



Dulwich Hill North Local Area Traffic Management

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Client // Marrickville Council
Office // NSW
Reference // 15S1012000
Date // 01/04/16

Dulwich Hill North

Local Area Traffic Management

Issue: A-Dr4 01/04/16

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Executive Summary

Marrickville Council commissioned GTA Consultants to prepare a Local Area Traffic Management plan for Dulwich Hill North. Dulwich Hill is located approximately seven kilometres southwest of the Sydney Central Business District.

Existing Traffic Assessment

The key traffic and transport issues identified from the existing conditions assessment and feedback provided by the community/ stakeholders include:

Traffic Volumes

- Constitution Road – carries between 3,100 and 4,300 vehicles per day (vpd), which is above the desirable capacity of a Collector Road (3,000vpd), however below the maximum limit (5,000vpd).
- Denison Road – carries approximately 2,500 vpd, which is below the desirable capacity of a Collector Road (3,000vpd). However, during the AM peak hour (8:00am to 9:00am) the traffic volumes are above the maximum peak hour limit (500vph).

Traffic Speed

- The 85th percentile speeds recorded on the following roads marginally exceed the 50km/h speed limit (i.e. by less than 3km/h):
 - Arlington Street
 - Dixon Avenue
 - Dulwich Street
 - Elizabeth Avenue
 - Gelding Street.

Crashes

- There were 19 crashes on the local road network in the study area identified in Section 4.3. Most of the crashes involved a vehicle leaving their travel path on either a straight road (7 crashes) or curve/ turning (3). Two of these crashes occurred on each of Constitution Road, Denison Road and Dulwich Road.

Future Traffic Conditions

The future traffic conditions resulting from anticipated development in the study area was determined based on future land use targets set out in the 'Marrickville Section 94/94A Contributions Plan 2014' prepared by Council.

Major transport infrastructure projects, such as the WestConnex and Sydney Metro projects and resulting Urban Renewal Corridor studies that would influence the broader future traffic conditions, were not considered in detail as part of the study.

The key findings from the future conditions assessment include:

- There are expected to be three development precincts in Dulwich Hill North, generating in the order of 600 residential dwellings and 5,200sq.m of commercial and retail floor area.
- These development precincts are estimated to generated approximately 4,400 additional daily vehicle movements.

- Approximately 1,150 vehicle movements are expected to occur within the study area, given two precincts are located on the perimeter of the study area.
- The future daily traffic volumes resulting from the additional vehicle movements would remain within the desirable environmental limits along all affected roads, with the exception of Constitution Road. The volumes on Constitution Road would be within 10% of the maximum limit.

Identified LATM Measures

Existing LATM Conditions

A review was completed of all LATM devices in the Dulwich Hill North study area to understand the maintenance requirements for each device. As part of Council's maintenance works, it is recommended that all faded, damaged or missing traffic and parking signs and linemarking be replaced/ repainted within the study area.

Suggested LATM Options

The suggested LATM measures for the study area include several options for key streets in the area. The rationale behind the suggested measures, as well as any secondary implications have been outlined.

The study identified local residential streets that fulfil a collector road function for Dulwich Hill North. The suggested LATM options for these roads are set out in Table E1, with the intention of incorporating the following additional treatments on all key roads:

- Visual road narrowing through the provision of 2.1 metre wide marked parking lanes
- On-road bicycle symbols to create mixed traffic conditions for cyclists and vehicles.

Table E1: LATM Treatment Summary – Key Roads

ID. No.	Location	Suggested Measure	Other Benefits (L / M / H)	Priority (S / L)
1.1	Constitution Road	'No Right Turn' from Old Canterbury Road	L	S
1.2		Rumble bars along centreline between Williams Parade and Denison Road	L	S
1.3		Entry threshold treatment at Old Canterbury Road	M	S
1.4		Reconstruct existing devices	M	S
2.1	Denison Road	'No Left Turn' from New Canterbury Road	L	S
2.2		Improve roundabout splitter islands at Constitution Road and Eltham Street	L	S
2.3		Reconstruct existing devices	M	S
2.4		Change intersection priority at Dulwich Street and Pigott Street intersections	M	S
2.5		Four-way intersection treatment at Pigott Street	M	S
2.6		T-intersection treatment at Dulwich Street	M	S
2.7		Mid-section closure/ discontinuity of road	H	L
3.1	Union Street/ Windsor Road	Entry threshold treatment at Old Canterbury Road and New Canterbury Road intersections	M	S
3.2		Reconstruct existing devices	M	S
3.2		Change intersection at Abergeldie Street and Terry Road intersections	M	S
3.4		T-intersection treatment at Abergeldie Street, Hampstead Road and Terry Road intersections	M	S

For all other roads in the study area, the suggested LATM measures identified are set out in Table E2.

Table E2: LATM Treatment Summary – Other Roads

ID. No.	Suggested Measure	Location	Other Benefits (L / M / H)	Priority (S / M / L)
4.0	Fixed radar speed display	Constitution Road between Grove Street and Denison Road (and potentially other future temporary locations)	L	S
5.0	No Stopping linemarking	Denison Road/ Davis Street intersection	L	S
6.0	'No Left Turn' restriction (AM peak period)	New Canterbury Road at Dulwich Street	L	S
7.0	Pedestrian refuge island	Windsor Road at Davis Street (both legs of intersection)	L	S
8.1	Pedestrian refuge island + kerb extensions	Constitution Road at Williams Parade (south leg of roundabout)	M	S
8.2		Williams Parade at Constitution Road	M	S
9.1	Kerb extensions	Davis Street at Windsor Road	M	S
9.2		Weston Street at Windsor Road	M	S
10.1	Linemark 2.1 metre wide parking lanes	Arlington Street	L	S
10.2		Davis Street	L	S
10.3		Dulwich Street	L	S
11.1	On-road bicycle symbols	Arlington Street	L	S
11.2		Davis Street	L	S
11.3		Dulwich Street	L	S
12.0	Entry threshold treatment	Dixon Avenue at Old Canterbury Road	M	S
13.1	New mid-block device	Abergeldie Street	L	S
13.2		Arlington Street	L	S
13.3		Dixon Avenue	L	S
13.4		Elizabeth Street	L	S
13.5		Gelding Street	L	S
13.6		Hampstead Road	L	S
14.1	Four-way intersection treatment	Arlington Street intersection with Abergeldie Street and Dixon Avenue intersection	M	S
15.1	Modified T-intersections	Gelding Street/ Maddock Street intersection	M	S
15.2		Hampstead Road/ Gelding Street intersection	M	S
16.0	Left-in/ Left-out via central median	Lewisham Street at Denison Road	H	L
17.0	One-way northbound road section	Lewisham Street between The Boulevard and New Canterbury Road	H	L

An overview of the suggested LATM measures are shown graphically in the figure on the following page.

Legend

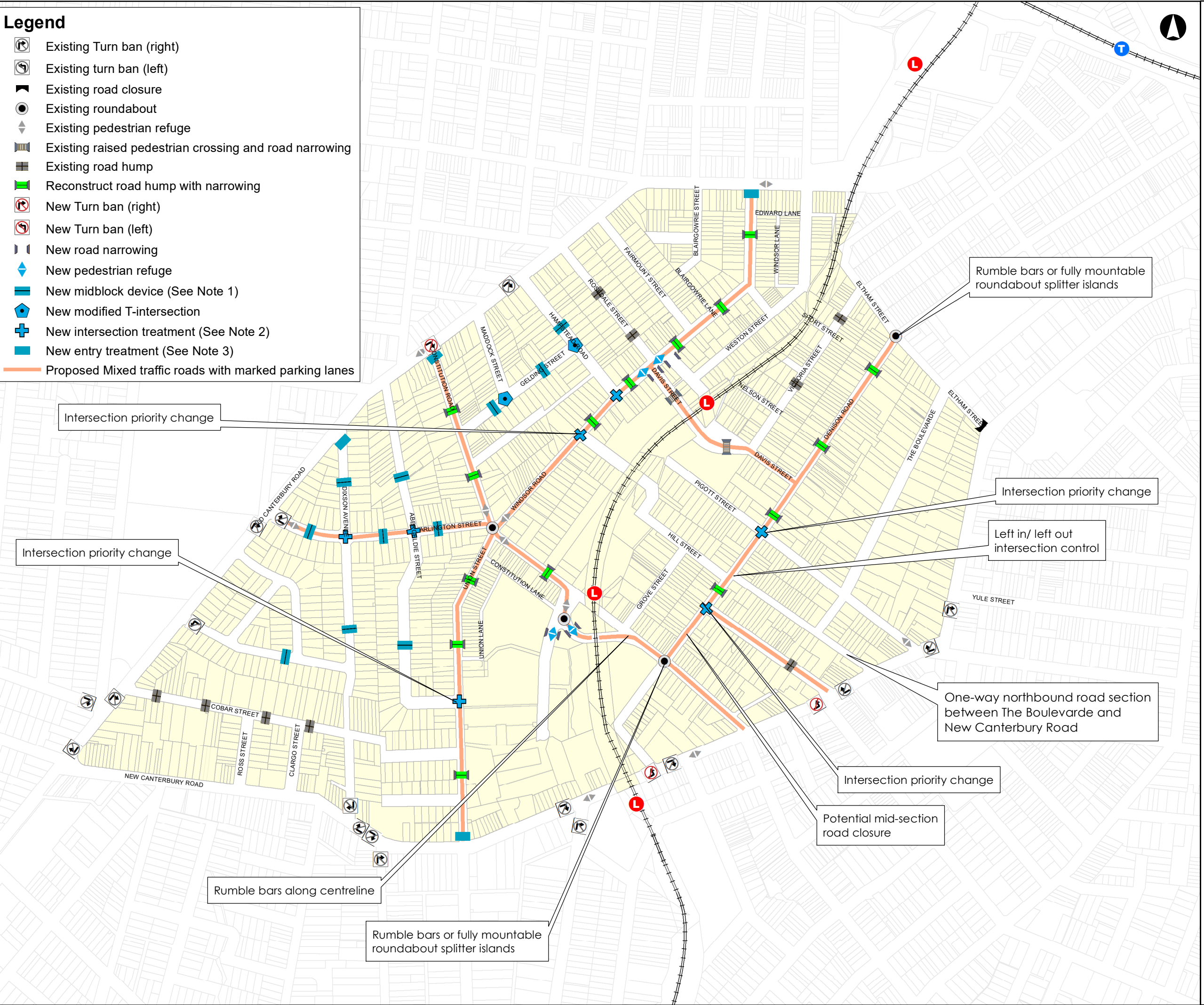
- Existing Turn ban (right)
- Existing turn ban (left)
- Existing road closure
- Existing roundabout
- Existing pedestrian refuge
- Existing raised pedestrian crossing and road narrowing
- Existing road hump
- Reconstruct road hump with narrowing
- New Turn ban (right)
- New Turn ban (left)
- New road narrowing
- New pedestrian refuge
- New midblock device (See Note 1)
- New modified T-intersection
- New intersection treatment (See Note 2)
- New entry treatment (See Note 3)
- Proposed Mixed traffic roads with marked parking lanes

NOTES

- (1) Midblock device:
- Raised and/ or narrowed
- Two-way, two lane or single-lane slow point
- (2) Intersection treatment:
- Modified T-intersection and/ or kerb extensions
- Raised pavement and/ or kerb extensions at four-way intersection
- (3) Entry treatment:
- Kerb extension and/ or tactile surface

It is suggested either midblock or intersection or combination of both treatments be implemented along a street.

There is opportunity to remove existing road humps if a new intersection treatment is preferred nearby.



P3	31-03-16	ADM	BDM	BDM
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Issue	Date	By	Chkd	Appd
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Client

Marrickville Council

Job Title

Dulwich Hill North
Local Area Traffic Management
Study

Drawing Title

Suggested LATM Options

Scale at A3

1:6,000

Drawing Status

Preliminary

Job No	Drawing No	Issue
15S1012000	Appendix D	P3

Trial LATM Treatment Opportunities

There is a general support for trialling of LATM measures, given there will be additional planning, thus time required, before some LATM measures (particularly those with any significant infrastructure works) are approved and implemented. As such, it is suggested that a trial plan/ program be considered that enables early temporary installation of specific LATM measures to investigate their effectiveness, thus confirm the suitability of a permanent installation.

It is noted that the trialling of measures would still need to go through Traffic Committee; and where an arterial road is affected, RMS be consulted. Upon approval of a trial, the community in the affected area would need to be notified and advance warning signs installed prior to the trial to inform drivers of the imminent road condition changes.

As such, in the first instance, the following LATM measures are suggested for inclusion in the trial plan/ program:

- o Fixed radar speed display on Constitution Road between Grove Street and Denison Road for eastbound traffic
- o Right-turn ban restriction from Old Canterbury Road into Constitution Road
- o Left-turn ban restriction from New Canterbury Road into Denison Road and/ or Dulwich Street
- o Single-lane slow points on Denison Road and Windsor Road at selected flat top road humps (using water filled barriers), with 'give-way' control for northbound traffic.

It is suggested that the trials be implemented for a minimum of one month to observe the benefits and implications once traffic conditions settle around the temporary measure.

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1. Introduction

1.1 Background

Councils future vision for the municipality is set out in the "Marrickville Community Strategic Plan (CSP) – Our Place Our Vision 2023" document. The key transport objectives of the vision are reproduced below:

- o Marrickville's roads are safer and less congested
- o Marrickville's streets, lanes and public spaces are sustainable, welcoming, accessible and clean
- o The community walks, ride bikes and use public transport.

Key to delivering the above transport objectives is the development of robust Parking Management and Local Area Traffic Management (LATM) plans. A LATM plan has been previously prepared for the Dulwich Hill South area, whilst a Parking Management study for Dulwich Hill is being prepared concurrently with this study.

Marrickville Council commissioned GTA Consultants to prepare a Local Area Traffic Management plan for Dulwich Hill North.

1.2 Objectives of this Study

The objective of the Precinct LATM plan has been sourced from the study brief prepared by Marrickville Council and is reproduced below:

"Investigate and review the performance of the existing Local Area Traffic Management (LATM) schemes and recommend proposed LATM works."

It is intended that once complete, this LATM plan will feed into the Connecting Marrickville initiative. The Connecting Marrickville Initiative seeks to efficiently deliver Council infrastructure through a collaborative approach.

1.3 Purpose of this Report

This report sets out an assessment of the transport conditions in Dulwich Hill North and includes the following:

- o Collation of all existing information and collection of traffic data for the study area, as well as preliminary consultation with stakeholders and community.
- o Determination of existing traffic conditions and compliance with environmental capacity and speed performance standards.
- o Estimation of future traffic conditions based on anticipated land use growth areas.
- o Identification of further opportunities to reduce volumes and speed of traffic on local roads.
- o Identification of pedestrian and cyclist improvements.
- o Development of concept LATM proposals.

1.4 Reference Documents

In preparing this report, reference has been made to the following:

- o A number of inspections of the study area
- o Marrickville LEP 2011 (15 August 2014)
- o Guide to Traffic Generating Developments, Roads and Maritime Services, 2002
- o Technical Directions (Various), Roads and Maritime Services
- o Imagining Marrickville Community Survey and raw data, Micromex Research
- o traffic surveys undertaken by Austraffic as referenced in the context of this report
- o traffic data provided by Marrickville Council as referenced in the context of this report
- o other documents and data as referenced in this report.

2. Previous Dulwich Hill North LATM Review

In 2002, Marrickville Council undertook a review of the then existing LATM scheme in Dulwich Hill North. Community concerns were investigated as well as feedback sought on a range of proposals. Proposals that gained high level of community support were subsequently implemented.

The devices proposed in addition to the existing LATM scheme are presented below with the installation status in brackets:

- o *two midblock thresholds in Constitution Road, between Windsor Road and Williams Parade (one implemented)*
- o *a roundabout at the intersection of Arlington Street and Dixon Avenue(not implemented)*
- o *four midblock thresholds in Cobar Street, between Old Canterbury Road and Kroombit Street (implemented)*
- o *a kerb extension in Constitution Road at its junction with Grove Street (implemented)*
- o *closure of the existing "slip lane" in Dulwich Street at its junction with New Canterbury Road (implemented)*
- o *a pedestrian refuge island in Pigott Street at its junction with New Canterbury Road (implemented)*
- o *a midblock threshold in The Boulevarde, adjacent to Lewisham Christian Brothers High School (not implemented)*
- o *two midblock thresholds in Dulwich Street, between Denison Road and New Canterbury Road (one implemented)*
- o *two block threshold in Denison Road (not implemented).*

It is understood that the devices that have not been implemented were generally as a result of them not being sufficiently supported by the local community.

