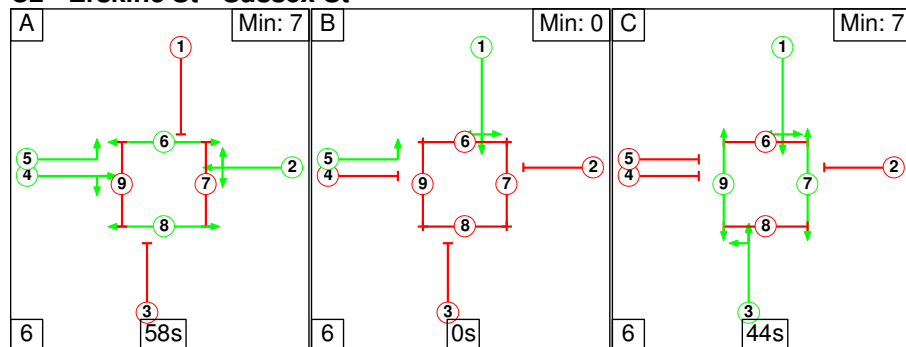
## Stage Sequence Diagram

**Scenario 1: 'AM With Development Flows'** (FG5: 'AM Traffic With Development Effects', Plan 1: 'Network Control Plan 1')

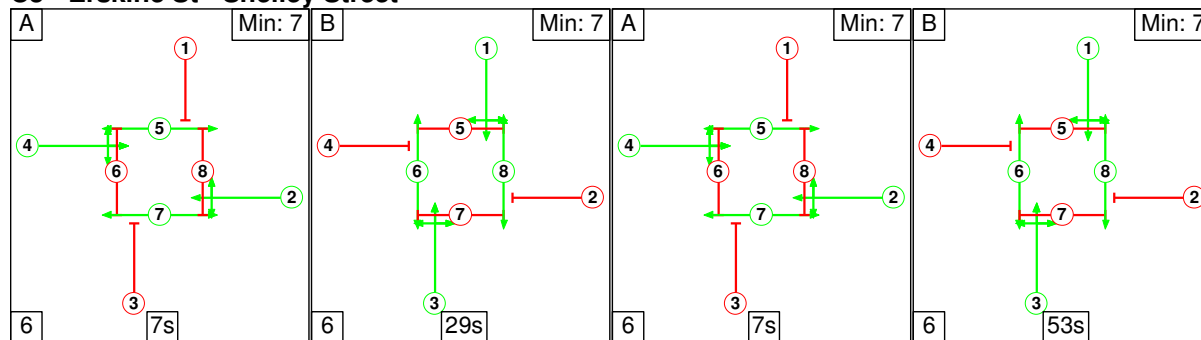
### C1 - Sussex St - Shelley St



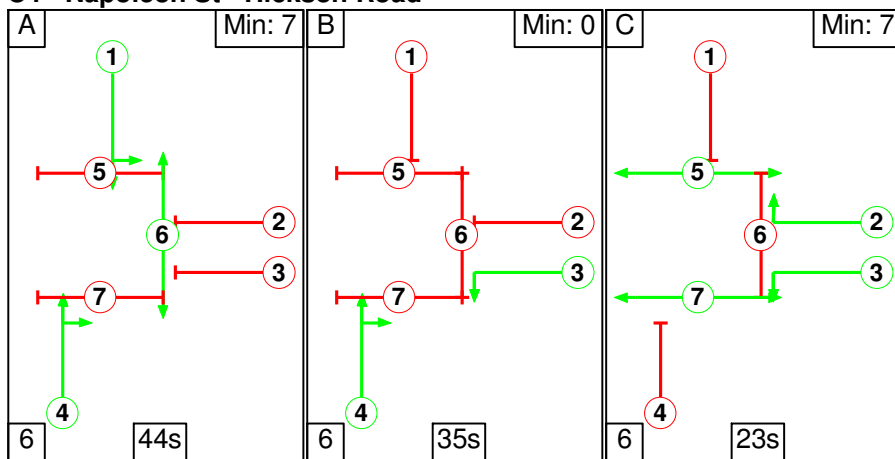
### C2 - Erskine St - Sussex St



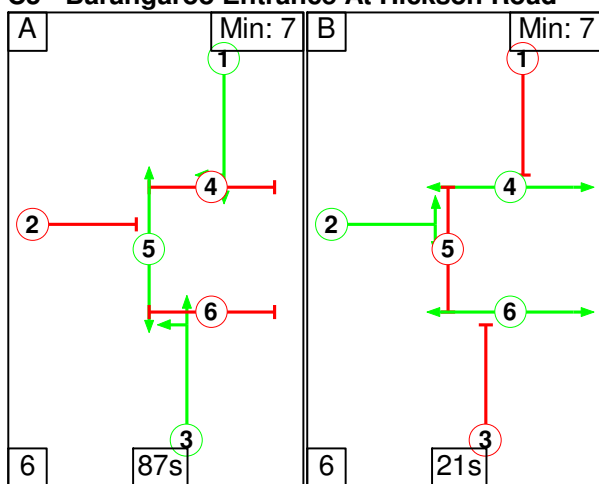
### C3 - Erskine St - Shelley Street



#### C4 - Napoleon St - Hickson Road



#### C5 - Barangaroo Entrance At Hickson Road



## Network Results

Item	Lane Description	Controller Stream	Full Phase	Arrow Phase	Deg Sat (%)	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Ignoring Random Delay ?
<b>Network: Future Scenario Option 2</b>	-	<b>N/A</b>	-		<b>88.8%</b>	-	-	-	-	<b>1432</b>	-
<b>J1: Sussex Street - Barangaroo Entrance</b>	-	<b>N/A</b>	-		<b>61.0%</b>	-	-	-	-	<b>0</b>	-
1/1	Hickson Road (Northern Arm) Ahead Right	N/A	C5:1		15.3%	2.3	6.3	217	217	0	-
2/2+2/1	Hickson Road (Southern Arm) Ahead Left	N/A	C5:3		50.3%	5.1	5.0	714	714	-	-
3/1	Barangaroo Entrance (Western Arm) Left Right	N/A	C5:2		61.0%	5.4	67.0	149	149	0	-
