UrbanGrowth NSW Development Corporation

North Eveleigh

Stage 1 Transport Management and Accessibility Plan

Rev B | 11 February 2013

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Arup Pty Ltd ABN 18 000 966 165

Arup
Level 10 201 Kent Street
PO Box 76 Millers Point
Sydney 2000
Australia
www.arup.com





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1 Introduction

This Stage 1 Transport Management and Accessibility Plan (TMAP) has been carried out by Arup on behalf of the UrbanGrowth NSW Development Corporation (UGDC).

The purpose of the report is to satisfy the requirement for a TMAP in accordance with Condition B3 of the approved North Eveleigh Concept Plan, and to define, understand and address the travel and transport planning requirements for the first stage of the North Eveleigh Concept Plan. The first development stage provides for the introduction of up to 200 residential dwellings at the western end of the site.

This report assesses the ability of the proposed development to achieve a transport strategy that provides a practical and sustainable basis for land use development – supporting the achievement of a maximum 40% car mode share for the Stage 1 site.

This TMAP is prepared in accordance with the Draft Interim Guidelines on Transport Management and Accessibility Plans and in consultation with City of Sydney Council and key state government agencies including Transport for NSW (TfNSW) and the Roads and Maritime Services (RMS).

1.1 Study Background

The North Eveleigh Concept Plan was approved by the Department of Planning in December 2008. The approved plan allowed for the development of the 10.7 hectare site, for a maximum of 177,527m² GFA, comprised of approximately:

- 95,000m² of residential GFA;
- 60.000m² of commercial and retail GFA; and
- 23.000m² of cultural and community GFA.

A maximum of 50,698m² of residential GFA was approved for the western precinct.

At this stage RailCorp has only agreed to release approximately 15,900m² of land for redevelopment. This is located at the western end of the North Eveleigh site adjacent to Wilson Street, as shown in Figure 1.

This land will accommodate a maximum of 14,938m² GFA (up to 200 dwellings) of the 50,698m² residential GFA (or approximately 700 dwellings) approved for the western end of the site. This is less than 30% of all GFA for the western precinct, and less than 9% of the total site's potential GFA under the approved Concept Plan.

The remainder of the land will be held by RailCorp. Release of additional land for redevelopment is uncertain.



Figure 1: Stage 1 Development Site Area

Condition B3 of the Concept Plan approval requires the preparation of a Transport Management and Accessibility Plan (TMAP) – to be prepared prior to or concurrently with the first project application that includes new floor space for the site. The TMAP is focused on the specific local constraints, opportunities and strategic context.

The UGDC has selected a community housing provider, City West Housing, to develop and manage building D4 (maximum 6,480m² GFA) for affordable housing. This affordable housing building proposal will be the first application that includes new floor space for the site, thus triggering the Concept Plan requirement for a TMAP.

Given the proportion of land available for development, and that it will accommodate less than 30% of all GFA for the western precinct and less than 9% of the total site's potential GFA under the approved Concept Plan, it is appropriate to consider a staged approach to traffic and transport management issues. As such this Stage 1 TMAP considers the development of the Stage 1 area, including buildings A2, A3, C4 (existing Clothing Store to be adaptively reused) and building D4 (intended for affordable housing).

The development of remaining land will be preceded by further TMAPs. This staged approach will allow for transport and traffic related recommendations to reflect the situation and conditions relevant at the time of development.

1.2 Study Objectives

The purpose of the study is to establish the specific local traffic and transport constraints and opportunities within a strategic context. The aim of the assessment is to:

- Discuss the existing transport network conditions surrounding the site,
- Establish the likely trip generation from the Stage 1 development,
- Identify potential measures to reduce reliance on car mode share to below 40% (Note that the adjacent Darlington precinct has a low car dependence for the journey to work of only 19%),

- Provide traffic modelling which forecasts the future operation of local intersections,
- Identify transport infrastructure works that would be required as a direct result of the proposed development,
- Recommend any required facilities to manage site traffic generation during the commuter peak hours,
- Review pedestrian and cyclist accessibility in the precinct and within the site itself and provide recommendations to improve existing facilities, and
- Establish the likely construction vehicle routes associated with the development.

Modelling of regional intersections was not considered necessary due to the level of development in the Stage 1 TMAP resulting in dispersal of development traffic between the development and these intersections. Modelling may be undertaken for a Stage 2 TMAP as considered appropriate by TfNSW and RMS.

2 Existing Transport Conditions

2.1 Site Location

Stage 1 of the North Eveleigh Development is located on the northern side of Eveleigh, approximately 4km south of the Sydney CBD. The site is bounded by Darlington to the north, Redfern to the east, Alexandria and Erskineville to the south and Newtown to the west. Figure 2 shows a context location of the surrounding suburbs.

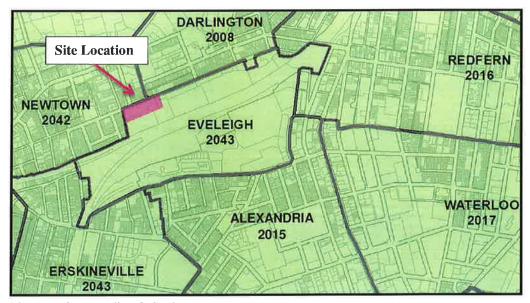


Figure 2: Surrounding Suburbs

The North Eveleigh development site is located on the former North Eveleigh Railway yards. It is located to the south of Wilson Street and on the northern side of the main rail corridor between Macdonaldtown and Redfern railway stations. The Stage 1 development site may accommodate approximately 200 of the 700 dwellings proposed for the western end of the North Eveleigh site as part of the approved North Eveleigh Concept Plan. Figure 3 below shows the Stage 1 site area.

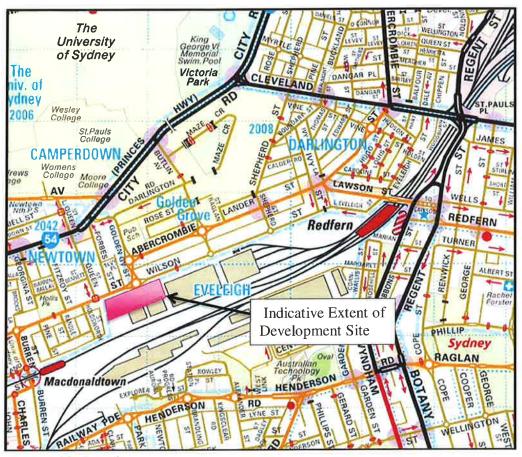


Figure 3 Site Location

2.2 Rail Network

The site is approximately 800 metres from Redfern railway station, which provides the area with frequent rail links to the surrounding region. Redfern station is the ninth busiest railway station in the Sydney area. The station has 12 platforms available, 10 of which are in use. 7 of the platforms serve CityRail services and 3 serve inner city services. Table 1 details the number of services at the station for each line.

Redfern Railway Station is proposed to undergo upgrades as part of the Long Term Transport Master Plan (LTTMP). The proposals facilitate access and connectivity, increased station capacity and improved links to multi-modal connections such as surrounding bus stops, pedestrian and cycle links.

Table 1: Redfern Railway Station Services

Rail Line	Direction	Trains per weekday	Trains in AM Peak ¹
Eastern Suburbs and Illawarra Line	Waterfall or Cronulla to Bondi Junction	178 trains	18 trains
	Bondi Junction or Cronulla to Waterfall	170 trains	14 trains
Bankstown Line	Liverpool or Lidcombe to City Circle	76 trains	5 trains
	City Circle to Liverpool or Lidcombe	80 trains	5 trains
Inner West Line	Liverpool to City via Regents Park	202 trains	15 trains
	City to Liverpool Via Regents Park	205 trains	12 trains
Airport and East Hills Line	Macarthur to City Circle via Airport or Sydenham	11 trains	3 trains
	City Circle to Macarthur via Airport or Sydenham	11 trains	0 trains
South Line	Campbelltown to City Circle via Granville	200 trains	15 trains
	City Circle to Campbelltown via Granville	200 trains	12 trains
North Shore Line	Berowra to Parramatta via City	193 trains	12 trains
	Parramatta to Berowra via City	206 trains	18 trains
Northern Line	Hornsby or Epping to City	79 trains	6 trains
	City to Hornsby or Epping	83 trains	6 trains

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¹ For the purposes of this table only the trains during the AM peak hour is defined as the trains that depart Redfern Station between 08:00am and 09:00am. RailCorp definition of the AM peak period is 6.30am-9.30am which would include more services than indicated above.

The site is served by a second railway station; Macdonaldtown Station located approximately 400 metres from the site. Access to Macdonaldtown Station is via Burren Street under the railway bridge. While Macdonaldtown Station is closer to the site then Redfern Station, it is expected that the majority of patrons using trains will walk to Redfern station as a result of the more frequent services and additional lines servicing this station. This is shown in Table 2. Users travelling to Newtown and other stations on the inner west line are likely to use Macdonaldtown Station.

Table 2: Macdonaldtown Railway Station Services

Rail Line	Direction	Trains per weekday	Trains in AM Peak ²	
Inner West Line	From Macarthur to City	70 trains	4 trains	
	From City to Macarthur	78 trains	5 trains	

2.3 Bus Network

The majority of the buses in the area operate along City Road to the north of the site. Bus stops on City Road are approximately 500 metres away from the proposed development site – just over a 5 minute walk. Table 3 details a list of the existing bus routes in operation along City Road and the daily scheduled number of buses in operation on the route. Photograph 1 shows the bus stop and shelters on City Road.