Other community concerns that were submitted to the Local Traffic Planning and Advisory Committee around the time of the LATM review and subsequently investigated included:

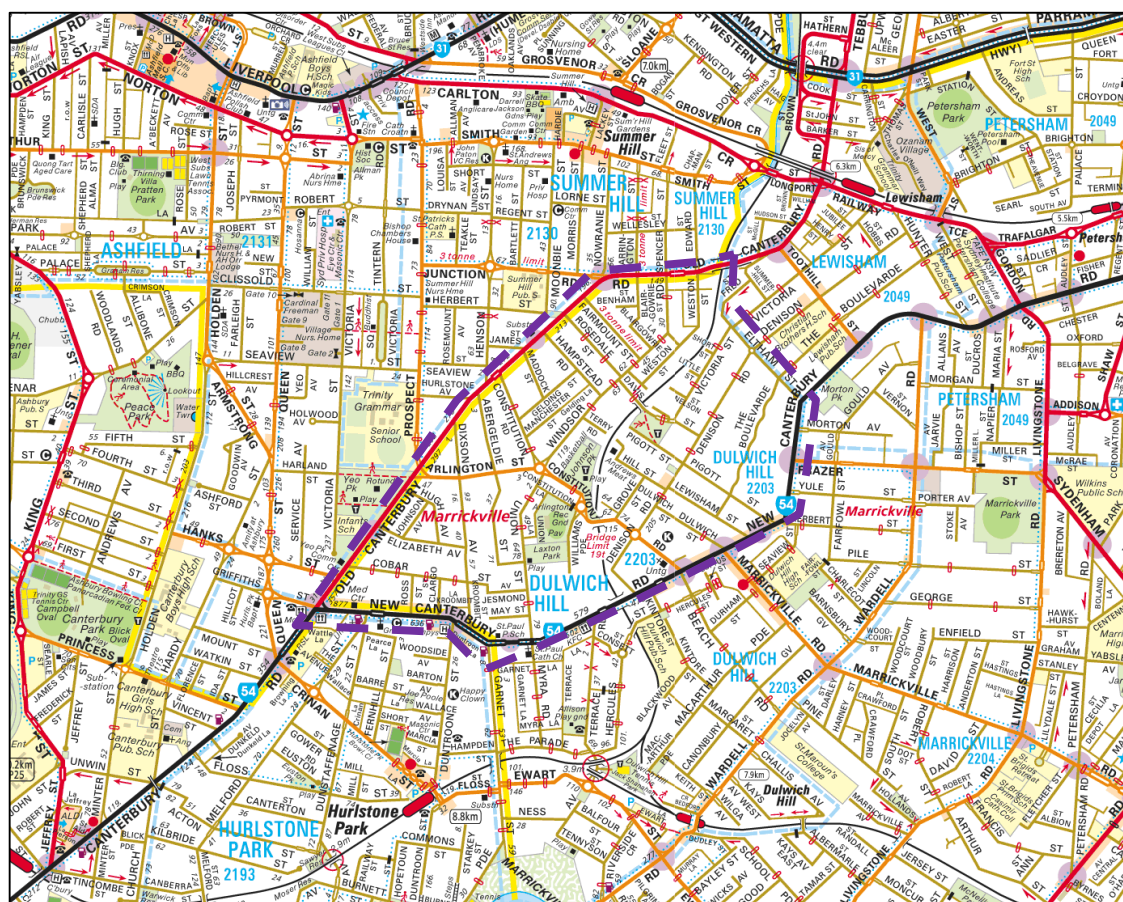
- o Traffic volume and speeds along Kroombit Street and Dixon Avenue. In 2004, traffic volumes were found to have reduced from a previous year (1996) and vehicle speed maintained. The Council officer's recommendation was that no further action was required and that vehicle speeds be monitored by Police.
- o Installation of a median island at the bend in Denison Road, as well as a raised mid-block threshold, between New Canterbury Road and Constitution Road. In 2003, the Council officer's recommendation was for the devices to be advertised for public comment. An inspection of the area indicates that as of 2015, the recommendations had not been implemented.

3. Transport Network and Characteristics

3.1 Study Area

Dulwich Hill is located approximately seven kilometres southwest of the Sydney Central Business District. The extent of Dulwich Hill is shown in Figure 3.1. The study area is located on the north side of New Canterbury Road, which runs in an east-west direction.

Figure 3.1: Dulwich Hill North



Basemap source: Sydways 2010

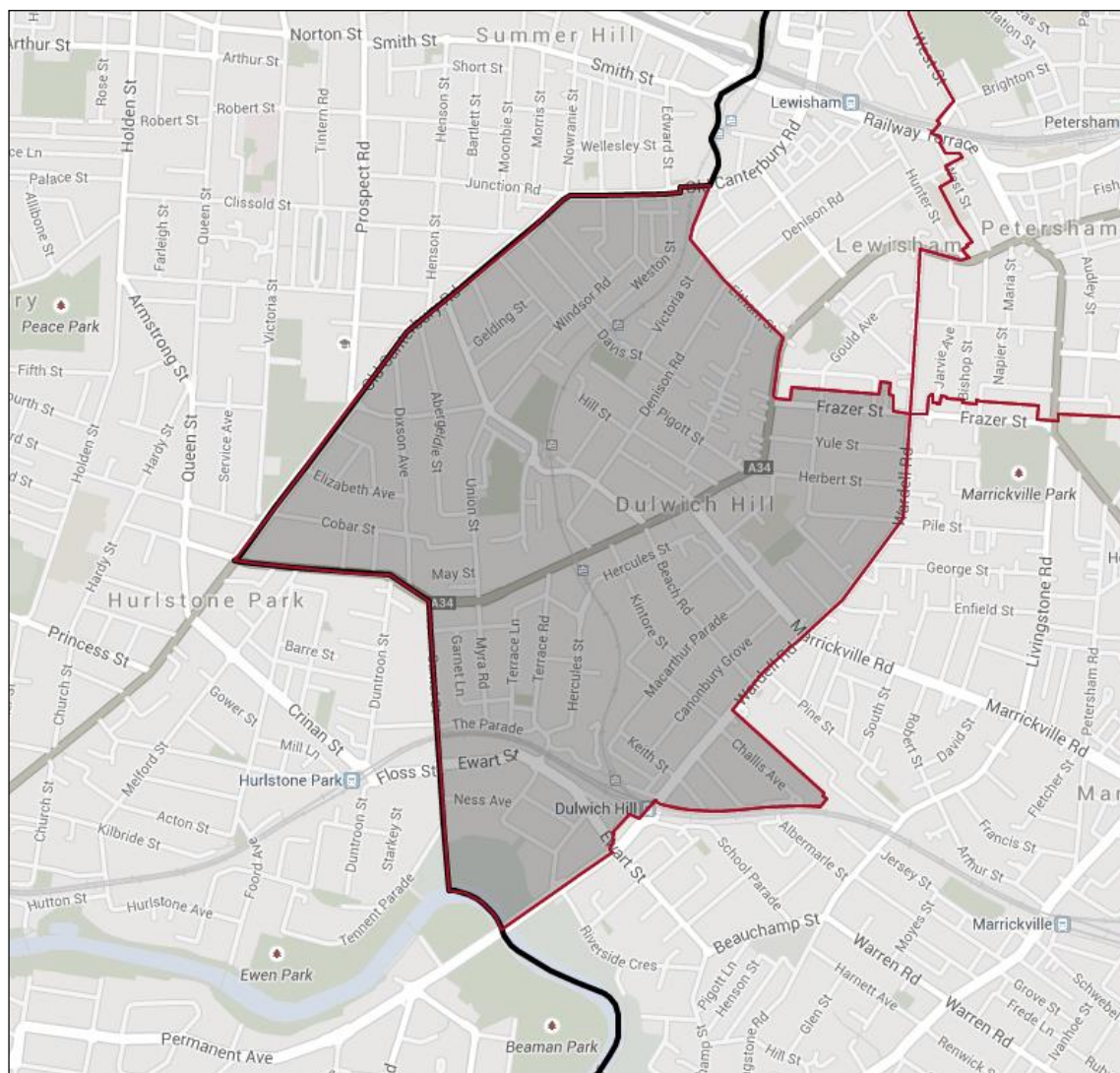
3.2 Demographic and Travel Demand

The 2011 Census from the Australian Bureau of Statistics (ABS) was reviewed in this section to understand the travel demand characteristics of Dulwich Hill.

3.2.1 Population

Dulwich Hill has a population of approximately 13,500 people. It spans across 208 hectares, resulting in a population density of approximately 65 people per hectare. The Dulwich Hill boundary for the 2011 Census is presented in Figure 3.2.

Figure 3.2: Dulwich Hill State Suburb Boundary in the 2011 Census by the ABS



Source: <http://profile.id.com.au/> accessed January 2015

3.2.2 Journey to Work

Journey-to-Work data¹ for Dulwich Hill gathered from the 2011 Census and presented in Table 3.1 indicates that 45.5% of commuter trips from Dulwich Hill are by private vehicles, either as a driver or passenger, and 23.6% are by train. In comparison to 2006 Census, private vehicle commuter trips reduced by 4.0% and train commuter trips increased by 3.7%. Commuter trips by bus remained at similar levels (10.3% in 2011).

There was an increase of 1.5% between 2006 and 2011 for commuter trips by bicycle to 2.6%, which represents a 236% increase over 5 years. Commuter trips by walking reduced by 1.1% in the same period (noting potential anomalies and influences associated with a single sample day for each year, including weather conditions).

¹ 6,969 and 6,146 persons employed in Dulwich Hill in 2011 and 2006 respectively.

It is expected that the opening of the Inner West Light Rail extension in 2014, that links Dulwich Hill to Sydney CBD via Pyrmont will have some impact on journey to work patterns for Dulwich Hill and the Inner West region.

Table 3.1: Journey to Work Mode Share from Dulwich Hill

Main method of travel	Dulwich Hill 2011	Dulwich Hill 2006
Car - as driver	42.1%	45.1%
Train	23.6%	19.9%
Bus	10.3%	10.5%
Did not go to work	8.6%	8.8%
Car - as passenger	3.4%	4.4%
Worked at home	3.3%	2.8%
Bicycle	2.6%	1.1%
Walked only	2.3%	3.4%
Motorbike	1.2%	0.6%
Other	1.1%	1.8%
Not stated	1.5%	1.6%

Source: <http://profile.id.com.au/> accessed January 2015

The 2011 Census also indicates that 40% of employed residents within Dulwich Hill work in the Sydney CBD; 12% in Strathfield-Burwood-Ashfield; and 6% in Marrickville-Sydenham-Petersham.

As such, private vehicle travel from Dulwich Hill is used for almost half of all work trips, in both 2006 and 2011. As outline in subsequent sections, Dulwich Hill residents have a broad range of alternative transport options available to them. As such, a focus on providing walking and cycling friendly neighbourhoods as part of any street treatments would be beneficial to improve the mode share of public and active travel.

3.3 Road Hierarchy

The *Road Design Guide* (RMS, 1996) states that the purpose of a functional road hierarchy is to establish a logical integrated network in which roads of similar functional classifications are:

- o provided with the same general level of traffic service with regards to trip purpose, traffic composition, capacity and operational speed
- o designed, constructed and maintained to the same general level of structure with regard to alignment, cross section, pavement strength and access control
- o assigned to the appropriate administrative control.

This classification includes arterial, sub-arterial, collector and local roads. Together the roads make up a road network. The administrative/ functional road classifications in NSW are:

- o State/ Arterial Roads – Predominantly carry through traffic from one region to another, forming principal avenues of communication for urban traffic movements.
- o Regional/ Sub-Arterial Roads – Connect the arterial roads to areas of development and carry traffic directly from one part of the region to another. They may also relieve traffic on arterial roads in some circumstances.
- o Local Roads – The sub-divisional roads within a particular developed area. These are used solely as local access roads.

The following roads in the study area, also shown in Figure 3.3, are under the care, control and management of Road and Maritime Services:

State Roads

- New Canterbury Road (RMS Road No. 167)
- Old Canterbury Road/ Tebbutt Street/ Brown Street (652).

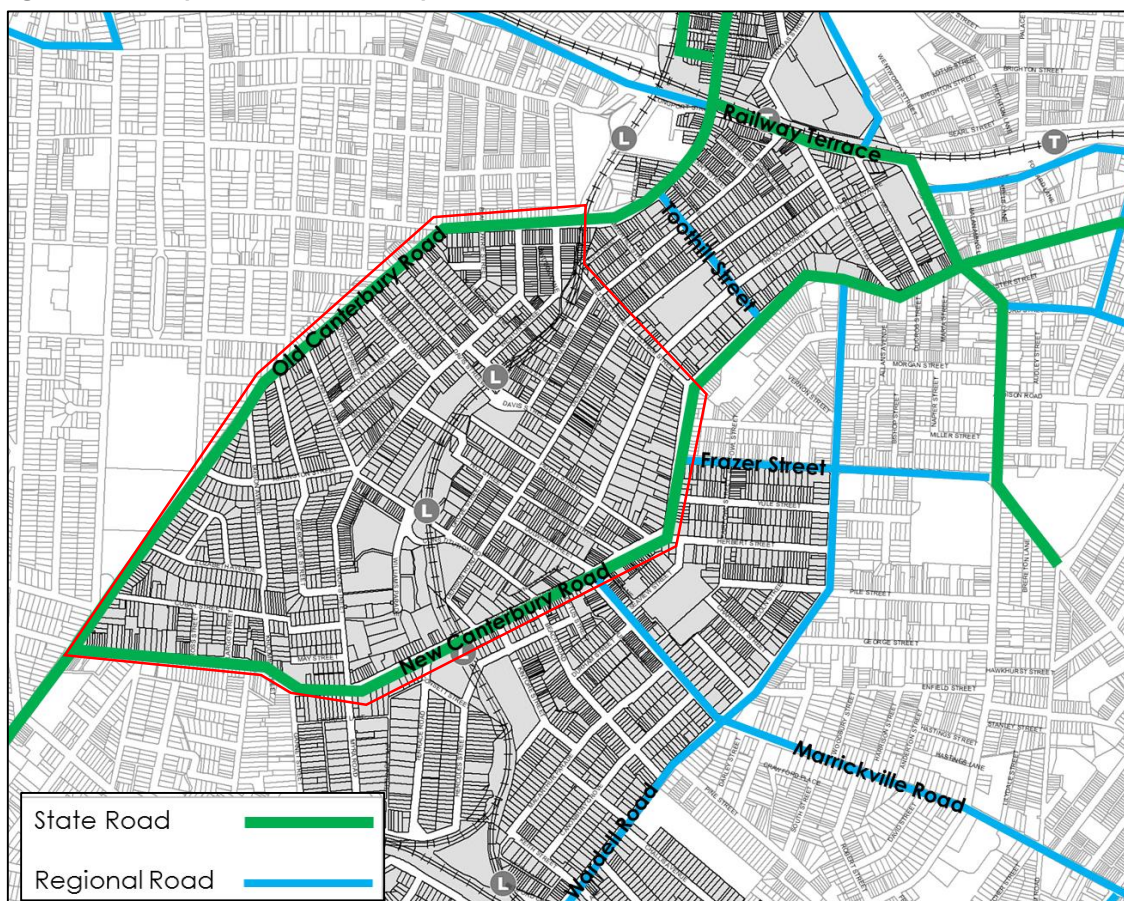
All other roads in the study area are classified as local roads. However, there are a number of sub-classifications within the local road classification including local accessways, local streets and local collector roads. The majority of roads function as local streets, with the exception of Constitution Road, Dulwich Street, Denison Road, Davis Street, Windsor Road and Union Street that function as local collector roads by linking local streets to the arterial/ sub arterial road network. A number of laneways provided within the study area are classified as local accessways. These roads are under the care, control and management of Marrickville Council.

The typical road width characteristics of the roads in the study area are as follows:

- Greater than 11.6 metres:
 - Arlington Street (west of Dixon Avenue)
 - Dulwich Street
 - Hampstead Road
 - Jesmond Avenue
 - Windsor Road
- 10.4-9.0 metres:
 - Abergeldie Street
 - Arlington Street (east of Dixon Avenue)
 - Cobar Street
 - Constitution Road
 - Davis Street
 - Denison Road
 - Fairmount Street
 - Hill Street
 - Kroombit Street
 - Pigott Street
 - The Boulevarde (south of Pigott Street)
 - Union Street
 - Victoria Street
- 9.0-7.0 metres:
 - Dixon Avenue
 - Elizabeth Avenue
 - Eltham Street
 - Grove Street
 - Hugh Avenue
 - Johnson Avenue
 - Lewisham Street
 - Margaret Street
 - Weston Street
 - Williams Parade (excluding width of 90-degree angled parking)

- Less than 7.0 metres:
 - The Boulevard (between Pigott Street and Eltham Street)
 - All other local accessways.

Figure 3.3: Study Area Road Hierarchy



3.4 Existing Local Area Traffic Management

An inventory of all existing LATM devices was completed by GTA Consultants. The inventory assists with reviewing the effectiveness of the devices and identifying locations where new or upgraded devices are required. The locations of the existing devices are shown in Figure 3.4 and in Appendix A of this report.