<b>J2: Sussex Street - Napoleon Street</b>	-	<b>N/A</b>	-		<b>60.1%</b>	-	-	-	-	<b>668</b>	-
1/2+1/1	Hickson Road (Northern Arm) Left Ahead	N/A	C4:1		47.3%	7.8	26.8	366	366	-	-
2/1	Napoleon Street (Eastern Arm) Left	N/A	C4:3		56.5%	11.3	26.0	462	462	-	-
2/2	Napoleon Street (Eastern Arm) Right	N/A	C4:2		60.1%	5.8	63.3	164	164	-	-
3/1	Sussex Street (Southern Arm) Ahead	N/A	C4:4		27.9%	0.4	2.2	360	360	-	-
3/2+3/3	Sussex Street (Southern Arm) Right Ahead	N/A	C4:4		59.9%	22.6	11.9	766	766	308	-
5/1	Hickson Road (Northern Arm) Ahead	N/A	-		39.1%	9.9	6.3	360	360	360	-
5/2	Hickson Road (Northern Arm) Ahead	N/A	-		19.7%	0.1	1.2	354	354	-	-
<b>J3: Sussex Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>56.7%</b>	-	-	-	-	<b>14</b>	-
1/2+1/1	Sussex Street (Southern Arm) Ahead Left	N/A	C1:4 C1:5		44.1%	2.6	11.8	334	334	-	-
1/3	Sussex Street (Southern Arm) Ahead	N/A	C1:4		56.7%	13.0	21.5	462	462	-	-
2/1	Shelley Street (Western Arm) Left	N/A	C1:2		41.8%	7.4	21.6	330	330	-	-
2/2	Shelley Street (Western Arm) Right	N/A	C1:3		33.0%	2.9	54.7	90	90	-	-