² For the purposes of this table definition of morning peak hour is between 08:00am and 09:00am.

Table 3: Bus Services Along City Road

Bus Number	Operator	Route	Total Number of Buses Per Day	Buses in the AM Peak Hour
Metrobus 30	Sydney Buses	Sydenham Station to Spit Junction	128	12
352	Sydney Buses	Bondi to Marrickville Junction	53	6
370	Sydney Buses	Coogee to Leichhardt	112	11
422	Sydney Buses	Circular Quay to Kogarah	156	10
423	Sydney Buses	Kings Grove to Circular Quay	148	11
426	Sydney Buses	Kingsgrove to Circular Quay	133	7
428	Sydney Buses	Dulwich to Circular Quay	135	10
L23	Sydney Buses	Kingsgrove – Circular Quay	17	5



Photograph 1: Bus stop at City Road / Butlin Avenue

2.4 Pedestrian Network

Pedestrian links facilitate connectivity from the subject site to nearby bus stops on City Road and at Redfern and Macdonaldtown railway stations. Pedestrian laneways and wide footpaths equipped with pram ramps and street lighting further add to the pedestrian amenity in the area. A pedestrian priority crossing is located on Wilson Street opposite Hollis Park. A pedestrian area is located between Wilson Street and Little Eveleigh Street to the east of the site, providing access to Redfern Railway Station. Dedicated pedestrian crossings are provided on all legs of key signalised intersections on City Road and King Street.

The Shepherd Street/ Abercrombie Street intersection is equipped with a 'scramble phase' crossing, an all red phase for vehicles which allows pedestrians to cross diagonally across the intersection. This crossing facilitates convenient access for university students accessing Maze Crescent, a pedestrian link across the university campus.

2.5 Bicycle Network

The site is well connected by a series of bicycle routes that form part of the City of Sydney's cycling network. Wilson Street is a key regional cycle route that runs adjacent to the site, providing connections to Newtown, Erskineville and Redfern. A contra-flow cycle lane is provided on Little Eveleigh Street to the east which connects Wilson Street to Lawson Street and Redfern station. The key cycle routes in the vicinity of the site are outlined in Figure 4.

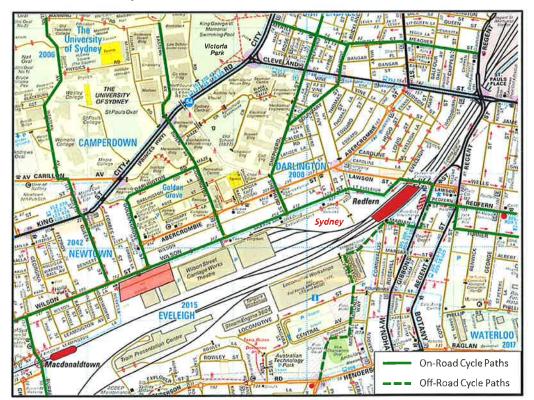


Figure 4: Cycle Routes surrounding North Eveleigh Site Source: Arup

The City of Sydney has commenced a roll out of cycleway connections across the entire LGA. These routes will facilitate regional cycle connections between the North Eveleigh site and key locations with the area. These routes are shown in Figure 5 below.

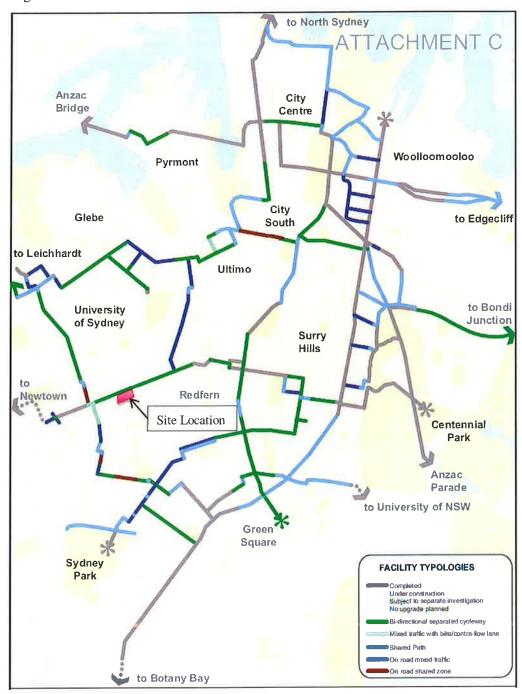


Figure 5: City of Sydney Regional Bike Network Site Improvements Program

Source: City of Sydney Council

2.6 Existing Travel Patterns

The suburb of Eveleigh contains 209 dwellings. The primary land uses in the suburb are related to the railway, the carriage works and the Australian Technology Park exhibition and convention centre. The existing dwellings in Eveleigh consist of a relatively small number of affordable housing located the south-western side of the railway line, an area which would have different travel patterns. Therefore, travel statistics for the neighbouring Darlington suburb have been utilised, as this area is more representative of the Stage 1 development being a predominantly residential suburb with good access to Redfern Station. A comparison of travel statistics for Eveleigh, Newtown and Darlington are attached in Appendix C which outlines the similarities in suburb demographics and travel patterns.

2.6.1 Mode Share

The 2011 ABS Census data relating to travel mode to work stated that workers travelling from Darlington travel to work by the modes indicated in Table 4:

Table 4: Existing Mode Share

Mode	Percenta	ge Split	
	Darlington	Greater Sydney Average	
Car, as driver	18%	54%	
Car, as passenger	1%	5%	
Train	23%	9%	
Walked only	22%	4%	
Bicycle	6%	1%	
Bus	5%	5%	
Other	25%	22%	
Total	100%	100%	

Source: 2011 Census (Australian Bureau of Statistics, 2012)

The data shows that approximately 18% of workers drive themselves to work from the area –significantly lower that the Sydney wide average. The other major travel modes are by train and bicycle, ranging from 23% to 6% of the total modal split. The 'other' mode consists of people who used a different mode, work from home or did not work on the day of the census. The data also shows that approximately 75% of the residents in the workforce commuted on the day of the Census.

The key trend to emerge from the 2011 Census data is the level of non-car usage by residents of Darlington. More than 56% of people surveyed indicated they travelled to work via public train, bus, walking or cycling rather than private vehicle. This is well above the average for the greater Sydney region of 19%, and reflects the good public transport availability in the area.

2.6.2 Trip Distribution

The 2006 ABS Census data³ is the latest published data relating directions to Journey to Work. The Census data is grouped into zones in order to compare differences between travel patterns in areas. The Stage 1 North Eveleigh development in 'Travel Zone 0256' which is bound by Queen Street to the west Darlington Road to the north, Codrington Street to the east and the railway line to the south. Figure 6 below, illustrates the area covered by 'Travel Zone 0256'.

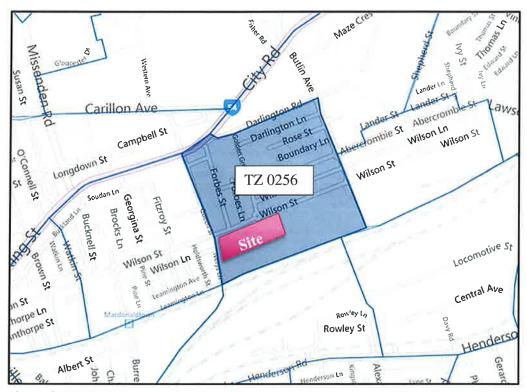


Figure 6: Travel Zone 0256 - Darlington

Source: BTS Travel Zone Finder

The survey data states that commuter workers travelling to work by private vehicle from Travel Zone 0256 containing the proposed development site travel in the directions as stated in Table 5:

2

³ At the time of writing this report full 2011 JTW Census data has not been published.

Table 5: Directional Split based on 'Travel Zone 0256' 2006 JTW Census Data - Darlington

Direction	Percentage Split
North	38%
East	29%
South	10%
West	23%
Total	100%

The data shows that the majority of vehicle commuters travel north towards Sydney CBD and North Sydney.

2.7 Area Demographics

The 2011 Census data for demographics shows the suburb of Darlington as a predominantly residential area with a recorded population of 2,243 people. A review of the demographics of the suburb was conducted using the 2011 Census data to establish typical lifestyle and modes for Darlington.

2.7.1 Dwelling Occupancy

Darlington has a total of 934 dwellings with an average of 2.3 people per dwelling. The median age is 28 years old. There are a total of 360 families with an average of 1.4 children per family.

2.7.2 Car Ownership

One third of houses in the suburb of Darlington have no cars and these residents use public or active transport such as walking and cycling as their primary means of transportation. Almost half of all dwellings have one motor vehicle. Dwellings with two or more cars represent 17% of all households –significantly lower than the NSW average of more than 50%. This lower car ownership rate again reflects the good public transport availability in the precinct. This data is illustrated on Figure 7 below.

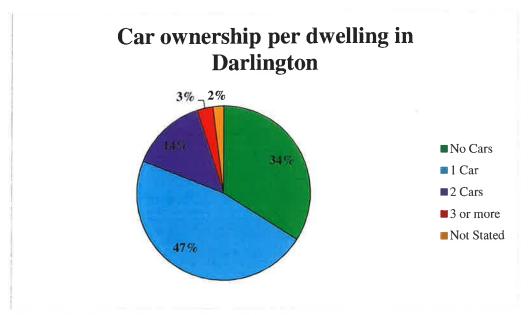


Figure 7: Car Ownership per dwelling - Darlington

2.8 Traffic Generation of Residential Developments

The primary document relating to traffic impact assessment in NSW is the RMS's *Guide to Traffic Generating Developments*. Traffic generation forecasts are typically based on rates per m² of GFA development for each type of land use, or other factors including parking provision or dwelling numbers. Rates are usually derived from one of the following two sources:

- Standard rates contained in the RMS's *Guide to Traffic Generating Developments*; or
- Rates estimated on the basis of surveys of existing developments similar to the proposed development.