Figure 3.4: Existing LATM devices

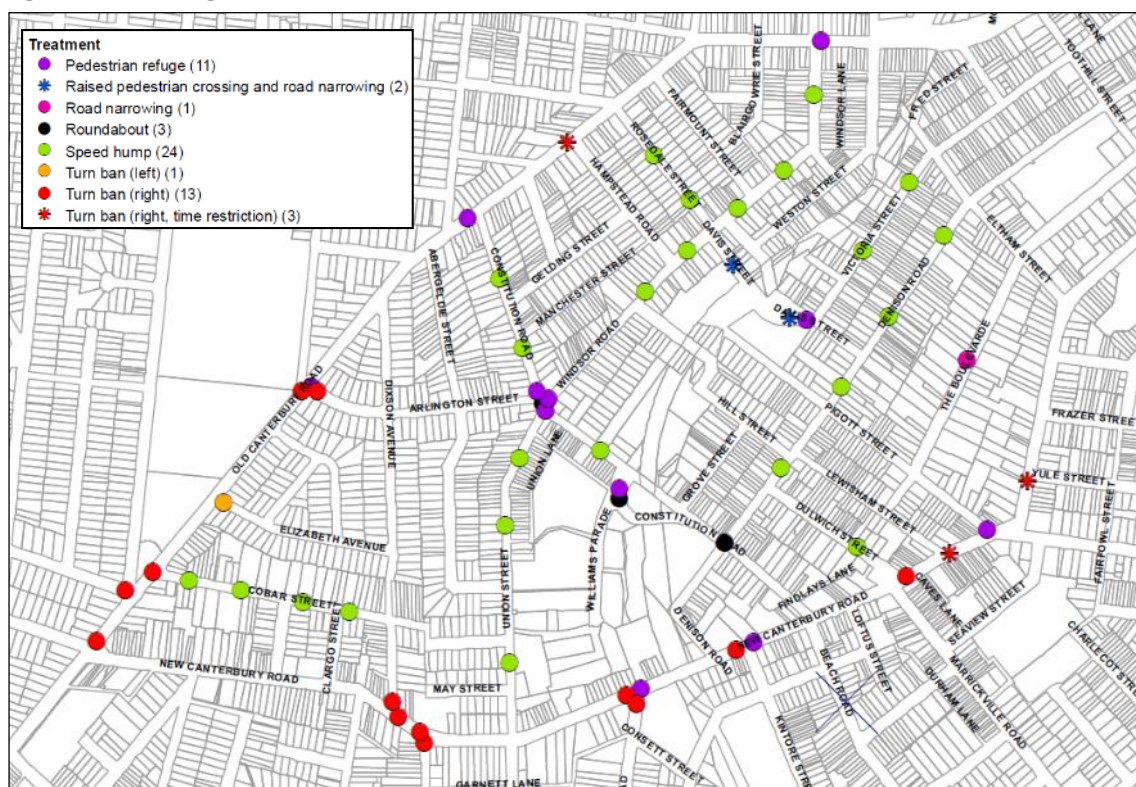


Figure 3.4 illustrates that there are road humps (i.e. midblock thresholds) currently installed on several roads in Dulwich Hill. There are also a number of local roads with turn ban restrictions to/from the surrounding arterial road network, particularly along New Canterbury Road.

Noticeable long and generally straight roads with LATM omissions include Dixon Avenue, Arlington Street, Abergeldie Street and Pigott Street.

3.5 Public Transport

GTA Consultants has completed a review of the existing public transport which services the study area. Understanding the availability of public transport services directly relates to the level of reliance on private car use.

3.5.1 Trains

Dulwich Hill Railway Station

Dulwich Hill Railway Station is located on the south boundary of the study area. The station is serviced by the Bankstown line with the typical service frequencies presented in Table 3.2.

Table 3.2: Dulwich Hill Railway Services – Weekdays

Service	Service Frequency per Hour		
	AM Peak Hour	Off-Peak	PM Peak Hour
Liverpool or Lidcombe to City Circle	5 (7:00am – 8:00am)	4	4 [1]
City Circle to Liverpool or Lidcombe	4 [1]	4	5 (6:00pm – 7:00pm)

[1] No defined peak hour

Lewisham Railway Station

Lewisham Railway Station is located within an approximately 10 minute walk from the northern boundary of the study area. The station is serviced by the Inner West line with typical service frequencies presented in Table 3.3.

Table 3.3: Lewisham Railway Services – Weekdays

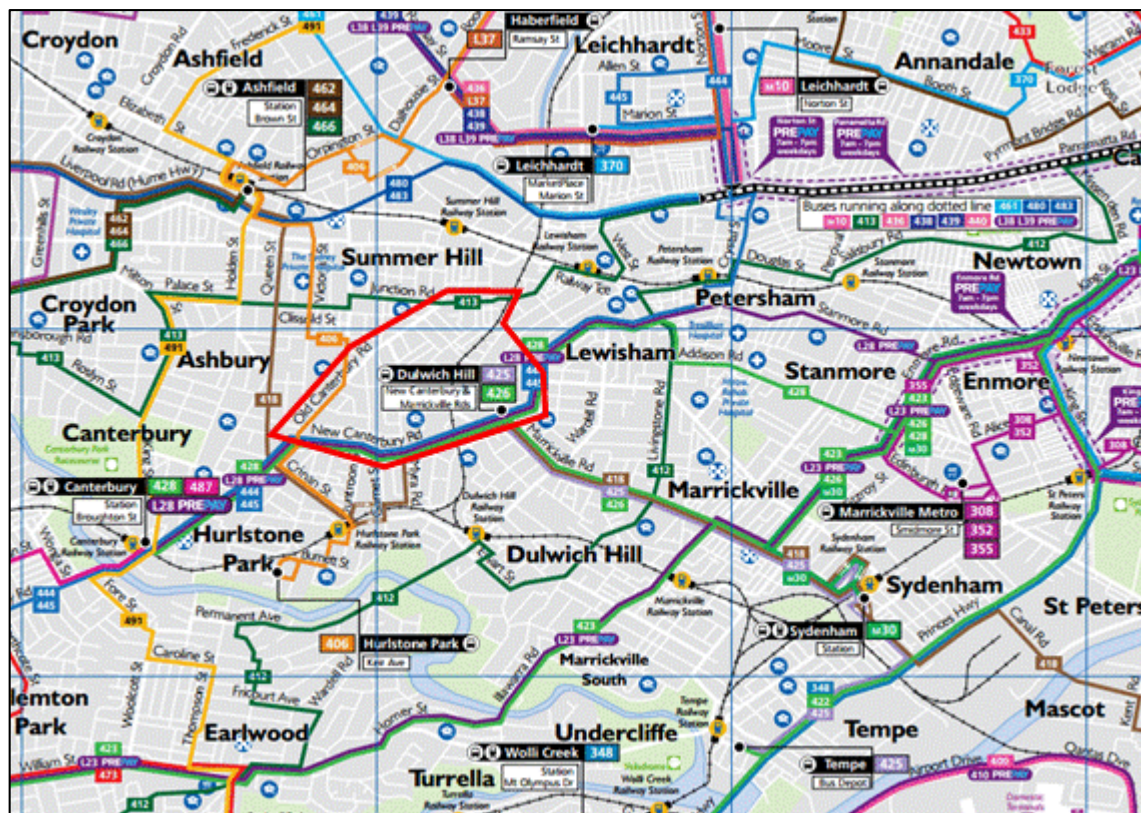
Service	Service Frequency per Hour		
	AM Peak Hour	Off-Peak	PM Peak Hour
Homebush to City Circle	4 [1]	4	4 [1]
City Circle to Homebush	4 [1]	4	4 [1]

[1] No defined peak hour

3.5.2 Buses

An overview of the bus network in the vicinity of Dulwich Hill North is presented in Figure 3.5.

Figure 3.5: Sydney Bus Network



Source: Sydney Buses accessed January 2015 (http://www.sydneybuses.info/routes/14054_STA_region_web_map_south.pdf)

Figure 3.5 indicates that Dulwich Hill is serviced by 11 bus routes operated by Sydney Buses. Descriptions of these bus routes are summarised in Table 3.4.

Table 3.4: Bus Route Descriptions

Route #	Route Description
406	Five Dock – Hurlstone Park via Ashfield
412	Campsie Station – City via Earlwood
413	Campsie Station – City via Ashbury
418	Burwood – Bondi Junction via Dulwich Hill
425	Dulwich Hill – Tempe via Marrickville
426	Dulwich Hill – City via Marrickville
428	Canterbury – City via Petersham
444	Balmain Wharf – Campsie via Leichhardt
445	Balmain Wharf – Campsie via Lilyfield Light Rail stop
L28	Canterbury – City via Petersham (Limited Stops)

3.5.3 Light Rail

Transdev operates light rail services between Central to the east and Dulwich Hill to the west. There are four stops within the study area as highlighted in Figure 3.6, with the last stop on the line (Dulwich Hill Light Rail stop) located within 100 metres of Dulwich Hill Railway Station.

Figure 3.6: Sydney Light Rail Network



Source: Transport for NSW accessed October 2015 (<http://www.transportnsw.info/resources/documents/maps/light-rail-map.pdf>)

3.6 Walking and Cycling

GTA Consultants has completed a review of the existing pedestrian and cycling facilities provided in the study area to understand how they incorporate with existing LATM devices and ensure the facilities are considered for any proposed new or upgrade devices.

3.6.1 Walking

The existing footpath network in Dulwich Hill and the width of the footpaths are shown in Figure 3.7. The figure indicates that most roads in the study area have footpaths of 1.2m wide or greater (considered the minimum desirable footpath width), hence providing a well-connected network for pedestrians to move throughout the study area.

The locations of missing kerb ramps were provided by Marrickville Council. A review of the locations was completed to identify where kerb ramps have recently been installed. The locations of the missing kerb ramps are shown in the Figure 3.7.

Figure 3.7: Existing Footpath Network & Locations of Missing Kerb Ramps



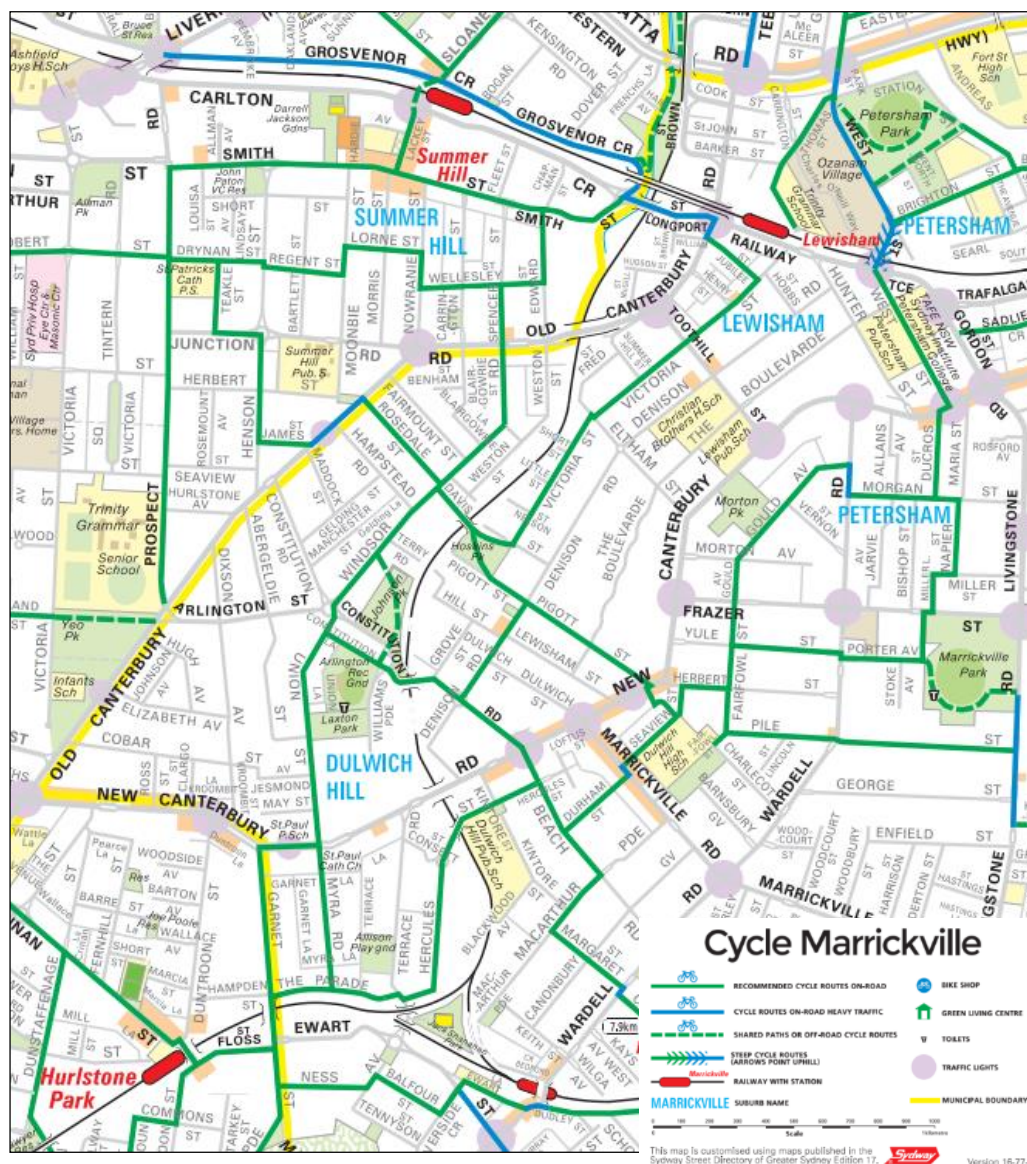
3.6.2 Cycling

The bicycle network as of 2007 is shown in Figure 3.8 and does not show the Greenway Trail that has been partial completed. There are a number of roads in the study area that are recommended for on-road cycling including:

- North-south direction:
 - Windsor Road/ Union Street
 - Victoria Street/ Pigott Street/ Denison Road
- East-west direction:
 - Rosedale Street/ Davis Street/ Pigott Street
 - Constitution Road between Union Street and New Canterbury Road.

No shared path or off-road bicycle routes exist along the road network in Dulwich Hill.

Figure 3.8: Existing Bicycle Network



Source: Marrickville Council accessed January 2015

(<http://www.marrickville.nsw.gov.au/Global/Community/Transport%20and%20Infrastructure/CycleMapWeb.pdf>)

The Greenway Trail, shown in Figure 3.9, is a 5.8 kilometre shared walking and cycling path along the Inner West Light Rail corridor, connecting Parramatta River at Iron Cove (to the north) with Cooks River (to the south).

Figure 3.9: Greenway Trail



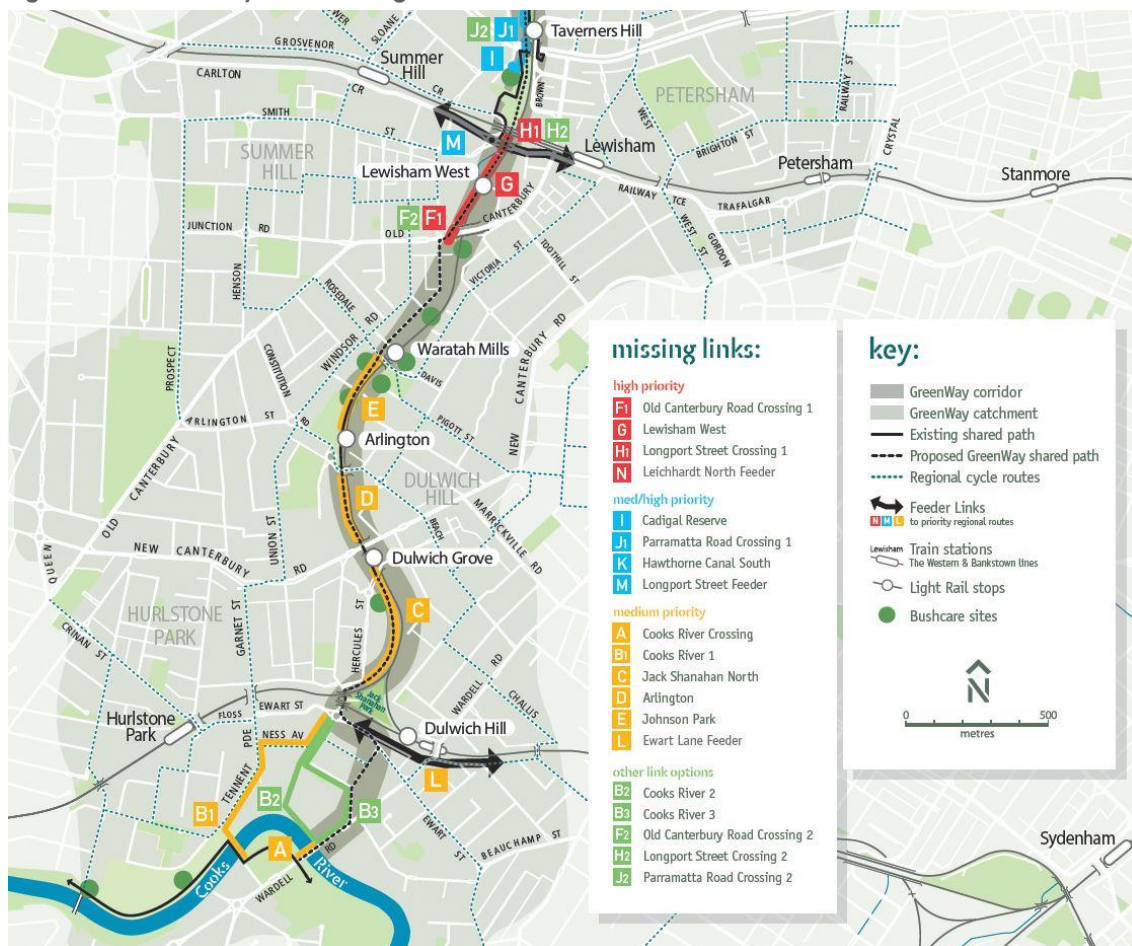
Source: Greenway accessed October 2015 (<http://www.greenway.org.au/about-the-greenway/aerial-map>)

The Trail is 45% completed (2.6km), with the remaining 3.2kms, comprising of 11 links, estimated for completed before 2020. As shown in Figure 3.10, two of the missing links are through Dulwich Hill North and are of medium priority. The links are between:

- o Davis Street and Constitution Road (Link E)

- o Constitution Road and New Canterbury Road (Link D).