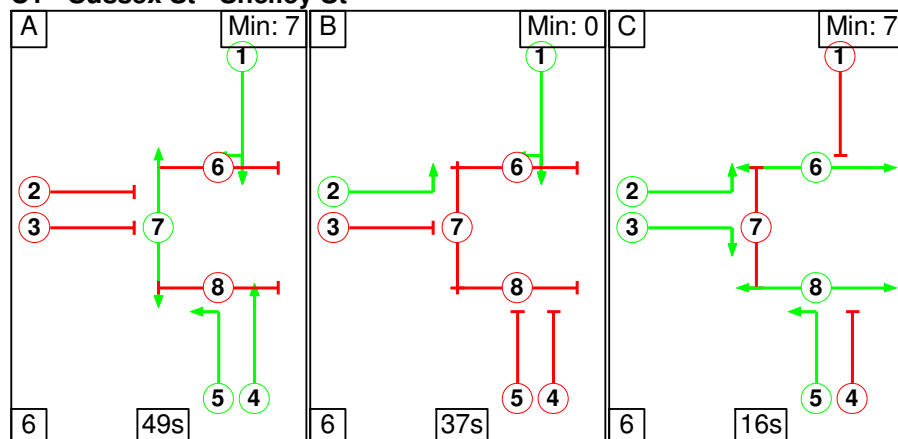
3/1	Sussex Street (Northern Arm) Ahead	N/A	C1:1		16.8%	2.5	7.6	233	233	-	-
3/2+3/3	Sussex Street (Northern Arm) Ahead Right	N/A	C1:1		33.3%	2.3	4.8	495	495	14	-
4/1	Shelley Street (Eastern Arm) Ahead	N/A	-		0.0%	0.0	0.0	0	0	0	-
4/2	Shelley Street (Eastern Arm) Ahead	N/A	-		1.4%	0.0	0.9	28	28	-	-
<b>J4: Erskine Street - Sussex Street</b>	-	<b>N/A</b>	-		<b>88.8%</b>	-	-	-	-	<b>244</b>	-
1/2+1/1	Sussex Street (Northern Arm) Left Ahead	N/A	C2:1		41.4%	4.5	15.9	352	352	-	-
1/3+1/4	Sussex Street (Northern Arm) Ahead Right	N/A	C2:1		49.3%	9.5	17.6	438	438	2	-
2/1	Erskine Street (Eastern Arm) Left	N/A	C2:2		55.2%	10.3	26.5	421	421	-	-
2/2+2/3	Erskine Street (Eastern Arm) Right Ahead	N/A	C2:2		16.8%	2.0	25.1	110	110	88	-
3/1	Sussex Street (Southern Arm) Ahead Left	N/A	C2:3		38.5%	6.3	35.4	236	236	-	-
3/2	Sussex Street (Southern Arm) Ahead	N/A	C2:3		57.7%	12.6	35.3	450	450	-	-
4/2+4/1	Erskine Street (Western Arm) Left Ahead	N/A	C2:4 C2:5		24.2%	3.8	18.4	218	218	-	-
4/3+4/4	Erskine Street (Western Arm) Ahead Right	N/A	C2:4		46.4%	3.8	41.6	158	158	154	-
6/1	Sussex Street (Southern Arm)	N/A	-		88.8%	17.5	25.6	710	710	-	-
6/2	Sussex Street (Southern Arm)	N/A	-		73.8%	15.9	18.2	590	590	-	-
<b>J5: Erskine Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>59.1%</b>	-	-	-	-	<b>373</b>	-
1/1	Erskine Street (Eastern Arm) Left Ahead Right	N/A	C3:2		33.9%	1.5	21.6	94	94	66	-
2/1+2/2	Shelley Street (Southern Arm) Right Left Ahead	N/A	C3:3		59.1%	5.2	8.3	830	830	304	-
3/1	Erskine Street (Western Arm) Ahead Left	N/A	C3:4		13.5%	0.3	52.2	12	12	-	-

3/2+3/3	Erskine Street (Western Arm) Ahead Right	N/A	C3:4		8.2%	0.4	31.5	22	22	0	-
4/1	Shelley Street (Northern Arm) Left	N/A	C3:1		3.8%	0.2	4.5	44	44	-	-
4/2+4/3	Shelley Street (Northern Arm) Ahead Right	N/A	C3:1		2.0%	0.3	5.6	28	28	3	-
<b>J6: Lime Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>22.3%</b>	-	-	-	-	<b>134</b>	-
1/1	Shelley Street (Southern Arm) Right Left	N/A	-		16.7%	0.1	1.3	274	274	-	-
1/2	Shelley Street (Southern Arm) Right	N/A	-		16.9%	0.1	1.1	320	320	-	-
2/1	Lime Street (Western Arm) Ahead Right	N/A	-		22.3%	0.1	3.9	134	134	134	-
4/1	Shelley Street (Eastern Arm) Left Ahead	N/A	-		1.4%	0.0	0.9	28	28	0	-
<div> <div> C1 - Sussex St - Shelley St  C2 - Erskine St - Sussex St  C3 - Erskine St - Shelley Street  C4 - Napoleon St - Hickson Road  C5 - Barangaroo Entrance At Hickson Road </div> <div> PRC for Signalled Lanes (%): 58.7  PRC for Signalled Lanes (%): 56.0  PRC for Signalled Lanes (%): 52.3  PRC for Signalled Lanes (%): 49.8  PRC for Signalled Lanes (%): 47.5  PRC Over All Lanes (%): 1.4 </div> <div> Total Delay for Signalled Lanes (pcuHr): 8.37  Total Delay for Signalled Lanes (pcuHr): 17.24  Total Delay for Signalled Lanes (pcuHr): 2.94  Total Delay for Signalled Lanes (pcuHr): 11.69  Total Delay for Signalled Lanes (pcuHr): 4.14  Total Delay Over All Lanes(pcuHr): 53.50 </div> <div> Cycle Time (s): 120  Cycle Time (s): 120  Cycle Time (s): 120  Cycle Time (s): 120  Cycle Time (s): 120 </div> </div>											