Traffic generation rates are influenced by factors such as public transport availability, availability and cost of parking, mixed use and complementary nature of various land use components and peak traffic generation hours. The RMS advises a peak hour traffic generation rate of 0.24 vehicle trips / dwelling is to be used for high density residential flat buildings (>20 dwellings) in metropolitan regional centres.

Arup has recently undertaken independent surveys to obtain site specific traffic generation rates for high density residential buildings with good public transport access. These included existing developments in Erskineville and Meadowbank and included more than 860 residential dwellings. The Glo and Motto residential developments is Erskineville were surveyed during the morning and afternoon peak periods to determine an appropriate traffic generation rate for apartments in this area. Glo, with 90 units, generated 0.19 trips/unit in the morning peak and 0.15 trips/unit in the afternoon peak. Motto, with 162 units, generated 0.15 trips/unit in the morning peak and 0.10 trips/unit in the afternoon peak.

Two more residential developments adjacent to the site were surveyed in April 2012. The Verve apartment complex on Coulson Street contains 106 units and

was found to have an AM peak hour trip generation of 0.10 vehicles per unit and a PM peak hour trip generation of 0.14 vehicles per unit. The Zenix apartment complex on Sydney Park Road contains 224 units and was found to have an AM peak hour trip generation of 0.16 vehicles per unit and a PM peak hour trip generation of 0.28 vehicles per unit.

The results indicate the traffic generation rates for the surveyed sites are generally lower than the generic RMS peak hour rate of 0.24 trips / dwelling. Following discussions with the RMS and Transport for NSW, it was agreed a generation rate of 0.24 vehicles / hour should be adopted for the North Eveleigh site. It is expected that this rate will equate to the maximum level of traffic generation.

Approximately 70 of the new dwellings within the precinct will be affordable housing. Research shows that car ownership in affordable housing is significantly lower especially if the development is located within close proximity of public transport.

The State Environmental Planning Policy for Affordable Housing (AHSSEPP) 2009 specifies relatively low car parking rates that lead to low traffic generation rates. In the case of a development application made by a social housing provider at least 1 car parking space is provided for each 5 dwellings or in any other case at least 0.5 car parking spaces are provided in each dwelling.

Applying the RMS rate of 0.24 trips per dwelling to a Stage 1 dwelling outcome of 200 residential dwellings results in a peak hour traffic generation of 48 two-way vehicle movements. If the Stage 1 dwelling outcome was reduced to 150 dwellings due to a different building efficiency and dwelling size then the traffic generation would reduce to 36 two-way vehicle movements. If 70 affordable housing dwellings were included in this mix with only 1 car space per 5 dwellings then a further reduction in traffic generation to approximately 24 two-way vehicle movements. This represents a 50% reduction in traffic generation. For the purposes of this assessment the maximum traffic generation of 48 two-way vehicle movements has been adopted.

2.9 Road Network

The suburb of Eveleigh is divided between north and south by railway tracks between Redfern Railway Station and Macdonaldtown Railway Station. The development is accessed by the road network on the northern side of the railway line.

City Road is a nearby RMS controlled road which links Parramatta Road at Broadway to King Street travelling south. Near the site, City Road is a two-way multi-lane road with a central median to separate traffic.

Abercrombie Street is a Council controlled road and has a single lane of traffic in each direction. On-street parking is available on either side of the street. To the north of the subject site, traffic calming features are in place along the street in the form of pedestrian priority zebra crossings and mini roundabouts to maintain reduced traffic speeds in the area.

Wilson Street is a Council controlled road and has a single lane of traffic in either direction, with on-street parking provided on both sides of the road. To the east, Wilson Street provides a connection to Lawson Street and Redfern Railway Station via a pedestrianised roadway and Little Eveleigh Street.

Shepherd Street is a Council controlled road and provides connections from Wilson Street through to the north of Cleveland Street. Shepherd Street is equipped with a single lane carriageway in each direction with parking provided on either side of the street. Maze Crescent is a pedestrian spine through the University of Sydney and provides links through to Shepherd Street for students travelling to and from Redfern Railway Station.

Golden Grove Street is a Council controlled road. It provides for two-way traffic with a relatively wide cross-section and connects King Street with Wilson Street, and carries traffic flows at the sub-arterial level along that section between Abercrombie and Wilson Street. Traffic calming features are in place along the street in the form of pedestrian priority zebra crossings and mini roundabout intersections adjacent to the subject site. Abercrombie Street and Golden Grove Street are designated school zones with a 40km/h speed limit during school start and finishing times. The speed limit in the school zone is 50km/h outside of school hours. Lane widths are approximately 3.5 metres in the area.

2.10 Existing Traffic Flows

Arup conducted both intersection and 7 day automated traffic counts in the North Eveleigh precinct in order to establish typical traffic volumes and determine the performance of the road network. The surveys were undertaken during the University semester period and outside of school holidays to provide a typical representation of traffic flows, on the following dates:

- **Intersection Surveys**: Thursday 25 October 2012 (7am 9am and 4pm 6pm)
- Automated Traffic Count Surveys: Wednesday 24 October 2012 through to Tuesday 30 October 2012

The locations of the surveys are shown in Figure 8.

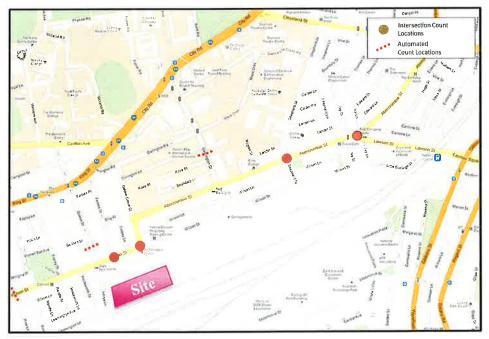


Figure 8: Traffic Survey Locations

The locations of the traffic surveys were selected to align with the surveys undertaken for the North Eveleigh Concept Plan or previous surveys taken in the area, and were confirmed following consultation with Council, TfNSW and the RMS. The section below describe existing traffic flow and compares these with previously collected traffic data for the area.

2.10.1 Intersection Counts

Classified turning counts were conducted during the weekly peak hour periods to establish the intersection usage in the area. The traffic counts were conducted at the following intersections:

- Wilson Street/ Forbes Street (priority intersection)
- Wilson Street/ Golden Grove Street (roundabout intersection)
- Abercrombie Street/ Shepherd Street (signal controlled intersection), and
- Abercrombie Street/ Lawson Street (signal controlled intersection)

For all of the surveyed intersections, the AM and PM peak hours were found to occur from 8am to 9am and 5pm to 6pm respectively – identical to that observed during traffic counts undertaken in April 2006 for the North Eveleigh Concept Plan. A summary of the peak hour vehicle flows is described in Table 6.

Intersection	Traffic Volumes Through Intersection							
	AM Peak Hour (8am – 9am)			PM Peak (5pm – 6pm)				
	April 2006	October 2012	% Change	April 2006	October 2012	% Change		
Wilson St / Golden Grove St	707	673	- 5%	641	613	- 4%		
Wilson St / Forbes St	650	670	+ 3%	645	614	- 5%		
Abercrombie St / Shepherd St	1037	893	- 14%	1093	910	- 16%		
Abercrombie St / Lawson St	911	845	- 7%	1021	888	- 13%		
Total Traffic	3305	3081	- 7%	3400	3025	- 11%		

Table 6: Intersection Traffic Count Summary

The results of the surveys indicate a minor reduction in peak hour traffic flows through the North Eveleigh precinct between 2006 and 2012. This largely reflects the static nature of land use development in the area during this period.

2.10.2 Automated Traffic Counts

Pneumatic tubes which record the number of vehicles in each direction on a roadway were placed at three locations within the surrounding road network. These tube counts were used to record variations in traffic flows over the course of a week. Tube counters were placed along Wilson Street, Queen Street and Codrington Street as indicated in Figure 8. These locations were used to compare with existing City of Sydney survey data collected in May 2009. The results for each are summarised in Table 7.

		-				
Counter Location	Five Day ADV*			Peak Hour Traffic Volume ⁴		
	May 2009	October 2012	% Change	May 2009	October 2012	% Change
Wilson Street (near Burren Street)	n/a	6,862	n/a ⁵	718	631	- 12%
Queen Street (near Wilson Street) ⁶	n/a	885	n/a	n/a	95	n/a
Codrington Street (near Rose Street)	6,055	6,434	+6%	548	580	+6%

Table 7: Tube counts bi-directional summary

2.10.3 Pedestrian and Cyclists

Pedestrian and cyclist turning counts were collected on Thursday 25 October 2012, coinciding with the intersection surveys. This indicated significant numbers of cyclists and pedestrians travelling through the area, with almost as many cyclists recorded on Wilson Street as cars. The results of the pedestrian and cyclist surveys are summarised in Table 8, with key pedestrian and cycle movements shown in Figure 9.