Figure 3.10: Greenway Trail - Missing Links within Marrickville LGA



Source: Marrickville Council

Aside for the Greenway Trail, there were no other shared path or off-road cycle routes proposed for the study area in the Marrickville Bicycle Strategy, adopted in 2007. However, there are a number of proposed on-road lanes or mixed traffic routes proposed through Dulwich Hill North, as shown in Figure 3.11 and including:

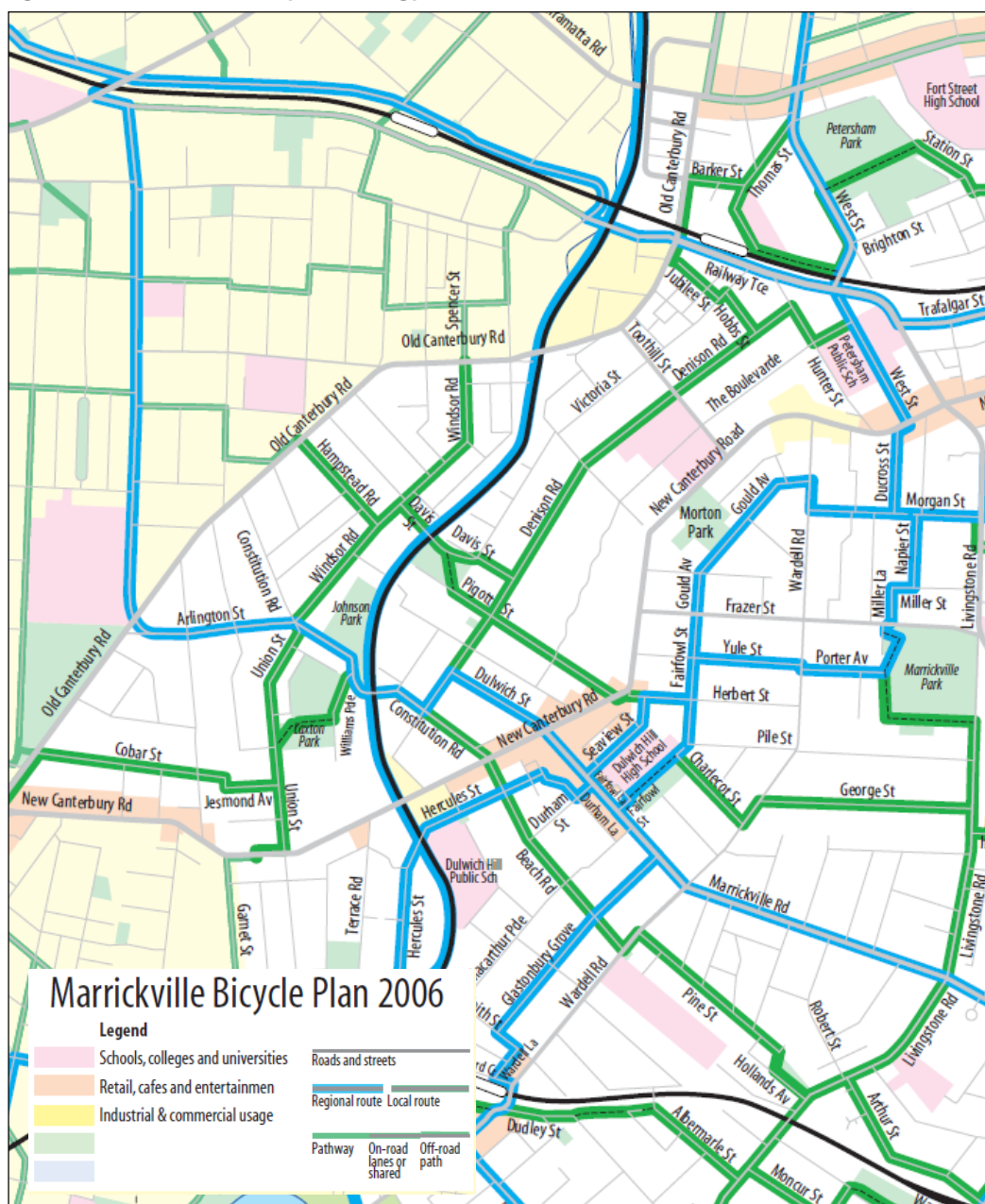
Regional Route

- o Arlington Street/ Constitution Road/ Denison Road/ Dulwich Street – a section of a proposed regional east-west route connecting Liverpool Road and Marrickville Road.

Local Route

- o Cobar Street – a proposed east-west route connecting Old Canterbury Road and Union Street.

Figure 3.11: Marrickville Bicycle Strategy 2007 - Recommendations



Source: Marrickville Council accessed January 2015 (<http://www.marrickville.nsw.gov.au/en/council/forms-and-publications/council-plans/bicycle-strategy/>)

3.6.3 Marrickville PAMP

At the end of 2009, Marrickville Council undertook a review of their Pedestrian Access and Mobility Plan. The PAMP focuses on the high pedestrian areas within Marrickville LGA.

There were no priority pedestrian routes identified within the PAMP in the Dulwich Hill North area. However, New Canterbury Road along the southern boundary of the study area was identified with sections of high and low priority.

3.7 On-Street Car Parking

Dulwich Hill North predominantly comprises residential dwellings. In addition, a mix of commercial and industrial development is located along New Canterbury Road.

Observations and a review of parking surveys completed as part of a separate parking study completed concurrently for Dulwich Hill indicates that overall there is generally a moderate demand for on-street parking within the study area throughout the day on both weekdays and weekends.

Car parking demand is highest on roads with higher density residential uses on both sides and minimal access to off-street parking. These roads include those between and including Denison Road and New Canterbury Road on weekday evenings and weekend mornings.

Understanding areas of high on-street car parking occupancy is important during the selection of proposed LATM devices to ensure the potential impacts of the devices on on-street parking supply is considered.

3.8 Waste Management

LATM devices have the potential to restrict manoeuvrability for large vehicles on local roads. Marrickville Council indicated that there are no existing areas of concern for drivers of their 9.5m garbage trucks in Dulwich Hill North as a result of existing road geometries or parking constraints.

3.9 Imagining Marrickville Community Survey

Marrickville Council commissioned an 'Imagining Marrickville' survey of residents and workers, to help identify how to improve roads and public spaces within the Marrickville LGA. Approximately 1,250 responses were received. The results of the survey were obtained and analysed with the focus on residents from within the Dulwich Hill, Lewisham and Riverside areas. This section provides a summary of the key traffic related findings from the survey for the Dulwich Hill, Lewisham and Riverside areas, with a detailed summary of all transport findings provided in Appendix B of this report.

3.9.1 Traffic

- o 69% of respondents mentioned that speeding traffic was frequent (41%) or sometimes (25%) occurred respectively on their street.
- o 53% of respondents mentioned that there was frequently (31%) or sometimes (22%) too much traffic or rat-running on their street.

3.9.2 Pedestrian

- o 29% of respondents mentioned that they had difficulties moving around their neighbourhood.
- o 37% of respondents felt there was a barrier that prevented them from walking in their neighbourhood. 40% of respondents selected safety at night as a key barrier.
- o 59% of respondents mentioned improvements were required for routes to bus stops, light rail, train stations, parks, schools and shops in their neighbourhood.
- o Common improvements mentioned in the responses to the survey included:
 - o Improved or additional pedestrian crossings (Constitution Road, Denison Road and Davis Road)

- Improved footpaths (Victoria Street, New Canterbury Road, Victoria Road, Denison Road and Dixon Avenue)
- Direct access between Dulwich Hill Light Rail stop and Dulwich Hill Railway Station.
- 48% of respondents frequently (20%) or sometimes (28%) felt that pedestrians are in danger on their street.
- Despite this, 66% felt their street was very (19%) or moderately (47%) pedestrian friendly.

3.9.3 Bicycle

- 52% of respondents are either frequent (27%) or occasional (25%) riders of bicycles.
- 62% of respondents felt there was a barrier that prevented them from cycling or cycling more in their neighbourhood. 51% of respondents selected the lack of safe or clear routes as a key barrier, while 10% mentioned the lack of end of trip facilities.
- The provision of dedicated bicycle paths or more direct routes were common improvements respondents mentioned would improve cycling in the area.
- 50% of respondents frequently (22%) or sometimes (28%) felt that cyclists are in danger on their street.
- Despite this, 46% felt their street was very (9%) or moderately (37%) bike friendly.

4. Existing Traffic Assessment

4.1 Environmental Capacity and Speed Performance Standards

The Guide to Traffic Generating Developments (Roads and Maritime Services, 2002) specifies environmental limits for each road class, which are detailed in Table 4.1.

A further criteria specified by the RMS is that heavy vehicles should not account for more than 5% of total traffic on local roads.

Table 4.1: Environmental Capacity and Speed Performance Standards

Road Class	Road Type	Maximum Speed (km/h) [1]	Max Peak hour volume (veh/hr)	Daily volume (veh/day) [2]
Local	Access way	25	100	1,000
	Street	40	200 (desirable) and 300 (maximum)	2,000 (desirable) and 3,000 (maximum)
Collector	Street	50	300 (desirable) and 500 (maximum)	3,000 (desirable) and 5,000 (maximum)

[1] In existing areas maximum speeds relate to 85th percentile speeds.

[2] Traffic data obtained for this study was largely daily volumes. As such, the maximum peak hour volumes have been converted to daily volume by assuming a peak to daily ratio of 10%.

Source: Guide to Traffic Generating Developments (RMS, 2002)

The standards are based on RMS research relating to safety (cross-ability, visibility and pedestrian delay) and amenity (noise and air quality) on residential roads. These standards were developed to assist practitioners in the design of residential subdivisions, to ensure an appropriate level of safety and amenity is maintained when designing these types of roads.

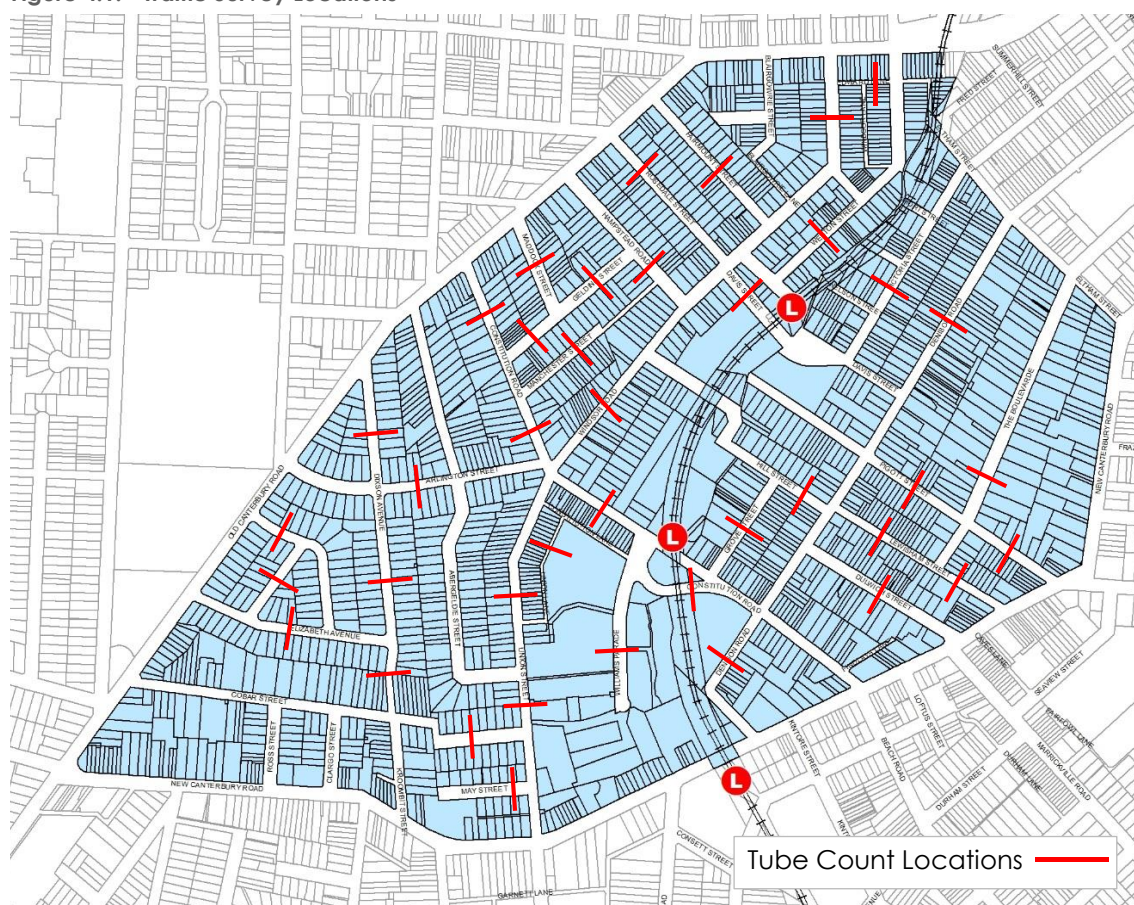
In practice, if these standards or limits are met, it is reasonable to assume that the street can be crossed safely and with minimal delay, and that the traffic noise and air quality levels are acceptable.

In addition to the above target maximum speeds (25km/h to 50km/h), as a general guide, all local roads have a 50km/h speed limit unless signed otherwise.

4.2 Traffic and Speed Assessment

Marrickville Council undertook 24-hour tube counts on several roads (some roads had counters installed at more than one location) to determine the existing mid-block traffic volumes and speeds in the study area. The locations of the surveys are presented in Figure 4.1.

Figure 4.1: Traffic Survey Locations



The average daily traffic volume, heavy vehicle percentage and 85th percentile speed data was provided by Marrickville Council. It is noted that peak hourly traffic volumes were not available as part of the data provided.

GTA analysed the traffic data against the set of criteria for the environmental capacity and speed performance as the basis for identifying traffic speed and volume issues on roads in Dulwich Hill North.

The roads with traffic volumes, heavy vehicle percentage and speeds that exceeded the environmental capacity and speed performance are highlighted in red in Table 4.2, and shown graphically in Figure 4.2. Note, 85th percentile speeds in **bold** also exceed the signposted limit.