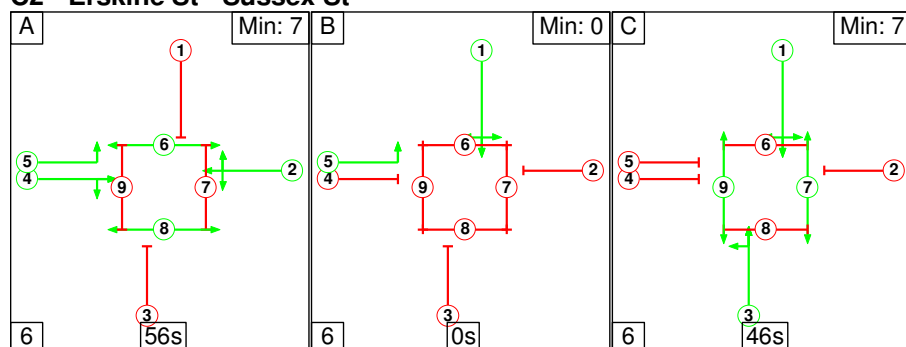
## Stage Sequence Diagram

**Scenario 2: 'PM With Development Flows'** (FG10: 'PM Traffic With Development Effects', Plan 1: 'Network Control Plan 1')

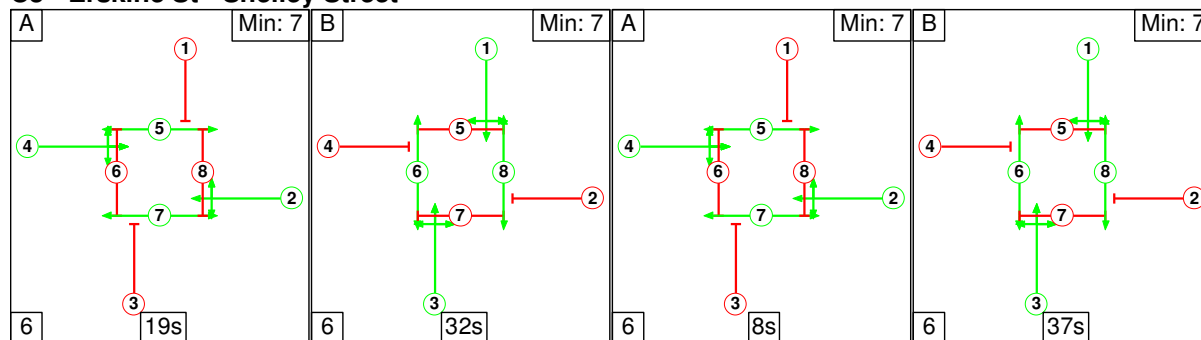
### C1 - Sussex St - Shelley St



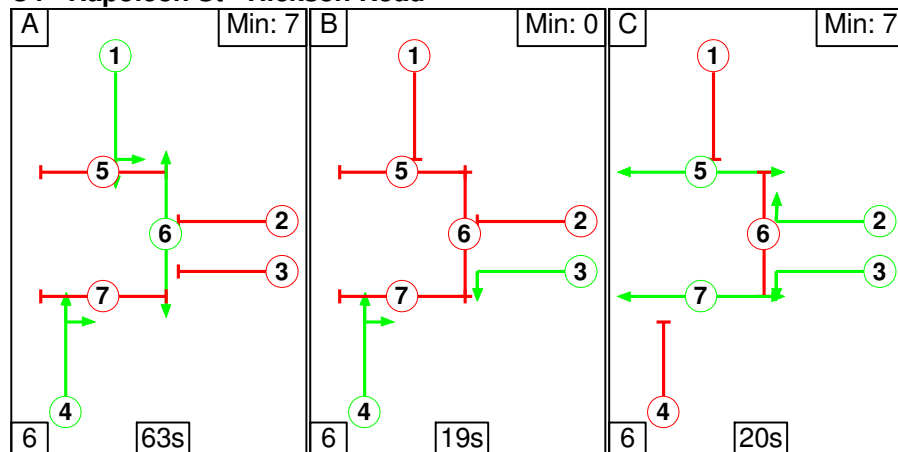
### C2 - Erskine St - Sussex St



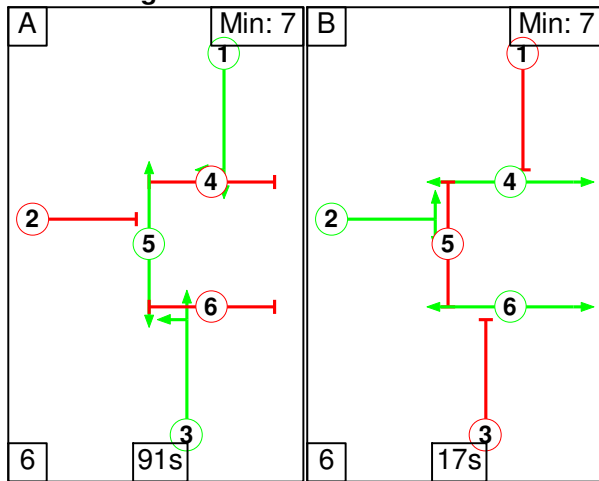
### C3 - Erskine St - Shelley Street



### C4 - Napoleon St - Hickson Road



# C5 - Barangaroo Entrance At Hickson Road



## Network Results

Item	Lane Description	Controller Stream	Full Phase	Arrow Phase	Deg Sat (%)	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Ignoring Random Delay ?
<b>Network: Future Scenario Option 2</b>	-	<b>N/A</b>	-		<b>96.9%</b>	-	-	-	-	<b>1195</b>	-
<b>J1: Sussex Street - Barangaroo Entrance</b>	-	<b>N/A</b>	-		<b>77.6%</b>	-	-	-	-	<b>0</b>	-
1/1	Hickson Road (Northern Arm) Ahead Right	N/A	C5:1		41.3%	7.2	6.8	615	615	0	-
2/2+2/1	Hickson Road (Southern Arm) Ahead Left	N/A	C5:3		33.5%	4.7	3.5	496	496	-	-
3/1	Barangaroo Entrance (Western Arm) Left Right	N/A	C5:2		77.6%	6.3	92.1	145	145	0	-