Table 8: Existing Pedestrian and Cycling Volumes

Intersection	Pedestrians and Cyclists Through Intersection					
	AM Peak (7ar	n – 9am)	PM Peak (4pm – 6pm)			
	Pedestrians	Cyclists	Pedestrians	Cyclists		
Wilson St / Golden Grove St	111	468	88	334		
Wilson St / Forbes St	111	467	129	332		
Abercrombie St / Shepherd St	1720	167	2208	108		
Abercrombie St / Lawson St	911	141	1445	106		

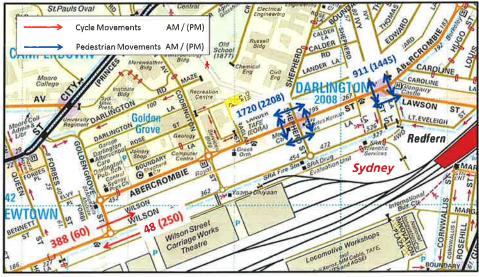


Figure 9: Pedestrian and Cyclist Volumes at Key Locations

^{*} ADV - Average Daily Vehicles

⁴ Wilson Street Peak Hour 8am – 9am, Queen Street / Codrington Street Peak Hour 5pm – 6pm.

⁵ City of Sydney data contained peak hour traffic data only, Five Day ADV was unavailable.

⁶ No comparable 2009 data was available for Queen Street.

3 Strategic Planning Context

A number of key planning policies and documents are relevant to the proposed Stage 1 development, which are identified in the sections below.

3.1 North Eveleigh Concept Plan

The North Eveleigh Concept Plan was approved in December 2008 and allowed for:

- Redevelopment of the site for commercial, office, retail, cultural, community and residential uses, involving a maximum of 177,527m² of GFA;
- Retention and adaptive reuse of heritage buildings
- Public open space network totalling 9,980m²

The Concept Plan allowed for a maximum of 1800 on-site car parking spaces, with maximum parking rates for the residential component of the development as follows:

- Studio apartment: 0.25 spaces / dwelling
- 1 bedroom apartment: 0.50 spaces / dwelling
- 2 bedroom apartment: 1.2 spaces / dwelling
- 3+ bedroom apartment: 2 spaces / dwelling

3.2 Draft NSW Long Term Transport Masterplan

The draft NSW Long Term Transport Masterplan was released in September 2012 and outlines a 20 year plan for the direction of transport services across NSW. The plan presents an integrated approach to transport planning and identifies the roles different modes of transport play in meeting the future needs of the State population.

The masterplan aims to integrate public transport services to maximise future use as well as improve the overall customer experience. The masterplan discusses the implementation of the 'Opal' card – the future integrated public transport ticketing system for NSW.

3.3 Sydney 2030 Strategy

The City of Sydney's vision to 2030 is a green, global and connected city. The strategy acknowledges that the City needs to provide the infrastructure that supports a stronger walking and cycling culture. Fundamental to the provision of pedestrian infrastructure is placing walking, cycling and light rail as the highest priority on City streets.

Specific to this study, Sustainable Sydney 2030 outlines the following:

- Objective 3.3 Reduce the impact of transport on public space in the City Centre and Activity Hubs
- Objective 4.1 Develop a network of safe, linked pedestrian and cycle paths integrated with green spaces throughout both the City and Inner Sydney.

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• Objective 4.2 Give greater priority to cycle and pedestrian movements and amenity in the City centre.

The directions outlined by Sustainable Sydney 2030 guide development in the City of Sydney to 2030 and inform the aims and ideals behind the transport strategy for the Stage 1 development.

3.4 NSW Planning Guidelines for Walking and Cycling

The NSW Planning Guidelines for Walking and Cycling provides guidance in relation to improving facilities for pedestrians and cyclists associated with new developments. The document proposes the argument that improving practice in planning for walking and cycling will reduce the reliance on private vehicle travel and create more opportunities for people to live in places with easy walking and cycling access to urban services and public transport.

The guidelines recommend the following bicycle parking rates for residential developments:

- 20% 30% of total dwellings (residents)
- 5% 10% of total dwellings (visitors)

The pedestrian and cycle strategy outlined in this report closely aligns with the objectives contained in the Walking and Cycling Guidelines.

3.5 Guide to Traffic Generating Developments

The primary document relating to traffic impact assessment in NSW is the RMS's *Guide to Traffic Generating Developments*. As described in Section 2.8 of this report, the traffic generation rates utilised for this analysis are based on those contained in the RMS guide.

4 Proposed Development

4.1 Description of Proposed Works

The North Eveleigh Concept Plan approval anticipated the development of the whole site concurrently. As a result of RailCorp's land requirements, the site will now be developed in a number of stages. The first development stage provides for the introduction of up to 200 residential dwellings at the western end of the site. Of these proposed dwellings, approximately 70 are to be provided as affordable housing.

4.2 Site Population

Based on the existing 2011 occupancy data for homes in Darlington of 2.3 people per dwelling, the Stage 1 development will accommodate up to 460 residents.

4.3 Parking Provision

Maximum parking rates for the Stage 1 development are to be in line with the existing North Eveleigh Concept Plan approval, as outlined below. These rates are consistent with those allowable under the existing City of Sydney Local Environment Plan (2005).

- Studio apartment: 0.25 spaces / dwelling
- 1 bedroom apartment: 0.50 spaces / dwelling
- 2 bedroom apartment: 1.2 spaces / dwelling
- 3+ bedroom apartment: 2 spaces / dwelling

The exact number of parking spaces to be provided will be determined following confirmation of the final dwelling mix at a later stage of the project. It should be noted that the above parking rates are *maximum* rates – with the potential to provide lower on-site parking to support the goal of increased non-car use. In addition, the Stage 1 development will provide 16 on-street spaces.

4.4 Proposed Access Arrangements

4.4.1 Site Access

Access into the Stage 1 development is to be via the existing improved road access into the Carriageworks site off Wilson Street near Queen Street. This access point is consistent with the location nominated in Built Environment Plan (Stage One) and the location approved by the North Eveleigh Concept Plan. A single lane entry and exit is proposed, with the intersection at Wilson Street to be priority controlled.

This access accommodates anticipated vehicle movements for Stage 1 development with additional spare capacity available to accommodate future residential development of the western precinct.

4.4.2 Queen Street Access

A statement of commitment in the North Eveleigh Concept Plan approval relating to traffic on Queen Street is worded as follows:

"Traffic management measures to ensure a right hand turn is not permitted from Wilson Street into Queen Street when exiting the site from Carriage Works Way, subject to the approval of the relevant roads authority."

Following consultation with City of Sydney Council, an indicative concept for the introduction of a central median on Wilson Street has been developed. This median would restrict the right turn from Wilson Street into Queen Street – including the movement of vehicles from the Concept Plan site into Queen Street. This concept is indicated in Figure 10.



Figure 10: Queen Street Central Median

Traffic counts undertaken as part of this study indicate Queen Street currently carries low traffic volumes – less than 1,000 vehicles per day. Therefore the implementation of any physical measure which restricts movements into this street is not considered critical from a traffic capacity perspective. The measure would serve to retain the level of residential amenity for residents in Queen Street.

The introduction of the median to ban the right turn into Queen Street would restrict vehicle access for residents. Residents approaching from the east on Wilson Street would need to continue west to the Burren Street roundabout to execute a u-turn to travel back to turn left into Queen Street. As the Queen Street median is not a current proposal, it has been agreed with Council to undertake modelling without the median in place.

It should be noted that this measure would fall under Section 116 of the Roads Act as it restricts a traffic movement from taking place. 28 days of community consultation will be required prior to consideration of the implementation of this median. Council has indicated this should be undertaken by UGDC/the developer

in conjunction with the City of Sydney to discuss the measure with the local community to explain the requirement to implement this measure. Subject to the outcome of this community consultation, and following discussion with the road authority, it is recommended that the construction of a central median be investigated prior to the development of more than 100 dwellings on the Stage 1 site.

The detailed design of the median would occur closer to construction in consultation with the road authority.

5 Transport Assessment

5.1 Future Mode Split

Section 2.6.1 identified the existing travel characteristics based on 2011 Census data for residents of Darlington (bound by Cleveland Street, Golden Grove Street, King Street and Wilson Street). This indicated a high level of non-car use, most prominently train, walking and cycling. Additionally, it can be expected that residents living in medium or high density development as is proposed will have a greater focus on public transport usage and be less reliant on private vehicle use.

Based on the projected site population of 460 residents, assuming 50% of residents travel in the peak hour⁷, approximately 230 peak hour person trips are forecast. The potential distribution of these trips across the various transport modes is shown in Figure 11 utilising the 2011 Census mode split described in Section 2.6.1.

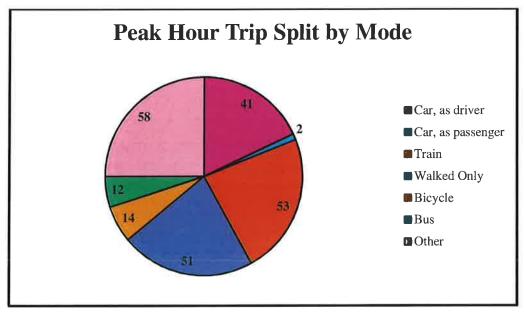


Figure 11: Peak Hour Trips by Mode

5.2 Forecast Trip Generation and Distribution

The RMS 'Guide to Traffic Generating Developments' recommends a vehicle trip generation rate of 0.24 trips per unit in the peak hour from a high density residential development. As previously discussed this 0.24 trips per unit is considered a maximum trip generation rate for the development and has been agreed with Council as the appropriate rate for the transport assessment. The Stage 1 North Eveleigh Development is expected to contain up to 200 units, corresponding to a peak hour trip generation of 48 vehicles.