Table 4.2: Evaluation of Environmental Capacity & Speed Performance

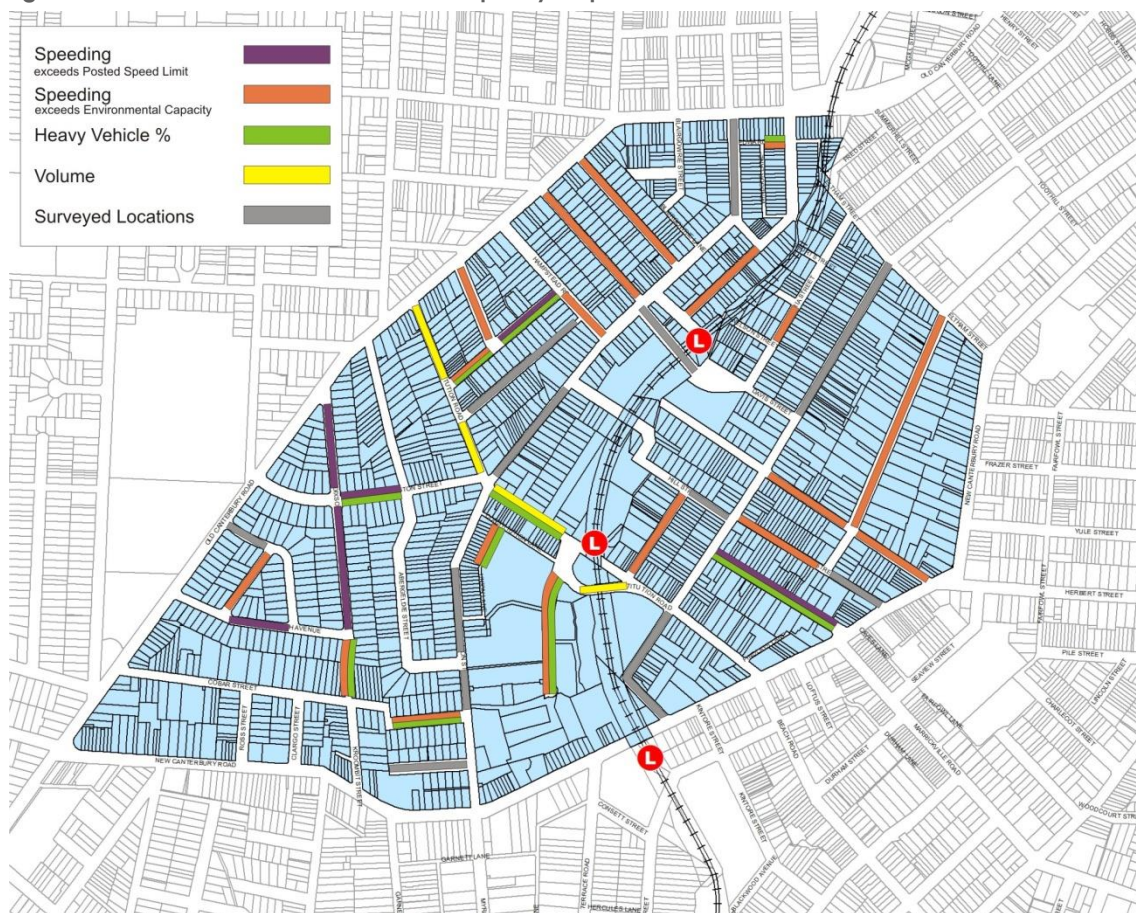
Street Name	Section	Surveyed			Functional Classification	Compliance		
		Volume (ADT)	Speed (85 th % km/h)	Heavy Vehicle (%)		Volume (ADT)	Speed (85 th % km/h) [1]	Heavy Vehicle (%) [2]
Arlington Street	Abergeldie St & Dixon Ave	730	51.6	5.70	Local	Yes	No	No
Constitution Road	Old Canterbury Rd & Gelding St	3,121	41.2	3.10	Collector	No	Yes	Yes
Constitution Road	Manchester St & Windsor Rd	3,118	41.8	3.60	Collector	No	Yes	Yes
Constitution Road	Williams Pde & Windsor Rd	4,256	34.6	5.80	Collector	No	Yes	No
Constitution Road	Williams Parade & Grove Street	4,308	46.1	2.80	Collector	No	Yes	Yes
Davis Street	Windsor Rd & Victoria St	1,242	42.1	4.00	Collector	Yes	Yes	Yes
Denison Road	Eltham St & Davis St	2,512	46.4	3.00	Collector	Yes	Yes	Yes
Denison Road	New Canterbury Rd & Constitution Rd	483	36.7	3.10	Collector	Yes	Yes	Yes
Dixon Avenue	Old Canterbury Rd & Arlington St	586	52.9	4.00	Local	Yes	No	Yes
Dixon Avenue	Arlington St & Elizabeth Ave	661	51.1	3.10	Local	Yes	No	Yes
Dixon Avenue	Elizabeth Ave & Cobar St	810	50	8.10	Local	Yes	No	No
Dulwich Street	New Canterbury Rd & Denison Rd	1,722	52.2	8.40	Collector	Yes	No	No
Edward Lane	Weston St & Windsor Ln	83	46.4	15.00	Access way	Yes	No	No
Elizabeth Avenue	Johnson Ave & Hugh Ave	430	51.1	2.10	Local	Yes	No	Yes
Fairmount Street	Old Canterbury Rd & Windsor Rd	171	42.5	2.80	Local	Yes	No	Yes
Gelding Street	Hampstead St & Maddock St	191	52.9	6.00	Local	Yes	No	Yes
Gelding Street	Maddock St & Constitution Rd	182	45.4	5.10	Local	Yes	No	No
Grove Street	Hill St & Constitution Rd	191	46.1	4.90	Local	Yes	No	Yes
Hampstead Road	Manchester St & Gelding St	474	48.6	1.10	Local	Yes	No	Yes
Hill Street	Denison Rd & End	308	32.8	2.9	Local	Yes	Yes	Yes
Hugh Avenue	Old Canterbury Rd & Johnson Ave	230	40	2.00	Local	Yes	Yes	Yes
Jesmond Avenue	Union St & Cobar St	541	46.8	9.1	Local	Yes	No	No
Johnson Avenue	Hugh Ave & Elizabeth Ave	95	44.3	2.60	Local	Yes	No	Yes
Lewisham Street	The Boulevard & Denison Rd	485	44.3	4.10	Local	Yes	No	Yes
Lewisham Street	The Boulevard & New Canterbury Rd	735	36.7	4.00	Local	Yes	Yes	Yes

Street Name	Section	Surveyed			Functional Classification	Compliance		
		Volume (ADT)	Speed (85 th % km/h)	Heavy Vehicle (%)		Volume (ADT)	Speed (85 th % km/h) [1]	Heavy Vehicle (%) [2]
Maddock Street	Old Canterbury Rd & Gelding St	219	46.4	1.9	Local	Yes	No	Yes
Manchester Street	Constitution Rd & Hampstead Rd	117	40	3.2	Local	Yes	Yes	Yes
May Street	Union St & End	483	20.2	1.70	Local	Yes	Yes	Yes
Pigott Street	Denison Rd & The Boulevarde	1,146	49	3.1	Local	Yes	No	Yes
Pigott Street	The Boulevarde & New Canterbury Rd	1,762	45	1.6	Local	Yes	No	Yes
Rosedale Street	Old Canterbury Rd & Windsor Rd	283	41.8	4.40	Local	Yes	No	Yes
The Boulevarde	Pigott St & Eltham St	973	48.2	3.40	Local	Yes	No	Yes
Union Lane	Constitution Lane & Union St	10	25.6	5.50	Access way	Yes	No	No
Union Street	Constitution Rd & Abergeldie St	607	46.1	2.8	Collector	Yes	Yes	Yes
Union Street	Abergeldie St & Jesmond Ave	805	45.4	2.5	Collector	Yes	Yes	Yes
Victoria Street	Little St & Nelson St	568	40.3	1.70	Local	Yes	No	Yes
Weston Street	Channel St & Windsor Rd	239	46.8	3.00	Local	Yes	No	Yes
Williams Parade	Constitution Rd to end	1,456	40.7	2.50	Local	Yes	No	Yes
Williams Parade	Constitution Rd to end	1,663	33.1	6.70	Local	Yes	Yes	No
Windsor Road	Constitution Rd & Terry St	971	45.7	2.2	Collector	Yes	Yes	Yes
Windsor Road	Channel St & Old Canterbury Rd	1,177	43.6	2.7	Collector	Yes	Yes	Yes

[1] 85th Percentile Speeds exceeding the signposted limit are shown in **bold**.

[2] No more than 5% of total traffic on local roads (refer to Section 4.1).

Figure 4.2: Evaluation of Environmental Capacity & Speed Performance



4.2.1 Traffic Volume

Existing traffic volumes on the roads in the study area comply with the desirable volume, except for Constitution Road.

Although Constitution Road (collector road) exceeds the desirable traffic volume, the volumes are within the maximum limits.

4.2.2 Speed

There are a number of roads on which the 85th percentile speed exceeds the maximum speed criteria.

In addition, there are 5 roads where the speed exceeds the 50km/h speed limit. The 85th percentile speeds along Arlington Street, Dixon Avenue, Dulwich Street, Elizabeth Avenue and Gelding Street marginally exceeded the speed limit (i.e. by less than 3km/h).

4.2.3 Heavy Vehicles

The proportion of heavy vehicles exceeds the 5% of total traffic limit on 8 roads within the study area. These are:

- o Arlington Street
- o Constitution Road
- o Dixon Avenue
- o Dulwich Street
- o Edward Lane
- o Gelding Street
- o Union Lane
- o Williams Parade.

Edward Lane and Union Lane are classified as accessways that carry low traffic volumes the heavy vehicle percentages for these roads are likely skewed as a result of the low traffic volumes rather than a serious over usage by heavy vehicles. Williams Parade is the only road with a proportion of more than 1% over the 5% limit.

4.3 Crash Data

Crash data was obtained from Marrickville Council for the most recent five year period available (July 2008 to June 2013) for all crashes in the study area. It is important to note the data only includes crashes where police attended and as such, does not capture unreported (generally minor) traffic crashes that occurred during this period.

The location of crashes in the study area is shown in Figure 4.3.

Figure 4.3: Location of Crashes July 2008 to June 2013

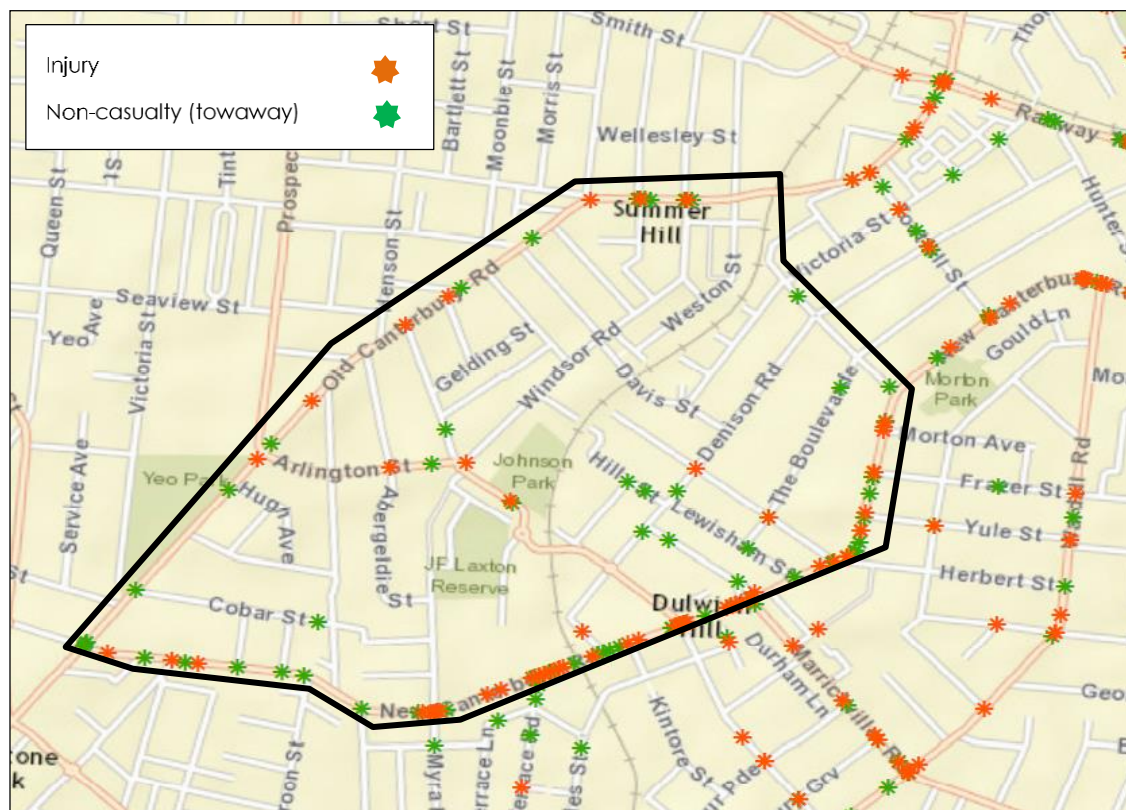


Figure 4.3 illustrates that a high concentration of crashes occurred along the State Roads bounding the study area.

There were 19 crashes on the local roads in the study area (i.e. excluding the RMS road network):

- 14 with no casualties
- five with injuries
- no fatalities.

A review of the year the crashes occurred, shown in Figure 4.4, indicates that there were no crashes within the study area in Year 2008/2009. The years with the highest number of crashes were Year 2010/2011 (6 crashes) and 2012/2013 (7 crashes).

Figure 4.4: Crashes by Year 2008 to 2013

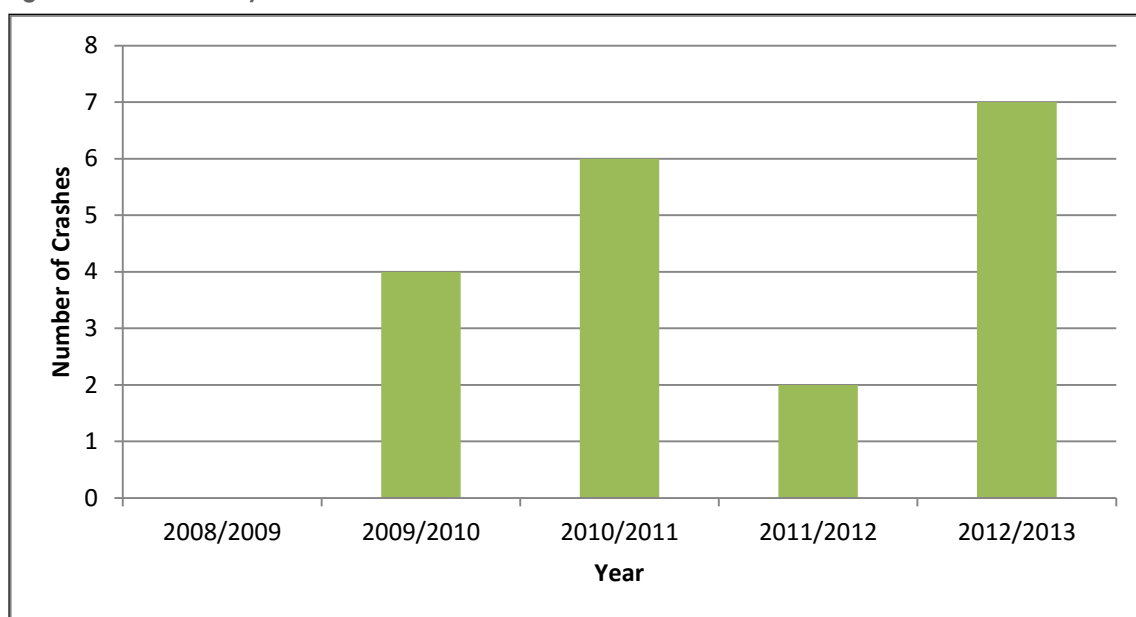


Figure 4.5 indicates more crashes occurred on a Tuesday than any other day of the week. However, there are no identifiable trends between accidents occurring on a weekday or a weekend.

Figure 4.5: Crashes by Day of Week

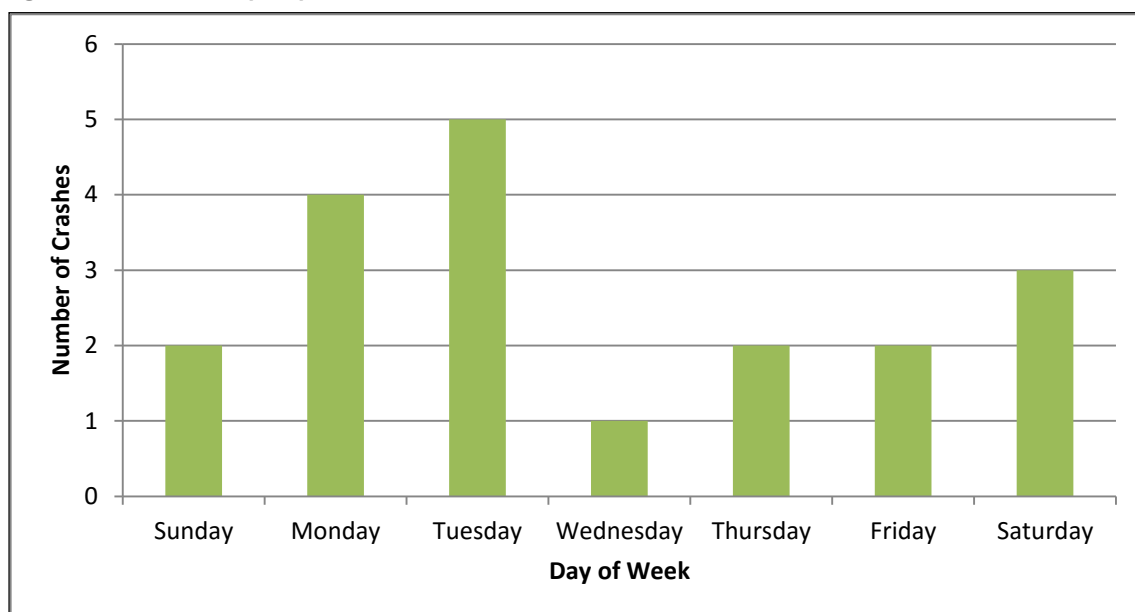
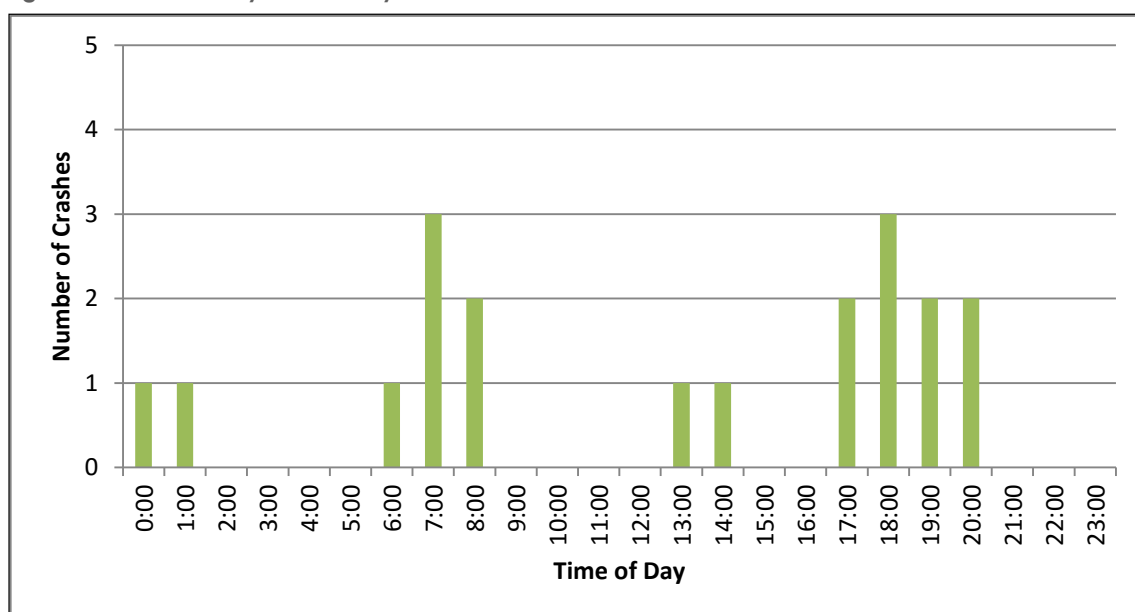


Figure 4.6 indicates that most of the crashes occurred during the morning and evening peak periods, this corresponds when hourly traffic volumes are at their greatest.