<b>J2: Sussex Street - Napoleon Street</b>	-	<b>N/A</b>	-		<b>79.4%</b>	-	-	-	-	<b>501</b>	-
1/2+1/1	Hickson Road (Northern Arm) Left Ahead	N/A	C4:1		67.9%	10.2	19.1	760	760	-	-
2/1	Napoleon Street (Eastern Arm) Left	N/A	C4:3		79.4%	15.2	50.8	443	443	-	-
2/2	Napoleon Street (Eastern Arm) Right	N/A	C4:2		46.1%	3.7	62.5	106	106	-	-
3/1	Sussex Street (Southern Arm) Ahead	N/A	C4:4		22.6%	0.5	2.3	302	302	-	-
3/2+3/3	Sussex Street (Southern Arm) Right Ahead	N/A	C4:4		53.9%	13.9	14.9	421	421	199	-
5/1	Hickson Road (Northern Arm) Ahead	N/A	-		31.6%	5.9	3.9	302	302	302	-
5/2	Hickson Road (Northern Arm) Ahead	N/A	-		10.8%	0.1	1.1	194	194	-	-
<b>J3: Sussex Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>42.9%</b>	-	-	-	-	<b>31</b>	-
1/2+1/1	Sussex Street (Southern Arm) Ahead Left	N/A	C1:4 C1:5		31.4%	1.9	8.3	253	253	-	-
1/3	Sussex Street (Southern Arm) Ahead	N/A	C1:4		30.3%	4.5	17.1	263	263	-	-
2/1	Shelley Street (Western Arm) Left	N/A	C1:2		27.6%	4.5	20.5	207	207	-	-
2/2	Shelley Street (Western Arm) Right	N/A	C1:3		42.9%	2.7	68.9	74	74	-	-