Using the directional split developed from Census data in Table 5, it is expected that the 48 vehicles will travel on the routes outlined in Figure 12 for the scenario

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⁷ Based on the latest Bureau of Transport Statistics 2010/11 HTS Summary Report - Figure 3.9.2.

where the right turn into Queen Street remains open and Figure 13 where the right turn into Queen Street is closed.

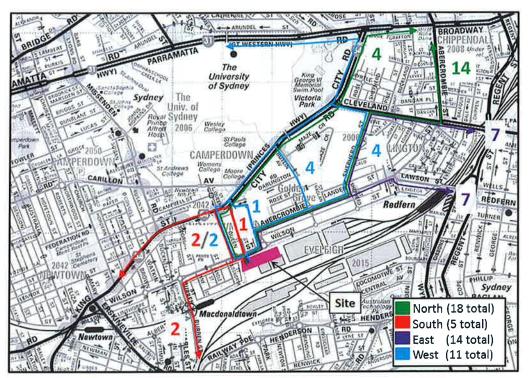


Figure 12: Peak Hour Vehicle Distribution with right turn into Queen Street open

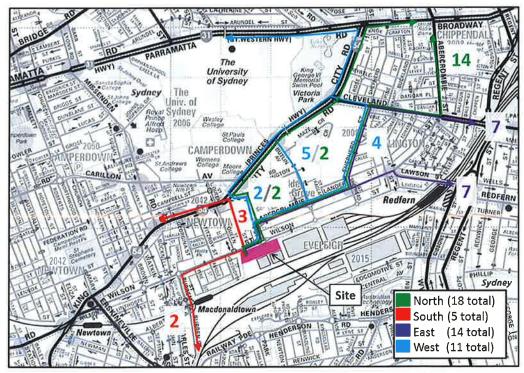


Figure 13 Peak Hour Vehicle Distribution with right turn into Queen Street closed

The Stage 1 development is expected to result in a total of 10 vehicles turning onto Queen Street if the right turn remains open and a total of 36 vehicles travelling on Abercrombie Street in the morning peak. If the right turn into Queen Street is closed then these vehicles will use a combination of Forbes Street, Golden Grove Street Butlin Avenue as shown in Figure 13. It has been assumed that the vehicles exiting the site in the morning will have similar patterns for returning in the evening.

5.3 Intersection Operation

The Abercrombie Street/ Shepherd Street intersection and the Abercrombie Street/ Lawson Street intersection have been modelled using SIDRA (Signalised Intersection Design and Research Aid) version 5.1 to assess the effects of the development on the surrounding traffic network.

5.3.1 Analysis Software

SIDRA Intersection 5.1 is a computer software package used for the assessment and design of intersections. It enables the user to predict the capacity, vehicle queues and delays at a variety of intersection types. The performance of the intersection is quantified in terms of level of service (LOS) and degree of saturation (DOS) as defined in the following section.

5.3.2 Assumptions

Shepherd Street Works

City of Sydney is currently considering pedestrian upgrade works along Shepherd Street. It is understood that these works may involve local footpath widening and some landscaping, with Council advising there would be no loss of traffic capacity associated with the proposed works. As such, the intersection analysis remains unaffected by this proposal.

A proposal to consider the closure of Shepherd Street, between Abercrombie Street and Lander Street is being considered as part of the Pedestrian, Cyclist and Traffic Control Plan (PCTC) for the area. The effects of the closure would cause traffic travelling between Abercrombie Street and Shepherd Street to reroute through the network. The effects of the possible network amendments have not been considered as part of this study.

Butlin Street Closure

A potential future change in the road network, proposed by Sydney University, would involve closing Butlin Street to vehicular traffic. This measure has not been approved by Council nor has it progressed beyond concept level plans. Council would need to undertake detailed consultation with stakeholders before this measure may be implemented – like any other major infrastructure project (e.g. cycleways). This road network modification would be the subject of a separate traffic and transport analysis, and therefore has not been considered in this study.

Abercrombie Street Precinct

The Department of Planning and Infrastructure has recently provided its recommendation for approval for the redevelopment of the Abercrombie Street precinct (MP07_0158). Arup provided traffic consultancy services as part of this major project application and concluded the following in relation to traffic generation:

There will be approximately 134 peak hour vehicle arrivals at the university campus. These staff and students are already elsewhere on-campus and so this traffic will not be additional to the existing traffic flows on the wider network. This analysis does not take into account traffic volume constraints related to the car parking provision, which would restrict vehicle numbers entering and exiting the site.

Therefore the potential redevelopment of the Abercrombie precinct will not add to existing traffic flows in the precinct and does not affect the analysis for this study.

Queen Street Median

As previously discussed, a potential median is currently under consideration on Wilson Street at the Queen Street entrance. The median will restrict right turn movements from Wilson Street onto Queen Street. As these works have not yet been approved, it has been agreed with Council to undertake modelling with the current road access without the Queen Street median. The potential redistribution of development traffic if the median is installed is considered in Section 5.2.

5.3.3 Performance Criteria

In urban areas, the performance of the major road network is generally a function of the performance of key intersections. This performance is quantified in terms of level of service (LOS), which is an index of the operational performance of traffic at an intersection and is based on the average delay per vehicle. LOS ranges from A = very good, to F = heavily congested travel conditions, as shown in Table 9 below.

Table 9: Level of Service Definitions

Description	Level of Service (RMS Definition)	Average Delay per Vehicle (s)	
Very Good	A	< 14.5	
Good	В	$14.5 \le 28.5$	
Satisfactory	С	$28.5 \le 42.5$	
Near Capacity	D	42.5 ≤ 56.5	
At Capacity	Е	56.5 ≤ 70.5	
Over Capacity	F	≥ 70.5	

(Source: RMS NSW Guide to Traffic Generating Developments)

A LOS of C or better is desirable at all major road intersections. However, in practice it is reasonable for some intersections to operate at LOS D during peak times. Another common measure of intersection performance is the degree of saturation (DOS), which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DOS of 1.0 indicates that an

Abercrombie Street

14

intersection is operating at capacity. The desirable maximum degree of saturation for an intersection with traffic signals is 0.9.

The full SIDRA analysis results for all intersections including AM and PM results are shown in Appendix B.

5.3.4 Abercrombie Street/Shepherd Street Intersection

The Abercrombie Street / Shepherd Street intersection is a signal controlled fourleg intersection. The signals operate under the three phase cycle, two traffic phases and a third all red pedestrian (scramble) phase. The SIDRA analysis indicates that the Abercrombie Street / Shepherd Street intersection currently reports a DOS of 0.66 and 0.70 in the AM and PM peaks respectively and reports a LOS of B in either peak. With consideration of the Stage 1 Development the DOS is expected to increase to 0.71 and 0.76 in the AM and PM peaks and remain at LOS B. The morning and evening peak hour results are shown in Table 10 with the full results attached in Appendix B.

	Scenario	DOS	LOS	Max Queue (veh)	Leg
AM Peak	Existing	0.66	В	14	Abercrombie Street West
	With Stage 1 Development	0.71	В	15	Abercrombie Street West
PM Peak	Existing	0.70	В	13	Abercrombie Street East
A.U.					

Table 10: Abercrombie Street/ Shepherd Street intersection analysis results

The analysis above indicates that the level of service through the intersection is maintained with the Stage 1 development traffic, with no works or upgrades required.

Abercrombie Street/ Lawson Street Intersection 5.3.5

0.76

With Stage 1

Development

The Abercrombie Street / Lawson Street intersection is a signal controlled threeleg intersection. A right turn filter is in operation for vehicles turning right from Abercrombie Street to Lawson Street. The SIDRA analysis indicates that the intersection currently reports a DOS of 0.70 and 0.81 in the morning and evening peaks respectively with a LOS of B in each peak. With consideration of the Stage 1 Development the DOS is expected to increase to 0.73 and 0.84 in the morning and evening peaks respectively. The intersection is expected to retain a LOS B with the introduction of the Stage 1 site. The morning and evening peak hour results are shown in Table 11 with the full results attached in Appendix B.

	Scenario	DOS	LOS	Max Queue (veh)	Leg
AM Peak	Existing	0.70	В	8	Abercrombie Street West
	With Stage 1 Development	0.73	В	9	Abercrombie Street West
PM Peak	Existing	0.81	В	9	Lawson Street
	With Stage 1 Development	0.84	В	9	Lawson Street

Table 11: Abercrombie Street/ Lawson Street intersection analysis results

The Abercrombie Street/ Lawson Street intersection is expected to experience minor changes in delays as a result of the expected development traffic, with the existing level of service retained following the introduction of the Stage 1 Development.

5.3.6 Summary

As a result of the intersection analysis, it is considered that the provision of up to 200 residential dwellings on the location of the North Eveleigh Stage 1 site is expected to have negligible effect on the surrounding road network. No infrastructure works are considered necessary to support the introduction of the future dwellings forming part of the Stage 1 site.

The expected traffic distribution indicates that 10 vehicles from the development may choose to travel along Queen Street in the peak hour if the right turn is not banned. At this stage of the development, this level of traffic increase is negligible.

5.4 Public Transport Provision

As discussed in Section 2.2 and 2.3, the proposed development location is within close proximity to a range of good public transport options. This is reflected in the existing strong public transport mode share for the site, well above the Sydney average.