Figure 4.6: Crashes by Time of Day



A summary of the crashes and their locations within the study area is presented in Table 4.3.

Table 4.3: Reported Crash Summary 2008 to 2013

Location	No. of Accidents				
	Vehicle-Vehicle	Vehicle-Pedestrian	Vehicle-Cyclist	Other	Total
Arlington Street	2	-	-	-	2
Cobar Street	1	-	-	-	1
Constitution Road	3	-	-	-	3
Denison Road	2	-	1	1 (vehicle-fixed object)	4
Dulwich Street	2	-	-	-	2
Grove Street	1	-	-	-	1
Hill Street	1	-	-	-	1
Lewisham Street	1	-	-	-	1
Pigott Street	2	-	-	-	2
The Boulevarde	1	-	-	-	1
Windsor Road	1	-	-	-	1

Table 4.3 indicates that 17 crashes occurred between two vehicles. There was one crash that involved a cyclist.

Figure 4.7 illustrates the characteristics of the crashes in Dulwich Hill North. A RUM Code is a standard code used to identify the type of Road User Movement(s) (RUM) involved in crashes. The categories for the RUM Codes are as follows and each RUM Code description is provided in Appendix C of this report:

- RUM Code 0-9: Pedestrian on foot or in Toy/Pram
- RUM Code 10-19: Vehicles from adjacent directions (intersections only)
- RUM Code 20-29: Vehicles from opposing directions
- RUM Code 30-39: Vehicles from same direction
- RUM Code 40-49: Vehicles parking, reversing or emerging onto roadway
- RUM Code 50-59: Vehicles overtaking
- RUM Code 60-69: Vehicles on path
- RUM Code 70-79: Vehicle off path on straight
- RUM Code 80-89: Vehicles off path on curve or turning
- RUM Code 90-99: Miscellaneous.

Figure 4.7: Reported Crashes by RUM Code Category

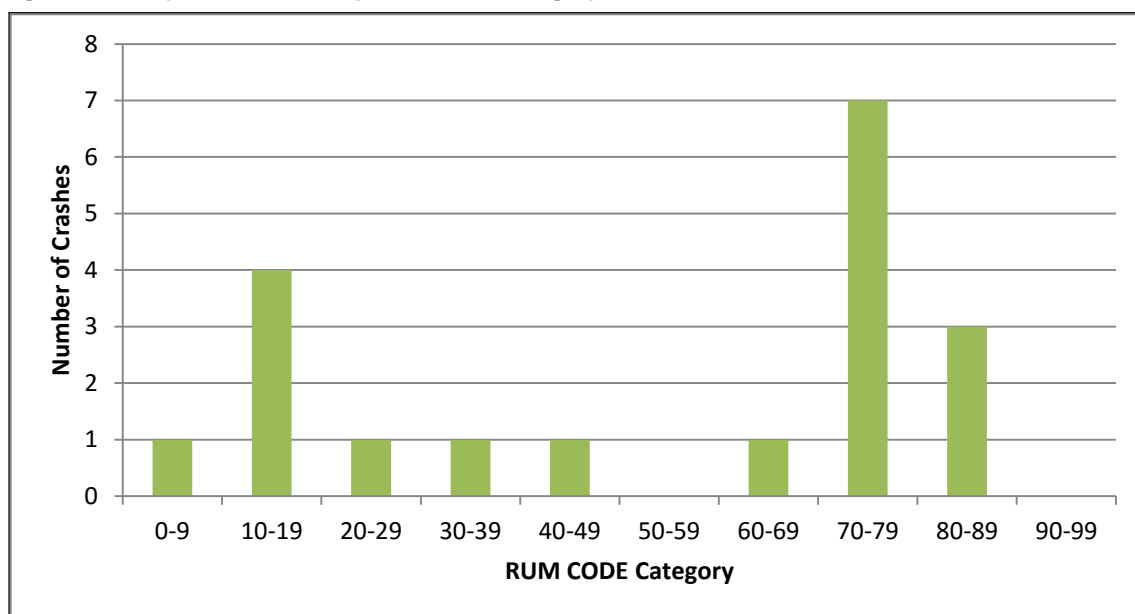


Figure 4.7 indicates that most of the crashes involved a vehicle leaving their travel path on either a straight road (7 crashes) or curve/ turning (3). These accidents occurred twice on Constitution Road, on Denison Road and on Dulwich Road.

4.4 Traffic Issues Community Consultation

4.4.1 Tomorrow's Dulwich Hill. Stage 1. Learn and Share – Traffic

GTA Consultants prepared a traffic and parking issues plan that was posted on Marrickville Council's 'Your Say Marrickville' website for residents and other stakeholders to discuss traffic and parking issues in an open forum. The forum was open to the public from late March 2015 to early May 2015 and received 38 responses.

A summary of the traffic issues raised is provided below:

- Lack of pedestrian facilities across Constitution Road near Arlington Light Rail stop.
- Traffic congestion along Old Canterbury Road resulting in rat running along Gelding Street and Windsor Road.
- Lack of pedestrian facilities along Denison Road a concern for pedestrians as a result of the high traffic volumes, particularly in the morning peak period.
- Safety concerns at the intersection of Davis Street and Denison Road as a result of vehicles parking too close to the intersection, restricting sight distance.
- Future increased traffic on local roads between Light Rail line and New Canterbury Road, as a result of proposed residential developments.
- Traffic volumes and speed along Denison Road towards Toothill Street in peak hours, perceived to be used as a rat-run to avoid congestion along New Canterbury Road and Old Canterbury Road.
- Lack of pedestrian facility across Herbert Street at New Canterbury Road.
- Traffic speeds along New Canterbury Road through retail precinct.
- Insufficient green time for pedestrians at New Canterbury Road/ Marrickville Road intersection.

- o Insufficient green time for pedestrians on Duntroon Street leg of New Canterbury Road signalised intersection (*outside Study Area*).
- o Vehicles along Ewart Street and Floss Street not stopping for priority movements along Garnet Street (*outside Study Area*).
- o Drivers not obeying 'No Right Turn' restriction from New Canterbury Road into Terrace Road, primarily to access the KFC restaurant, thus delaying through traffic.
- o Sight distance at pedestrian refuge island facility across New Canterbury Road, east of Kintore Street.
- o Parking and traffic lane linemarking along Ewart Street, particularly at bend approaching Ness Avenue intersection (*outside Study Area*).
- o Pedestrian, cyclist and vehicle safety along Toothill Street, Denison Road and The Boulevarde in the vicinity of Christian Brother's High School (*Lewisham Study Area*).
- o High traffic volumes on Yule Street as a result of congestion on Frazer Street (*outside Study Area*).

4.4.2 Tomorrow's Dulwich Hill – Stakeholder Group Priorities

Marrickville Council consulted with stakeholder groups to understand what would make Dulwich Hill a better place. A summary of the key traffic issues raised is provided below:

- o Traffic volume and speeds on Denison Road.
- o Congestion on Toothill Street at Old Canterbury Road and New Canterbury Road (*Lewisham Study Area*).
- o Appropriate positioning of the pedestrian crossing on Denison Road/ Toothill Street (*Lewisham Study Area*).
- o Congestion on Railway Terrace/ Longport Terrace at Old Canterbury Road (*Lewisham Study Area*).
- o Safety concerns about turning movements at the New Canterbury Road/ Constitution Road/ Beach Road signalised intersection.
- o Heavy vehicles volumes on Marrickville Road through Dulwich Hill retail precinct and on Wardell Road at Dulwich Hill Station.
- o Connectivity between Dulwich Hill Station and light rail (*outside Study Area*).
- o Cyclist and pedestrian safety at intersections near Dulwich Hill Station (*outside Study Area*).
- o Safety of pedestrians crossing New Canterbury Road due to traffic speed (e.g. Duntroon Street).
- o Geometry concerns for pedestrians and drivers at New Canterbury Road/ Herbert Street intersection (wide crossing distance across Herbert Street for pedestrians).

4.5 Review of Intersection Operations

This section reviews the geometry and existing traffic conditions at intersections within or providing access to the study area, where perceived concerns from the local community exist or where high volumes of crashes were identified.

4.5.1 New Canterbury Road/ Constitution Road & Dulwich Street

The signalised intersections of New Canterbury Road with Constitution Road/ Beach Road and with Dulwich Street/ Marrickville Road were both perceived to be a safety concern by the community and identified to have high volumes of crashes between June 2008 and 2013. The intersections are shown in Figure 4.8 and Figure 4.9. New Canterbury Road is in the east-west

direction, with Constitution Road and Dulwich Street the northern approaches and Beach Road and Marrickville Road the southern approaches of the two intersections. The two intersections are located approximately 130 metres apart.

Figure 4.8: New Canterbury Road/ Constitution Road



Figure 4.9: New Canterbury Road/ Dulwich Street



The perceived safety concerns are related to the single phase for the side road traffic movements that combines right turn filtering and pedestrian crossing movements. As such, there is insufficient green time for vehicles to turn right, particularly in peak periods.

On site observations during the morning peak period indicated the phase is given a total of 30 seconds including the pedestrian movements when activated. The total cycle time for the two intersections is between 120-130 seconds. Vehicles were generally able to clear in the phase, although it was noted that right turning vehicles typically complete the movements towards the end of the phase, including in amber (clearance) time.

A review of the crash data indicates that between June 2008 and 2013, there were 44 reported crashes at the two intersections; 41 on New Canterbury Road, two on Dulwich Street and one on Marrickville Road. There were 14 crashes in the vicinity of Dulwich Street/ Marrickville Road and 27 crashes in the vicinity of the Constitution Road/ Beach Road. It is noted that the two crashes on Dulwich Street do not appear to be related to the intersection. The common crash types are as follows:

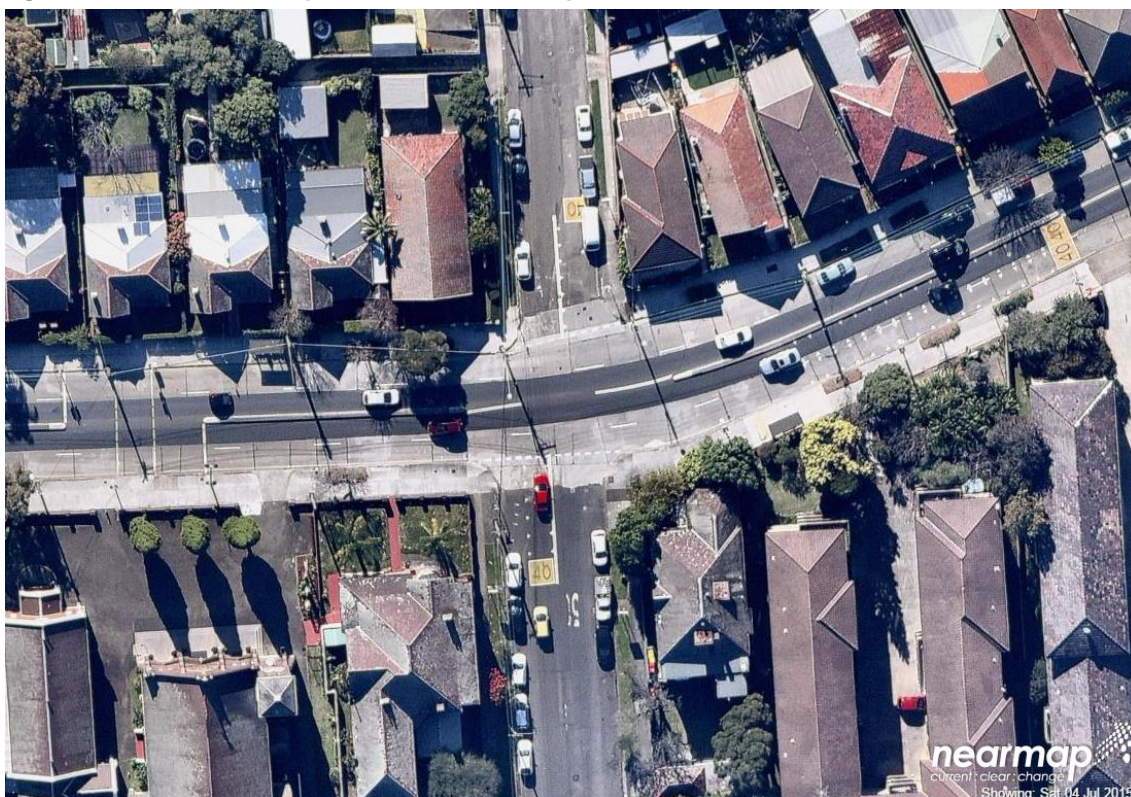
- o Vehicles from adjacent directions – 9 crashes, including 5 cross traffic
- o Vehicles from same direction (rear end) – 10 crashes
- o Vehicles from opposing directions (right-thru) – 13 crashes.

The crash data indicates there have been a number of crashes involving vehicles either turning or travelling through the intersection on red light.

4.5.2 New Canterbury Road/ Union Street/ Myra Road Intersection

The give-way controlled intersection of New Canterbury Road/ Union Street/ Myra Road was identified as an intersection with a high volume of crashes between June 2008 and 2013. The intersection is shown in Figure 4.10, with New Canterbury Road in the east-west direction and Union Street and Myra Road being the north and south approaches respectively. A signalised mid-block pedestrian crossing is located 50 metres west of the intersection and, when activated, has the ability to create safe turning gaps in eastbound traffic flows during peak periods.

Figure 4.10: New Canterbury Road/ Union Street/ Myra Road



A review of the crash data indicates there were 12 reported crashes at the New Canterbury Road/ Union Street/ Myra Road intersection including the following crash types:

- Four rear-end crashes involving vehicles travelling eastbound
- Three crashes that involved a vehicle turning right into Union Street with a vehicle travelling eastbound
- Two crashes that involved a vehicle rear-ending a right turning vehicle; one with a vehicle turning into Myra Road and the other with a vehicle turning into Union Street
- A vehicle turning right out of Myra Road colliding with a vehicle travelling westbound
- A vehicle travelling southbound from Union Street into Myra Road colliding with a vehicle travelling westbound
- A westbound vehicle colliding with a vehicle accessing an on-street parking space.

The crash data indicates there have been five crashes at the intersection involving a vehicle entering or exiting Union Street.

Traffic counts at the intersection indicates during the AM peak hour there were 55 vehicles that turned right into Union Street against 1,473 vehicles travelling eastbound, including turning movements. In the PM peak hour there were 81 vehicles that turned right into Myra Road against 1,234 vehicles travelling westbound, including turning movements. There were up to 10 through movements between Union Street and Myra Road in any hour.

SIDRA modelling of the intersection during the AM and PM peak hours verifies that Union Street and Myra Road experience significant delays and queuing. During the AM peak hour, there are considerable delays experienced for the right turn movement from New Canterbury Road into Myra Road, resulting in delays and queuing for eastbound traffic through the intersection.

4.5.3 The Boulevarde/ Eltham Street Intersection

The stop controlled intersection of The Boulevarde/ Eltham Street was perceived to be a safety concern by the community. The intersection is shown in Figure 4.11, with The Boulevarde in the northeast-southwest direction.

Figure 4.11: The Boulevarde/ Eltham Street



A review of crash data indicates that between June 2008 and 2013 there were no reported crashes that occurred at the intersection.

Traffic counts at intersection indicate that there is a notably high volume of vehicles turning left from Eltham Street into The Boulevarde (northbound) during the AM peak period (258 vehicles in the peak hour). The high volume can be linked to parents and students arriving to Christian Brothers' High School and Lewisham Public School, located north of the intersection.

As a result, in the AM peak hour, there were 505 vehicle movements at the intersection, compared to 141 vehicle movements at the intersection in the PM peak hour. It is noted that the PM peak period surveys did not capture the school peak, thus higher volumes between 3:00pm and 4:00pm can be expected.

Site observations during the morning school drop-off period indicated a combination of continuous flow of vehicles turning left from Eltham Street into The Boulevarde (northbound) and vehicle speeds through the turn, limits the opportunities for pedestrians crossing the north leg (The Boulevarde).

4.5.4 Denison Road/ Davis Street Intersection

The give-way controlled intersection of Denison Road/ Davis Street was also perceived to be a safety concern by the community as a result of vehicles parked close to the intersection on both Davis Street and Denison Road. The intersection is shown in Figure 4.12, with Denison Road in the northeast-southwest direction.

Denison Road is the priority road, with Davis Street controlled by a 'Give-Way' sign. A residential driveway is located opposite the Davis Street leg, slightly offset to the north.

Davis Street is one of two roads that cross the light rail line. Traffic counts at the intersection indicate 180 vehicles exit Davis Street in the AM peak hour, with an additional 46 vehicles entering the street. The average daily two-way traffic volumes is in the order of 1,250 vehicles.

A review of crash data indicates that between June 2008 and 2013 there were no reported crashes that occurred at the intersection.

A review of the intersection geometry and signage indicates that 'No Stopping' signs are not provided on Denison Road or Davis Street at the intersection, which is typical at a priority-controlled intersection in a residential environment. As such, vehicles are parking within 5-10 metres of the intersection, or within the required 10 metre 'No Stopping' distance, resulting in:

- o reduced sight distances for vehicles turning right out of Davis Street
- o insufficient manoeuvring area for vehicles turning right into Davis Street.