3/1	Sussex Street (Northern Arm) Ahead	N/A	C1:1		20.6%	4.1	9.4	309	309	-	-
3/2+3/3	Sussex Street (Northern Arm) Ahead Right	N/A	C1:1		42.2%	11.0	6.7	678	678	31	-
4/1	Shelley Street (Eastern Arm) Ahead	N/A	-		0.0%	0.0	0.0	0	0	0	-
4/2	Shelley Street (Eastern Arm) Ahead	N/A	-		2.6%	0.0	1.0	51	51	-	-
<b>J4: Erskine Street - Sussex Street</b>	-	<b>N/A</b>	-		<b>96.9%</b>	-	-	-	-	<b>170</b>	-
1/2+1/1	Sussex Street (Northern Arm) Left Ahead	N/A	C2:1		46.8%	4.8	13.7	419	419	-	-
1/3+1/4	Sussex Street (Northern Arm) Ahead Right	N/A	C2:1		64.2%	9.6	17.2	591	591	1	-
2/1	Erskine Street (Eastern Arm) Left	N/A	C2:2		62.1%	12.1	29.9	458	458	-	-
2/2+2/3	Erskine Street (Eastern Arm) Right Ahead	N/A	C2:2		8.8%	1.1	20.6	78	78	21	-
3/1	Sussex Street (Southern Arm) Ahead Left	N/A	C2:3		19.5%	3.0	30.7	124	124	-	-
3/2	Sussex Street (Southern Arm) Ahead	N/A	C2:3		42.0%	8.6	30.4	342	342	-	-
4/2+4/1	Erskine Street (Western Arm) Left Ahead	N/A	C2:4 C2:5		19.5%	2.6	17.7	170	170	-	-
4/3+4/4	Erskine Street (Western Arm) Ahead Right	N/A	C2:4		55.2%	4.1	49.8	148	148	148	-
6/1	Sussex Street (Southern Arm)	N/A	-		96.9%	28.5	52.0	775	775	-	-
6/2	Sussex Street (Southern Arm)	N/A	-		92.3%	29.3	40.5	738	738	-	-
<b>J5: Erskine Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>28.9%</b>	-	-	-	-	<b>257</b>	-
1/1	Erskine Street (Eastern Arm) Left Ahead Right	N/A	C3:2		22.0%	1.7	18.2	103	103	77	-
2/1+2/2	Shelley Street (Southern Arm) Right Left Ahead	N/A	C3:3		28.9%	2.4	9.3	375	375	168	-
3/1	Erskine Street (Western Arm) Ahead Left	N/A	C3:4		8.9%	0.4	28.7	25	25	-	-

3/2+3/3	Erskine Street (Western Arm) Ahead Right	N/A	C3:4		6.3%	0.4	21.6	31	31	0	-
4/1	Shelley Street (Northern Arm) Left	N/A	C3:1		11.0%	1.0	7.7	106	106	-	-
4/2+4/3	Shelley Street (Northern Arm) Ahead Right	N/A	C3:1		3.6%	0.1	6.7	43	43	12	-
<b>J6: Lime Street - Shelley Street</b>	-	<b>N/A</b>	-		<b>37.0%</b>	-	-	-	-	<b>237</b>	-
1/1	Shelley Street (Southern Arm) Right Left	N/A	-		7.8%	0.0	1.2	127	127	-	-
1/2	Shelley Street (Southern Arm) Right	N/A	-		8.2%	0.0	1.0	156	156	-	-
2/1	Lime Street (Western Arm) Ahead Right	N/A	-		37.0%	0.3	4.6	229	229	229	-
4/1	Shelley Street (Eastern Arm) Left Ahead	N/A	-		3.2%	0.0	1.2	51	51	8	-
<div> <div> C1 - Sussex St - Shelley St  C2 - Erskine St - Sussex St  C3 - Erskine St - Shelley Street  C4 - Napoleon St - Hickson Road  C5 - Barangaroo Entrance At Hickson Road </div> <div> PRC for Signalled Lanes (%): 109.7  PRC for Signalled Lanes (%): 40.1  PRC for Signalled Lanes (%): 211.2  PRC for Signalled Lanes (%): 13.4  PRC for Signalled Lanes (%): 15.9  PRC Over All Lanes (%): -7.6 </div> <div> Total Delay for Signalled Lanes (pcuHr): 6.50  Total Delay for Signalled Lanes (pcuHr): 15.49  Total Delay for Signalled Lanes (pcuHr): 2.19  Total Delay for Signalled Lanes (pcuHr): 14.06  Total Delay for Signalled Lanes (pcuHr): 5.37  Total Delay Over All Lanes(pcuHr): 63.90 </div> <div> Cycle Time (s): 120  Cycle Time (s): 120  Cycle Time (s): 120  Cycle Time (s): 120  Cycle Time (s): 120 </div> </div>											