In order to encourage a high use of public transport from the development, strong accessible links should be provided between the development and public transport nodes. These are discussed in further detail in Section 5.5 of this report.

Redfern Railway Station is proposed to undergo upgrades to facilitate access and connectivity, increased station capacity and improved links to multi-modal connections such as surrounding bus stops, pedestrian and cycle links.

5.5 Walking and Cycling Provision

A number of improvements are planned both internally within the site and externally on the road network to facilitate improved walking and cycling connections for future residents. These are summarised in Figure 14 and described in the sections below.

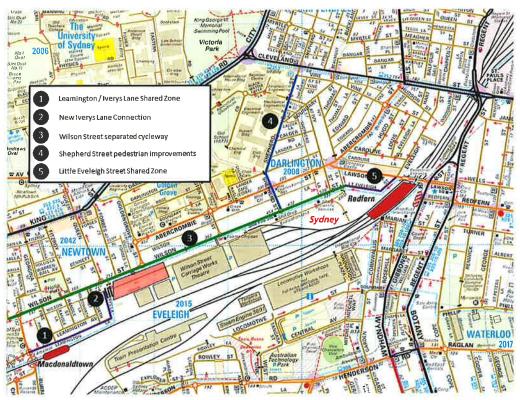


Figure 14: Future Pedestrian and Cycling Improvements

5.5.1 Wilson Street Cycleway

As part of the City of Sydney's cycleway program, a bi-directional separated bicycle facility is proposed to be implemented on the southern side of Wilson Street. This will provide high quality local and regional connections for residents of the Stage 1 site. Existing traffic counts in the area already indicate a significant number of cyclists utilise this corridor in peak hours, with this figure expected to grow following the introduction of this cycleway. Council is currently investigating an additional route which links the Wilson Street cycleway with Broadway via Shepherd Street. This is still at concept stage and further designs are currently taking place.

5.5.2 Access to Macdonaldtown Station

No formal pedestrian or cyclist access currently exists linking the Concept Plan site with Iverys Lane – providing the most direct path to Macdonaldtown Station. Access is obtained through a broken fence and stepping up a retaining wall. Pedestrian access will be improved through a proposed connection at the western end of the site, facilitating pedestrian movement to the station which is

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approximately 400m away. A new accessible access will be provided at the western end of the North Eveleigh site.

Existing City of Sydney Council Pedestrian Cycling & Traffic Calming (PCTC) Plans for the precinct indicate Council is currently investigating the implementation of shared zones west of the Concept Plan site (see Figure 15). Introduction of shared zones at these locations will improve the pedestrian environment in the area and encourage additional walking trips to Macdonaldtown station. Additional improvements are being provided by the UGDC as part of the infrastructure works to support affordable housing on the site. The infrastructure works include:

- The provision of stairs opposite Forbes Street
- The provision of an accessible access west of the site's vehicle access
- Improved pedestrian connection to Macdonaldtown Station

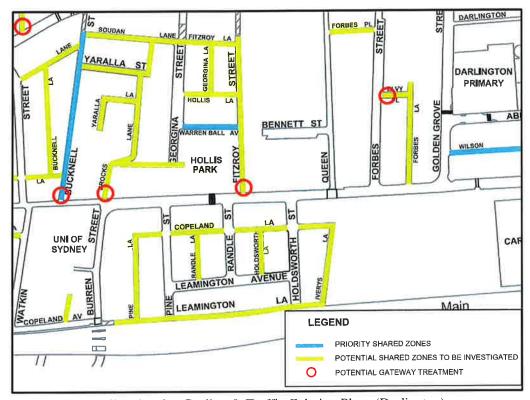


Figure 15: Council Pedestrian Cycling & Traffic Calming Plans (Darlington)

5.5.3 Access to Redfern Station

Redfern Station is approximately 800m away from the Stage 1 site (10 minute walk), with existing pedestrian connections provided that link Wilson Street and Little Eveleigh Street. City of Sydney Council has identified Little Eveleigh Street as a priority future shared zone (see Figure 16), with possible implementation in the next 3-4 years. This link will provide good walking access for pedestrians between Redfern Station and the Stage 1 site.

Improvements are currently being planned to Redfern Station. The improvements will provide for greater accessibility to the surrounding area and within Redfern Station.

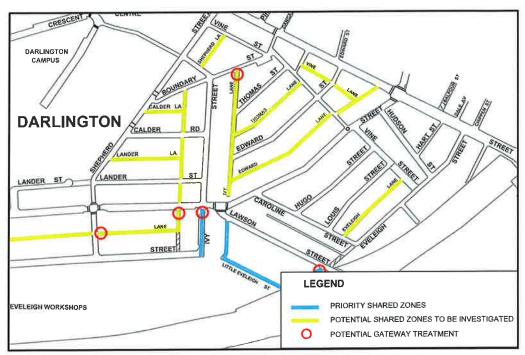


Figure 16: Council Pedestrian Cycling & Traffic Calming Plans (Redfern)

5.5.4 Other Pedestrian Improvement Works

Council in discussion with Sydney University are currently investigating opportunities for improvements in the pedestrian environment in the local area. It is understood that these works involve improvements to pedestrian amenities on Shepherd Street, Butlin Street and Little Eveleigh Street in order to cater for pedestrians from Redfern Station. These improvements may include local footpath widening and pedestrian amenities such as a priority shared zone on Little Eveleigh Street to relieve capacity on Lawson Street.

The University of Sydney has recently been granted planning approval for the Abercrombie Precinct Redevelopment Project. The project consists of new business school facilities within Darlington. A condition of the consent is the need to prepare a University Darlington Precinct Pedestrian and Bicycle Access Strategy and to provide pedestrian and bicycle access improvements with a minimum capital investment value of \$2 million.

5.5.5 On-Site Bicycle Parking

The proposed development should ensure appropriate levels of secure bicycle parking are provided to promote future growth in cycling levels and reduce the reliance on private vehicles. The bicycle parking should be provided in accordance with either Austroads Standards or those outlined in The NSW Planning Guidelines for Walking and Cycling, whichever is greater. The NSW Planning Guidelines for Walking and Cycling recommends the following bicycle parking rates for residential developments:

- 20% 30% of total dwellings (residents)
- 5% 10% of total dwellings (visitors)

On this basis between 50 and 80 bicycle parking spaces should be provided as part of the residential component of the proposed development. The site benefits from being located adjacent to a number of cycling routes, however without the proper bicycle parking provision much of this benefit will be lost.

5.6 Travel Demand Management Measures

5.6.1 Site Travel Plan

It is recommended that a site specific travel plan be prepared prior to the initial occupation of the residential component. A recommendation of this travel plan would be the development of a Transport Access Guide (TAG) to be distributed to residents prior to the occupancy of the building. A TAG provides site specific travel information using sustainable modes of transport – e.g. walking, cycling and public transport. The main objectives of the travel plan are to reduce the need to travel and promotion of sustainable means of transport. The more specific objectives include:

- To reduce the level of single occupancy car borne trips associated with commuting.
- To facilitate the sustainable and safe travel of visitors to the site.
- To reduce site traffic congestion and associated pollution in order to enhance, improve and make safe journeys of minority/sustainable transport mode users.
- To work in partnership with neighbouring organisations/developments, local authorities, retailers and other relevant bodies in achieving the maximum mode shift away from the private car.
- To facilitate all residents' access to key facilities such as retail, leisure, health and education
- To provide car share car parking to reduce the demand on private vehicles
- To provide a car parking provision below the maximum rate.

5.6.2 Monitoring and Improvement

As previously noted, the development of the Concept Plan site is to be staged over a number of years as land becomes available for development. It is important to recognise that the transport measures proposed in this report must support not only residents of the Stage 1 Development, but also future occupants of the Concept Plan site. Given that it may be a number of years before additional floor space is added to the site (above that proposed for the Stage 1 Development), enhancements to the proposed measures may be required.

It is therefore recommended further TMAPs are developed prior to the approval of any additional floor space for the site which considers the cumulative requirements of the site population. This includes a review of the provision of car parking in the area to ensure the maximum of 40% target for car use is maintained.

It is recommended that the Site Travel Plan be maintained for new residents. The purpose of the plan would be to inform and encourage residents to choose sustainable transport options available, such as walking, cycling and car sharing. The report would include relevant information packs for new residents with up to date public transport information and routes, cycling maps and walking and cycling catchments.

5.7 Construction Traffic

The construction of the development will require access for heavy vehicles travelling to and from the site. Prior to the commencement of construction, a Construction Traffic Management Plan (CTMP) is to be prepared to ensure the safest possible management of construction access. The CMTP would address:

- The likely construction vehicle numbers and frequency
- Approach and departure routes
- Parking access arrangements during construction
- Provision of acceptable pedestrian management measures

Construction vehicles would be restricted to collector and arterial roads, with movements along local residential streets such as Forbes Street and Queen Street prohibited. The construction route would be defined in accordance with City of Sydney requirements, which is understood to be via King Street and Golden Grove Street as outlined below in Figure 17.