Figure 4.12: Denison Road/ Davis Street



4.6 Review of 7-day Traffic Count Data

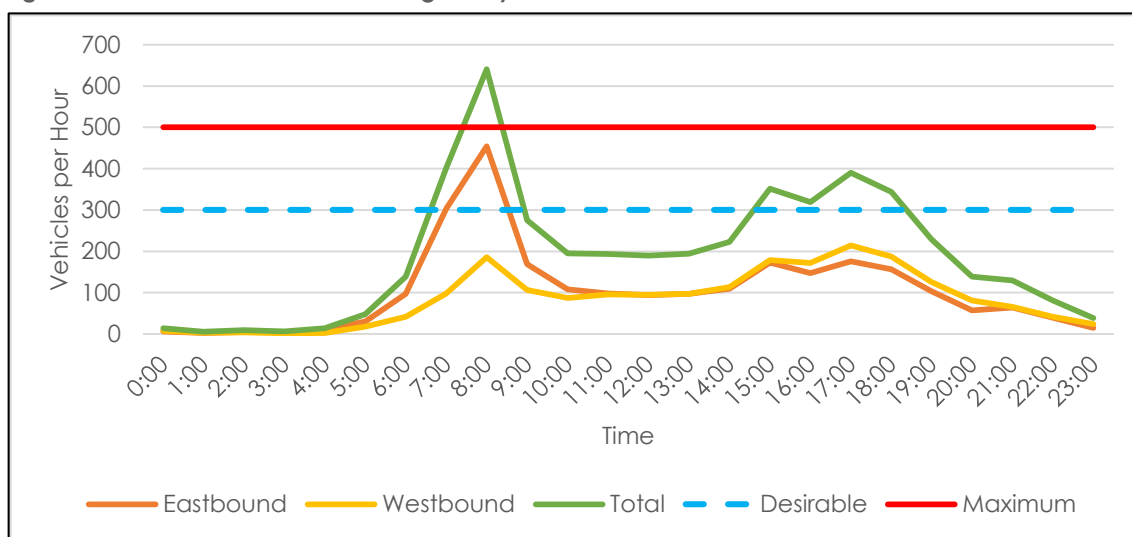
7-day traffic counts were obtained from Marrickville Council for key roads in the study area I to understand the traffic conditions throughout the day and the potential impacts of future traffic generated by additional development. The traffic counts collected between October 2013 and October 2014 have been reviewed in this section.

Constitution Road – between Williams Parade and Grove Street

The profile of the average weekday traffic volumes along Constitution Road, shown in Figure 4.13, indicate that during the morning and afternoon peak periods, the volumes exceed the desirable limit (300 vehicles/ hour) for a Collector Road. In the morning peak hour, between 8:00am and 9:00am, the volumes also exceed the maximum limit (500 vehicles/ hour).

The eastbound volume in the morning peak hour largely contributes to this result and, based on the traffic data available, can be linked to the drop-off period at the primary and secondary schools located in Lewisham. This was confirmed with traffic counts completed over a four-week period in September/ October 2015 on the same road section. The counts included the school holiday period and indicated that morning peak hour volumes during the holiday period were approximately 40% less than during the non-holiday period (i.e. 340 vehicles per hour compared to 600 vehicles per hour).

Figure 4.13: Constitution Road – Average Daily Traffic Volume Profile



Denison Road – between Davis Street and Eltham Street

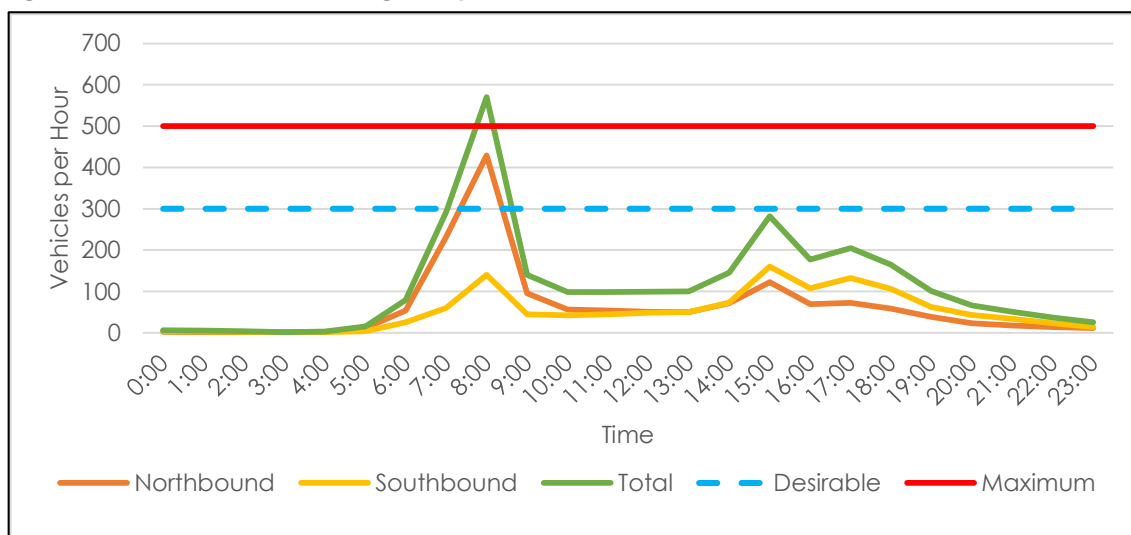
The traffic volume profile along Denison Road, shown in Figure 4.14, also indicates that the morning drop-off period at the primary and secondary schools is the likely contributor towards the peak hour volumes approaching the maximum limit (500 vehicles/ hour). In the September/ October 2015 traffic counts completed along this road section, there were approximately 60% less vehicles on the road in the morning peak hour during the school holiday period than the non-school holiday period (i.e. 200 vehicles per hour compared to 500 vehicles per hour).

The traffic volumes outside the morning peak period are otherwise largely below the desirable limit.

A review of the layout of the local road network illustrates that Denison Road acts as a key north-south road through the study area, linking the residential area to the educational facilities in

Lewisham. As such, the traffic volumes during the school drop-off and pick-up hours are considered acceptable given the function of the road in the study area, however there is need to focus on discouraging unsafe driver behaviour, thus improving pedestrian and cyclist amenity.

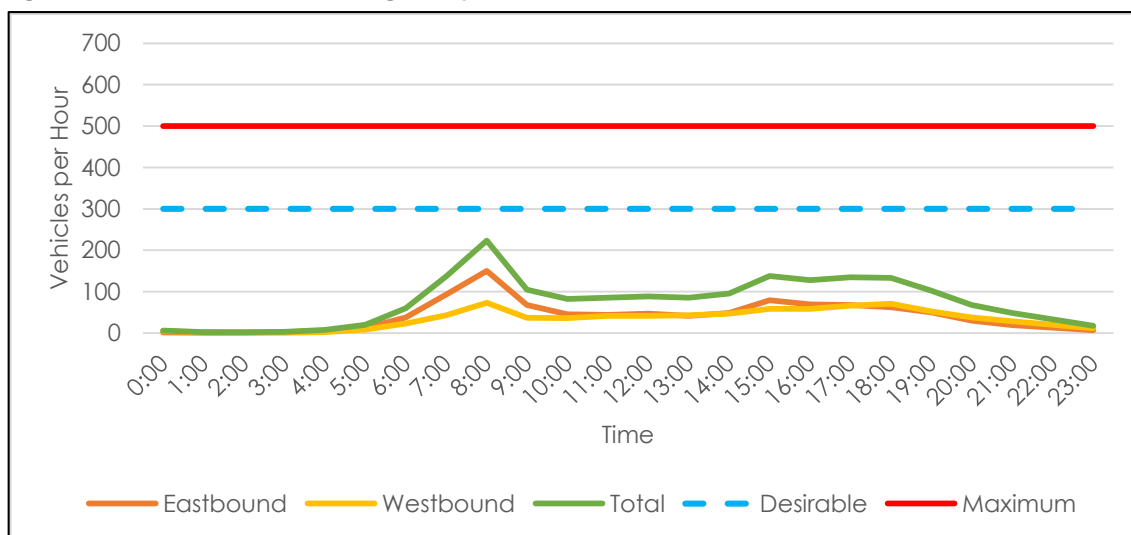
Figure 4.14: Denison Road – Average Daily Traffic Volume Profile



Dulwich Street – Denison Road and New Canterbury Road

The traffic volume profile along Dulwich Street, shown in Figure 4.15, further highlights there is a notable peak demand in the morning that occurs between 8:00am and 9:00am, although the traffic volumes along Denison Road are below the desirable limit.

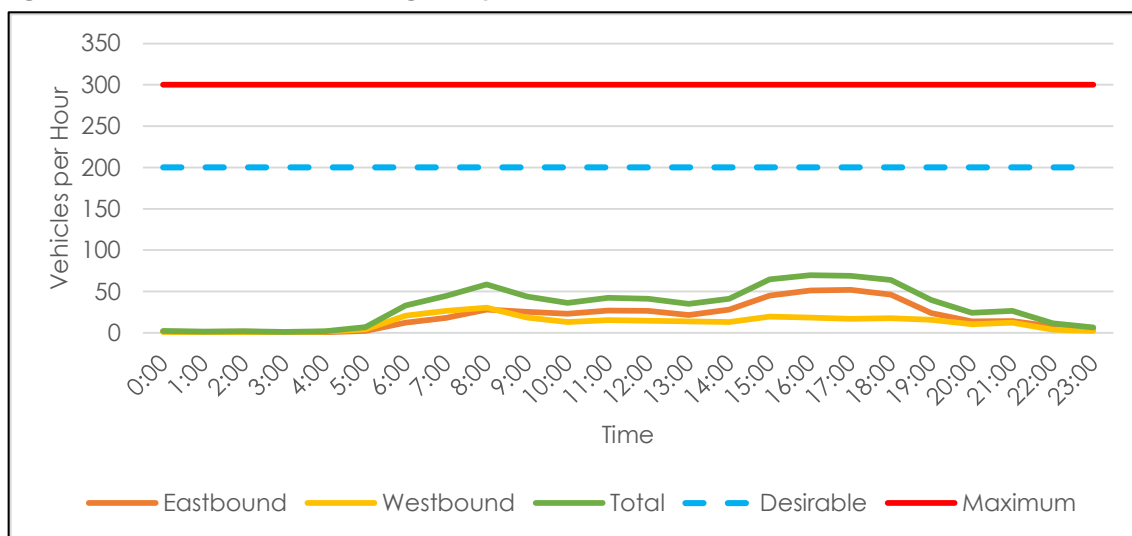
Figure 4.15: Dulwich Street – Average Daily Traffic Volume Profile



Lewisham Street

Lewisham Street has a carriageway width of 7.1 metres, which is not suitable to carry the traffic volumes expected on the 10-metre wide roads that make up a majority of the local road network. The traffic volume profile along Lewisham Street, as shown in Figure 4.16, illustrates this with volumes peaking at 70 vehicles per hour in the evening peak period.

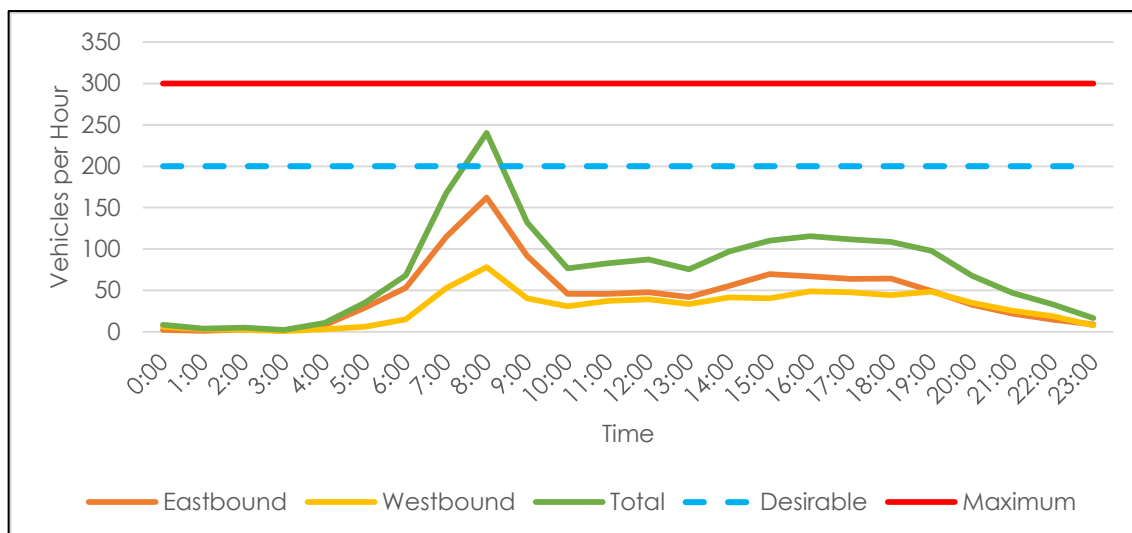
Figure 4.16: Lewisham Street – Average Daily Traffic Volume Profile



Pigott Street

The traffic volume profile along Pigott Street, shown in Figure 4.17, indicates that the road has a similar profile and volumes as Dulwich Street. Like Dulwich Street, Pigott Street provides access to the arterial road network. However, the Pigott Street access to the arterial road network is priority controlled (whereas Dulwich Street access is signalised). This could contribute towards higher volumes in the morning peak hour than Dulwich Street, as drivers experience less delays departing the study area.

Figure 4.17: Pigott Street – Average Daily Traffic Volume Profile



4.7 Summary of Key Traffic and Transport Issues

The key traffic and transport issues in the study area resulting from the assessment of the existing conditions and feedback provided by the community/ stakeholders, have been identified as follows.

4.7.1 Traffic Volumes

- o Constitution Road – carries between 3,100 and 4,300 vehicles per day (vpd), which is above the desirable capacity of a Collector Road (3,000vpd), however below the maximum limit (5,000vpd).
- o Denison Road – carries approximately 2,500 vpd, which is below the desirable capacity of a Collector Road (3,000vpd). However, during the AM peak hour (8:00am to 9:00am) the traffic volumes are above the maximum peak hour limit (500vph).

4.7.2 Traffic Speed

- o The 85th percentile speeds recorded on the following roads marginally exceed the 50km/h speed limit (i.e. by less than 3km/h):
 - o Arlington Street
 - o Dixon Avenue
 - o Dulwich Street
 - o Elizabeth Avenue
 - o Gelding Street.

4.7.3 Crashes

- o There were 19 crashes on the local road network in the study area identified in Section 4.3. Most of the crashes involved a vehicle leaving their travel path on either a straight road (7 crashes) or curve/ turning (3). These crashes occurred twice on Constitution Road, Denison Road and Dulwich Road.

5. Local Area Traffic Management

5.1 Preamble

Local Area Traffic Management (LATM) is concerned with the planning and management of road space usage on local and collector roads, which is primarily the responsibility of local government. LATM often seeks to modify streets and road networks which were originally designed in ways that are now no longer considered appropriate to the needs of residents and users of a local area and/or result in a significant proportion of through traffic.

This section reviews the typology of existing LATM devices in Dulwich Hill North and recommends objectives and principles to guide the delivery of LATM devices.

5.2 LATM Principles

The primary aim of LATM is to change driver behaviour, both directly by physical influence on vehicle operation, and indirectly by influencing the driver's perceptions of what is appropriate behaviour in that street. The objective of LATM is to reduce traffic volumes and speeds in local roads to increase liveability and improve safety and access for pedestrians and cyclists.

LATM involves the use of physical devices, streetscaping treatments and other measures (including regulations and other non-physical measures) to influence vehicle operation in order to create safer and more pleasant roads in local areas.

The need for LATM usually arises from:

- o an intent to reduce traffic-related problems
- o a need to modify transport behaviour
- o orderly traffic planning and management
- o a desire to improve the community space
- o a desire to improve environmental, economic and social outcomes
- o traffic impacts associated with new development.

In addition to the above general principles, it is understood that Marrickville Council are keen to avoid devices which have a significant impact on parking.