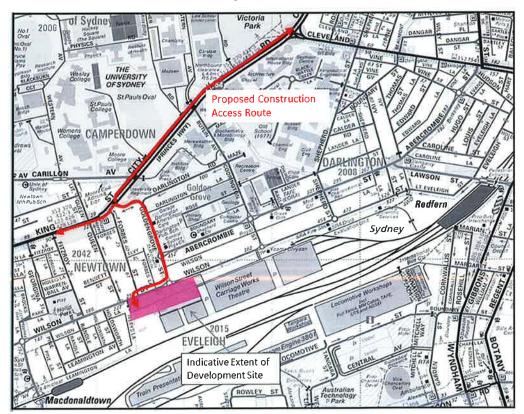


Figure 17: Proposed Construction Vehicle Access

6 Conclusions and Recommendations

This Transport Management and Accessibility Plan has been undertaken on behalf of UrbanGrowth NSW Development Corporation to understand and address the travel and transport planning requirements for the first stage of the North Eveleigh Concept Plan.

The Stage 1 Development provides for the introduction of up to 200 residential dwellings at the western end of the site. This is expected to result in a total of 48 vehicles travelling to and from the site in the morning and evening peak hours respectively. Intersection analysis forecasts these additional vehicle trips to have a minimal impact on the local road network, with no infrastructure upgrades necessary.

The site currently has good access to local pedestrian and cycling facilities. Further connections are being implemented by the City of Sydney with the roll out of cycleway connections across the entire LGA. These routes will facilitate regional cycle connections between the North Eveleigh site and key locations with the area.

Recent Census data indicates the Darlington suburb has a low private vehicle journey to work mode share, reflecting the good public transport, walking and cycling network surrounding the site. A number of improvements are planned which will facilitate improved walking and cycling connections for future residents and support the goal of achieving a maximum 40% private car use for the site. These include:

- improved pedestrian access to Wilson Street
- bi-directional separated bicycle facility on Wilson Street
- direct routes to Macdonaldtown Station
- the implementation of a shared zone on Little Eveleigh Street for improved access to Redfern Station

To support the transport requirements of the Concept Plan population, it is recommended that additional TMAPs be prepared prior to the approval of any additional floor space for the site (above that for the Stage 1 Development).

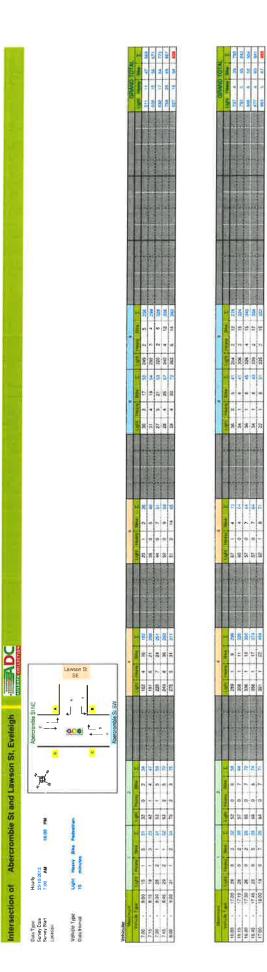
The future studies beyond Stage 1 should conduct a community consultation to understand community concerns and to develop solutions to local issues resulting from the development. Additional development beyond Stage 1 may require reassessment of the traffic controls at the Queen Street access.

It is recommended that the site is equipped with on-site bicycle parking and bicycle storage in accordance with appropriate guidelines. A Site Travel Plan and Transport Access Guide (TAG) including public transport maps is recommended to inform and encourage residents of the available transport options.

In summary, the proposed Stage 1 Development is considered to have a minimal impact on the local transport network.

Appendix A

Survey Data



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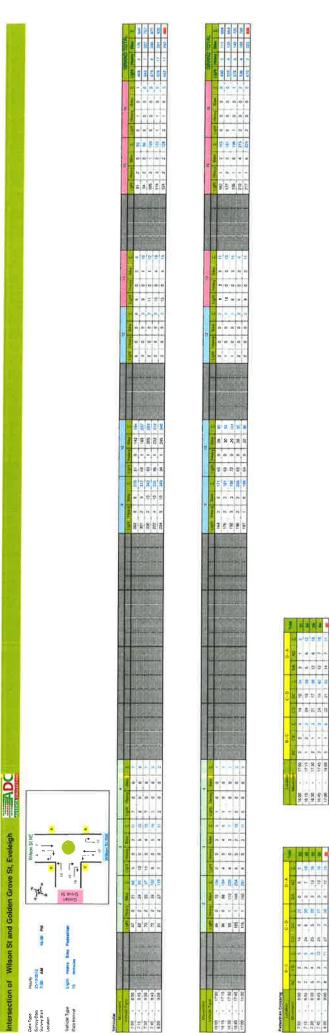


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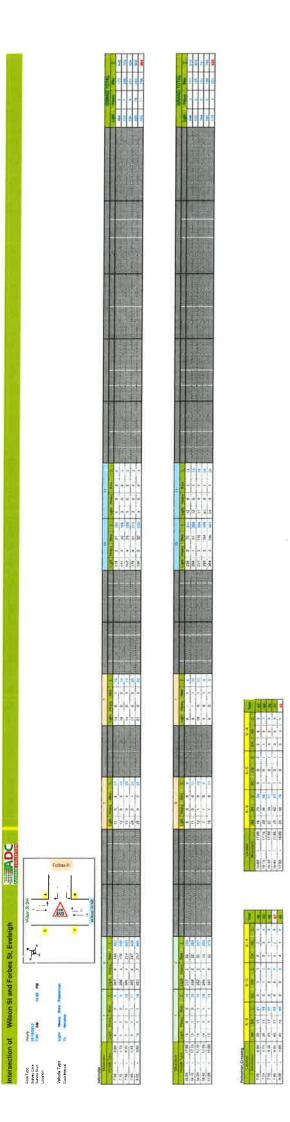
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Appendix B

Intersection Analysis Outputs

Abercrombie St and Sherpherd St

Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Movem	ent Perf	ormance - \	Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: S	Shepherd		70	- 110	000		1011			por voir	541177
1	L	7	0.0	0,457	42.3	LOS C	2.2	15.7	0.99	0.76	25.2
2	Т	32	0.0	0.457	35.9	LOS C	2.2	15.7	0.99	0.75	25.2
3	R	23	4.5	0.457	42.7	LOS D	2.2	15.7	0.99	0.76	25.1
Approac	:h	62	1.7	0.457	39.2	LOS C	2,2	15.7	0.99	0.75	25.2
East: Ab	ercrombie	St East									
4	L	9	0.0	0.564	25.0	LOS B	9,1	64.5	0.84	0.86	32,3
5	Т	293	2.2	0.564	18.6	LOS B	9.1	64.5	0.84	0.72	32.9
6	R	28	0.0	0.564	25.4	LOS B	9.1	64.5	0.84	0.88	32.3
Approac	h	331	1.9	0,564	19.4	LOS B	9.1	64,5	0.84	0.74	32.8
North: SI	hepherd S	St North									
7	L	25	0.0	0.556	43.0	LOS D	2,7	19.0	1.00	0.79	24.6
8	Т	12	0.0	0.556	36.6	LOS C	2.7	19.0	1.00	0.79	24.6
9	R	38	0.0	0.556	43.3	LOS D	2.7	19.0	1.00	0.79	24.6
Approacl	h	75	0.0	0.556	42.1	LOS C	2.7	19.0	1.00	0.79	24.6
West: Ab	ercrombi	e St West									
10	L	116	0.9	0.661	25.8	LOS B	13.5	96.3	0.88	0.87	31.8
11	Т	351	2.4	0.661	19.4	LOS B	13.5	96.3	0.88	0.77	32.2
12	R	6	0.0	0.661	26.1	LOS B	13.5	96.3	0.88	0.88	31.8
Approacl	h	473	2.0	0.661	21.1	LOS B	13.5	96.3	0.88	0.80	32.1
All Vehic	les	940	1.8	0.661	23.3	LOS B	13.5	96.3	0.88	0.77	31.0

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

2020	Control of the second	Demand	Average	Level of	Average Back	of Queue	Prop.	Effective
Mov ID	Description	Flow ped/h	Delay sec	Service	Pedestrian ped	Distance m	Queued	Stop Rate per ped
P1	Across S approach	405	27.5	LOS C	0.7	0.7	0.89	0.89
P3	Across E approach	392	22.4	LOS C	0.6	0.6	0.80	0.80
P5	Across N approach	843	22.4	LOS C	1.3	1.3	0.80	0.80
P7	Across W approach	371	22.4	LOS C	0.6	0.6	0.80	0.80
All Pede	estrians	2011	23.4	LOS C			0.82	0.82

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

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Abercrombie St and Sherpherd St

Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

		Demand	THE WASH	Deg.	Average	Level of	95% Back of	of Queue	Ргор.	Effective	Average
Mov ID	Turn	Flow	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/l
South: S	Shepherd	St South									
1	L	4	0.0	0.242	38.8	LOS C	1.5	10.3	0.95	0.74	26.4
2	Т	27	0.0	0.242	32.4	LOS C	1.5	10.3	0.95	0.70	26.
3	R	13	0.0	0.242	39.2	LOS C	1.5	10.3	0.95	0.75	26.3
Approac	:h	44	0.0	0.242	35.0	LOS C	1.5	10.3	0.95	0.72	26.4
East: Ab	ercrombi	ie St East									
4	L	24	0.0	0.700	28.5	LOS C	12.6	88.5	0.92	0.90	30.
5	Т	353	0.3	0.700	22.1	LOS B	12.6	88.5	0.92	0.83	31.0
6	R	33	0.0	0.700	28.9	LOS C	12.6	88.5	0.92	0.91	30.
Approac	h	409	0.3	0.700	23.1	LOS B	12.6	88.5	0.92	0.84	30.9
North: S	hepherd	St North									
7	L	20	0.0	0.688	42.4	LOS C	4.5	31.8	1.00	0.87	24.9
8	Т	34	0.0	0.688	36.0	LOS C	4.5	31.8	1.00	0.87	24.9
9	R	71	0.0	0.688	42.7	LOS D	4.5	31.8	1.00	0.87	24.9
Approac	h	124	0.0	0.688	40.8	LOS C	4.5	31.8	1,00	0.87	24.9
Nest: Ab	ercromb	ie St West									
10	L	65	0.0	0.561	26.2	LOS B	10.6	74.6	0.86	0.86	31.7
11	Т	313	0.7	0.561	19.8	LOS B	10.6	74.6	0.86	0.74	32.2
12	R	2	0.0	0.561	26.5	LOS B	10.6	74.6	0.86	0.87	31.7
Approacl	h	380	0.6	0.561	20.9	LOS B	10.6	74.6	0.86	0,76	32.
All Vehic	lec	958	0.3	0.700	25.1	LOS B	12.6	88.5	0.90	0.80	30.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Moven	nent Performance	- Pedestrian:	S					
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back Pedestrian ped	of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	504	27.5	LOS C	0.9	0.9	0.89	0.89
P3	Across E approach	1001	22.4	LOS C	1.6	1,6	0.80	0.80
P5	Across N approach	231	22.4	LOS C	0.4	0.4	0.80	0.80
P7	Across W approach	180	22.4	LOS C	0.3	0.3	0.80	0.80
All Ped	estrians	1916	23.7	LOS C			0.82	0.82

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

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Abercrombie St and Sherpherd St

Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Mary ID	¥.	Demand	LAV	Deg.	Average	Level of	95% Back	with the latest terms of t	Prop.	Effective	Average
Mov ID	Turn	Flow veh/h	HV %	Satn v/c	Delay sec	Service	Vehicles veh	Distance m	Queued	Stop Rate per veh	Speed km/ł
South: S	hepherd		70	V/C	300		73.11			ps/ 1011	Mile
1	Ĺ	7	0.0	0.457	42.3	LOS C	2.2	15.7	0.99	0.76	25.2
2	Т	32	0.0	0.457	35.9	LOS C	2.2	15.7	0.99	0.75	25.2
3	R	23	4.5	0.457	42.7	LOS D	2.2	15.7	0.99	0.76	25.
Approac	h	62	1.7	0.457	39.2	LOS C	2.2	15.7	0.99	0.75	25.2
East: Ab	ercrombie	St East									
4	L	9	0.0	0.578	25.2	LOS B	9.1	65.1	0.84	0.86	32.3
5	Т	293	2.2	0.578	18.7	LOS B	9.1	65.1	0.84	0.73	32.8
6	R	28	0.0	0.578	25.5	LOS B	9.1	65.1	0.84	0.88	32.
Approac	h	331	1.9	0.578	19.5	LOS B	9.1	65.1	0.84	0.74	32.
North: Si	hepherd \$	St North									
7	L	25	0.0	0.556	43.0	LOS D	2.7	19.0	1.00	0.79	24.6
8	Т	12	0.0	0.556	36.6	LOS C	2.7	19.0	1.00	0.79	24.6
9	R	38	0.0	0.556	43.3	LOS D	2.7	19.0	1.00	0.79	24.6
Approac	h	75	0.0	0.556	42.1	LOS C	2.7	19.0	1.00	0.79	24.6
Vest: Ab	ercrombi	e St West									
10	L	142	0.7	0.709	26.9	LOS B	15.1	107.7	0,90	0.89	31.2
11	Т	358	2.4	0.709	20.5	LOS B	15.1	107.7	0.90	0.81	31.6
12	R	6	0.0	0.709	27.2	LOS B	15.1	107.7	0.90	0.90	31.2
Approacl	h	506	1.9	0.709	22.4	LOS B	15.1	107.7	0.90	0.83	31,
All Vehic	les	974	1.7	0.709	24.0	LOS B	15.1	107.7	0.90	0.79	30.7

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Moven	Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back Pedestrian ped	of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	Across S approach	405	27.5	LOS C	0.7	0.7	0.89	0.89	
P3	Across E approach	392	22.4	LOS C	0.6	0.6	0.80	0.80	
P5	Across N approach	843	22.4	LOS C	1.3	1.3	0.80	0.80	
P7	Across W approach	371	22.4	LOS C	0.6	0.6	0.80	0.80	
All Pede	estrians	2011	23.4	LOS C			0.82	0.82	

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

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Abercrombie St and Sherpherd St

Signals - Fixed Time Cycle Time = 70 seconds (Practical Cycle Time)

Mov ID	Turn	Demand	HV	Deg.	Average	Level of	95% Back		Prop.	Effective	Average
טו ייטועו	Tulli	Flow veh/h	%	Satn v/c	Delay sec	Service	Vehicles veh	Distance m	Queued	Stop Rate per veh	Speed km/h
South: S	hepherd	St South	70	VIC	300		1011			por von	10000
1	L	4	0.0	0.216	37.6	LOS C	1.4	10.0	0,93	0.75	26.8
2	Т	27	0.0	0.216	31.2	LOS C	1.4	10,0	0.93	0.70	27.0
3	R	13	0.0	0.216	37.9	LOS C	1.4	10.0	0.93	0.75	26.8
Арргоас	h	44	0.0	0,216	33.7	LOS C	1.4	10.0	0.93	0.72	26.9
East: Ab	ercrombi	e St East									
4	L	24	0.0	0.743	30.9	LOS C	13.6	95.7	0.94	0.93	29.7
5	Т	360	0.3	0.743	24.5	LOS B	13.6	95.7	0.94	0.88	29.9
6	R	33	0.0	0.743	31.2	LOS C	13.6	95.7	0.94	0.94	29.7
Approacl	h	417	0.3	0.743	25.4	LOS B	13.6	95.7	0.94	0.89	29.9
North: SI	hepherd :	St North									
7	L	20	0.0	0.755	43.1	LOS D	5.6	39.4	1.00	0.93	24.6
8	T	34	0.0	0.755	36.6	LOS C	5.6	39.4	1.00	0.93	24.6
9	R	97	0.0	0.755	43.4	LOS D	5.6	39.4	1.00	0.93	24.6
Approacl	h	151	0.0	0.755	41.8	LOS C	5.6	39.4	1.00	0.93	24.6
West: Ab	ercrombi	e St West									
10	L	65	0.0	0.585	27.1	LOS B	10.9	76.4	0.88	0.86	31.3
11	Т	313	0.7	0.585	20.7	LOS B	10.9	76.4	0.88	0.75	31.7
12	R	2	0.0	0.585	27.5	LOS B	10.9	76.4	0.88	0.87	31.2
Approach	n	380	0.6	0.585	21.9	LOS B	10.9	76.4	0.88	0.77	31.6
All Vehic	les	992	0.3	0.755	26.9	LOS B	13.6	95.7	0.92	0.84	29.4

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back Pedestrian ped	of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	504	27.5	LOS C	0.9	0.9	0.89	0.89
P3	Across E approach	1001	22.4	LOS C	1.6	1,6	0.80	0.80
P5	Across N approach	231	22.4	LOS C	0.4	0,4	0.80	0.80
P7	Across W approach	180	22.4	LOS C	0.3	0.3	0.80	0.80
All Pede	estrians	1916	23.7	LOSC			0.82	0.82

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

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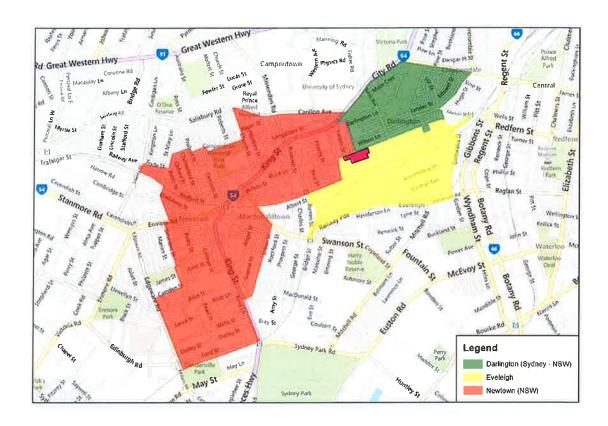


Site: With Dev - PM

Appendix C

Travel Pattern Comparison

1.1 Area Demographics Comparison



Statistical Area	Eveleigh	Newtown	Darlington	
Population	473	14,148	2,243	
Number of Families	116	3,023	360	
Number of Dwellings	209	7,115	934	
Dwelling Occupancy	2.4	2.1	2.3	
Median Age	30	32	28	
Children per Family	1.6	1.5	1.4	

1.2 Travel Patterns

1.2.1 Mode Share

Table 1: Existing Mode Share

Mode	Percentage Split*							
	Eveleigh	Newtown	Darlington	Greater Sydney Average				
Car, as driver	32%	23%	18%	54%				
Car, as passenger	2%	3%	1%	5%				
Train	24%	24%	23%	9%				
Walked only	11%	13%	22%	4%				
Bicycle	6%	5%	6%	1%				
Bus	4%	12%	5%	5%				
Other	22%	20%	25%	22%				
Total	100%	100%	100%	100%				

^{*} Numbers may not add to 100% due to decimal place rounding

Other: Worked from home, did not go to work, motorbike, etc

Source: 2011 Census QuickStats (Australian Bureau of Statistics, 2012)

1.2.2 Car Ownership Comparison