5.3 Local Traffic Area Structure

Understanding the distinction between local traffic areas and local traffic precincts is important in determining the extents of LATM treatment areas. The *Guide to Traffic Management Part 8: LATM* (Austroads, 2008) defines local traffic areas as follows:

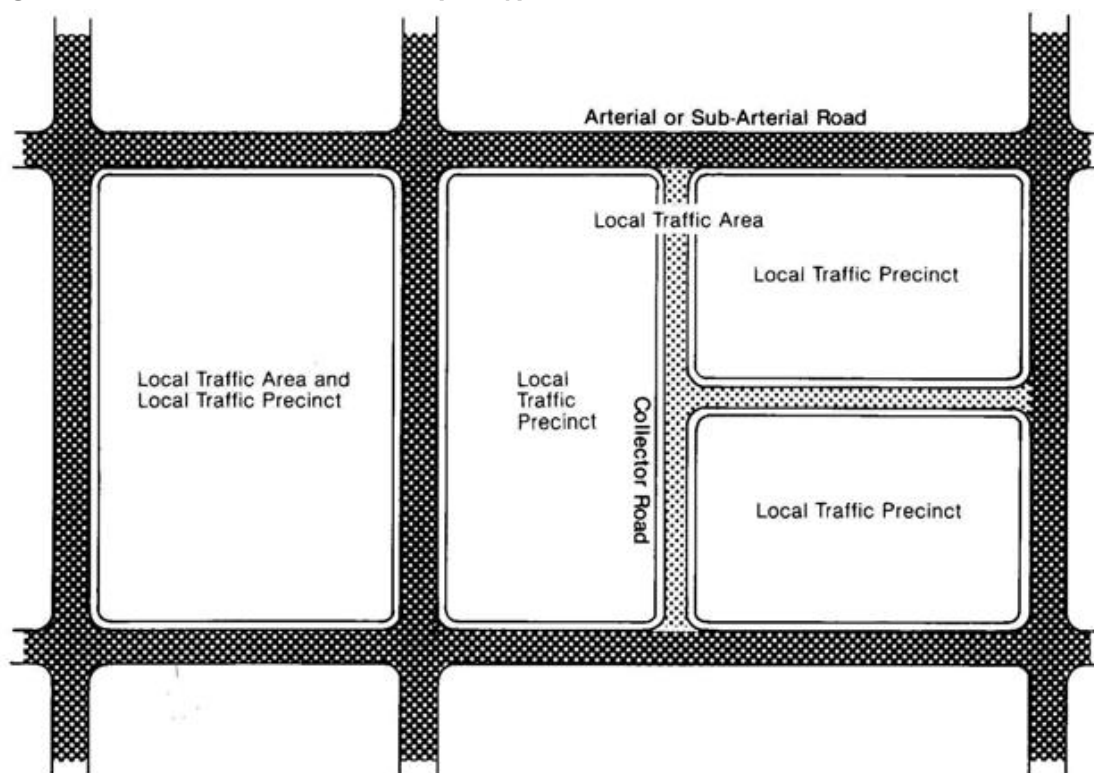
"An urban area containing local and collector roads bounded by arterial and sub-arterial roads or other limiting features." (Commentary 3, pg. 158)

Local precincts are defined as:

"Areas within a local area where specific local problems exist related to the speed of traffic and/or pedestrian crossing difficulties" (Commentary 3, pg. 158)

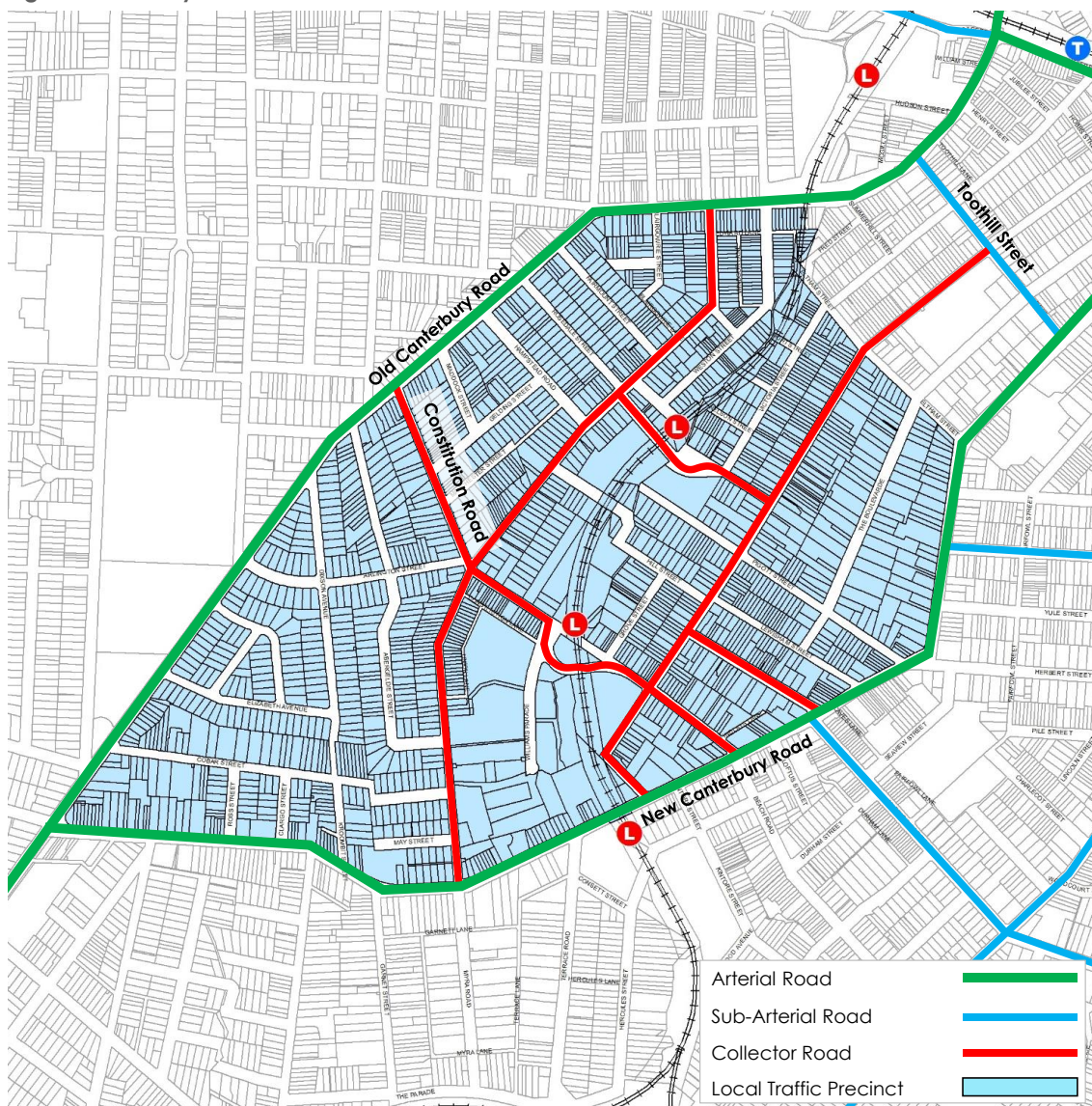
The differences between local traffic areas and local traffic precincts are shown graphically in Figure 5.1, with an overview of the study area provided in Figure 5.2.

Figure 5.1: Local Traffic Areas Structure (Theory)



Source: Austroads Guide to Traffic Management Part 8: LATM

Figure 5.2: Study Area – Local Traffic Area Structure



As previously noted, New Canterbury Road and Old Canterbury Road form the arterial road network through the study area, whilst Constitution Road, Dulwich Street, Denison Road, Davis Street, Windsor Road and Union Street function as collector roads through the study area. The remaining roads within the study area form the local traffic precincts.

The study area contains predominantly residential land uses with retail/ commercial uses along New Canterbury Road. Any LATM devices should seek to control non-residential vehicles using the local roads to bypass the congested arterial road network, namely Denison Road and Constitution Road.

5.4 LATM Treatment Types

An analysis of traffic volumes and speeds, together with input from the stakeholders generally informs the selection of the most suitable traffic control devices.

Two types of control devices are available - regulatory and geometric. Regulatory controls can be used as alternatives to or in addition to the geometric controls where necessary.

5.4.1 Geometric Controls

Geometric controls suitable to LATM schemes include:

- o Road closures
- o Restriction/ channelization
- o T-Intersection priority
- o Thresholds, both at entries and mid-block locations
- o Staggered T-intersection
- o Carriageway narrowing
- o Slow points
- o Road Humps
- o Kerb Extensions
- o Wombat Crossings
- o Roundabouts
- o Medians
- o Pedestrian crossings, refuges/ mid-block islands.

5.4.2 Regulatory Controls

Regulatory signs (Type R e.g. 'Stop' signs) are used to regulate the movement of traffic by indicating where or when a legal requirement applies. Failure to comply with regulatory signs constitutes a traffic offence.

Signage as well as linemarking can be used to regulate traffic movements and/ or calm traffic. It may discourage speeding, prevent vehicle conflicts, and prevent through traffic from short-cutting along a street. The primary aims of signs and linemarking are to aid in the safe and orderly movement of traffic.

5.4.3 Summary of LATM Devices

Table 5.1 provides a summary of typical LATM devices, which has been reproduced from Austroads Guide to Traffic Management Part 8, 2008. The guideline provides a clear indication of the type of treatments available, which issues they best address, and the advantages and disadvantages of each treatment.

Table 5.1: Use of LATM Devices

Measure		Reduce Speeds	Reduce Traffic Volumes	Reduce Crash Risks	Increase Pedestrian Safety	Increase Bicycle Safety
Vertical Deflection Devices	Watt Profile Road Humps	✓	✓	✓	-	-
	Road Cushions	✓	✓	✓	-	✓
	Flat Top Road Humps	✓	✓	✓	-	✓
	Wombat Crossings	✓	✓	✓	✓	✓
	Raised Pavements	✓	✓	✓		✓
Horizontal Deflection Devices	Lane Narrowings/ Kerb Extension	✓	-	-	✓	-
	Slow Points	✓	✓	-	-	-
	Centre Blister Islands	✓	✓	-	✓	-
	Driveway Links	✓	✓	-	✓	✓
	Mid-Block Median Treatments	✓	-	✓	✓	✓
Diversion Devices	Full Road Closure	-	✓	✓	✓	✓
	Half Road Closure	-	✓	✓	✓	✓
	Diagonal Road Closure	-	✓	✓	✓	✓
	Modified 'T' Intersection	✓	✓	✓	✓	✓
	Left-In/ Left-Out Islands	-	✓	✓	✓	-
Other treatments	Marked Pedestrian Crossings	-	-	✓	✓	✓
	Threshold Treatments	✓	✓	✓	-	✓
	Tactile Surface Treatments	✓	-	-	-	-
	Bicycle Facilities	-	-	✓	-	✓


Source: Reproduced from Austroads – Guide to Traffic Management Part 8: Local Area Traffic Management

5.5 Existing LATM Treatment Examples

The study area contains a number of existing LATM devices, including turn bans, road humps, road narrowings, pedestrian crossings, roundabouts, kerb extensions etc.

A summary of the various devices provided in Table 5.2.

Table 5.2: LATM Devices Typology in Dulwich Hill

Existing LATM Devices within the Study Area	
<p>Roundabouts</p> <p>A roundabout is an effective form of intersection control and reduces the relative speeds of conflicting vehicles by providing impedance to all vehicles entering the roundabout.</p> <p><i>Example: Constitution Road and Williams Parade</i> (Aerial photo source: NearMap)</p>	

Existing LATM Devices within the Study Area

Turn Bans

Turn bans are designed to restrict “rat running” though local traffic precincts from the arterial road network. Compliance with turn bans can be variable where no physical restriction is provided.

Example:

Right turn from Old Canterbury Road into Cobar Street

**Road Hump**

A watts profile road hump is a speed reduction device with a curved profile extending across the roadway. Road humps are typically 70mm to 120mm high with a total length of 3m to 4m.

Example: Dulwich Street

**Road Narrowings**

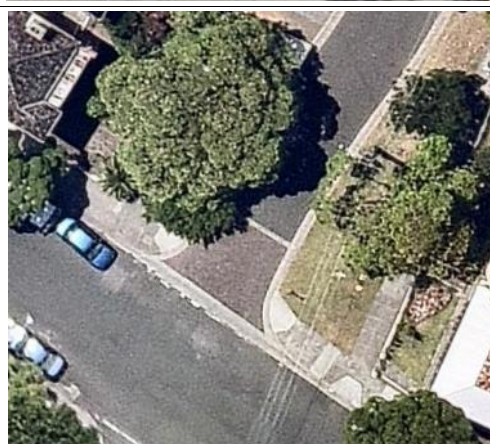
Lane narrowings involves narrowing of the trafficable carriageway to reduce speeds and improve delineation.

Example: The Boulevarde

**Pavement Treatments and Kerb Extensions**

Pavement treatments are generally provided to alert vehicles of an upcoming conflict such as on a minor approach at an intersection or where there might be an increased pedestrian presence. The kerb extensions narrow the trafficable carriageway, reducing vehicle speeds, improving delineation and minimising pedestrian crossing distances.

Example: The Boulevarde at Pigott Street
(Aerial photo source: NearMap)



Existing LATM Devices within the Study Area

Pedestrian Refuge Islands

Pedestrian refuge islands provide a safe crossing point for pedestrians and can be combined with a number of LATM devices including kerb extensions.

Example: Constitution Road



Pedestrian Zebra Crossing (Wombat / Zebra)

Wombat crossings are generally in the form of a flat top road hump with a marked pedestrian crossing on the raised flat surface. Standard pedestrian zebra crossings are not raised.

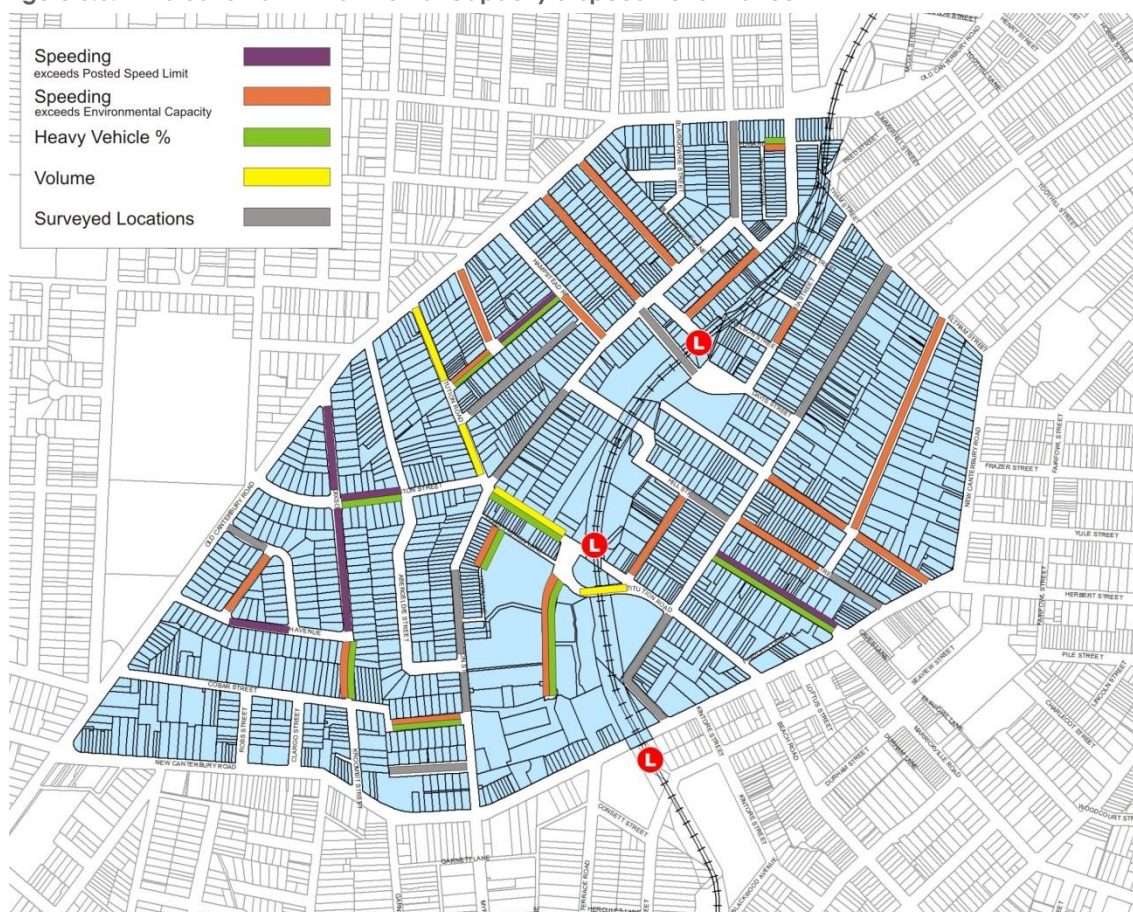
Example (Wombat): Davis Street
(Aerial photo source: NearMap)



5.6 Review of Existing LATM Effectiveness

As discussed in Section 4.2, a review was completed of the effectiveness of existing LATM devices, based on the findings of the traffic and speed assessment. The results are reproduced in Figure 5.3.

Figure 5.3: Evaluation of Environmental Capacity & Speed Performance



5.6.1 Speed Control Devices

Most devices are working effectively by maintaining vehicle speeds below the posted speed limit, with the exception of the road hump on Dulwich Street. The 85th percentile speed on Dulwich Street is above the posted speed limit, indicating that the road hump is not working effectively to slow drivers along the road (or is not sufficient on its own). It is noted that two road humps were previously recommended on Dulwich Road, however following community consultation, only one was installed.

It is noted that all other road sections in the study area with 85th percentile speeds above posted speed limit do not currently have any LATM devices installed. These include:

- Arlington Street
- Dixon Avenue
- Elizabeth Avenue
- Gelding Street.

The 85th percentile speed along The Boulevard between Eltham Street and Pigott Street was 48km/h. This section of road is 6.4m wide with a horizontal curve, however there is no kerbside parking. Although the traffic speed is below the posted speed limit, the speed is significantly above the environmental target maximum speed of 40km/h.

Lewisham Street by comparison, which has a slightly wider carriageway (7.2m wide) but provides kerbside parking on both sides, recorded an 85th percentile speed of 37km/h. This result demonstrates the effectiveness of providing narrow carriageways while maintaining kerbside parking on both sides that limits visibility, thus vehicles travel at reduced speeds. It is noted, however, that this cross-section is only considered appropriate for roads with low traffic volumes (less than 1,000 vehicles per day).

5.6.2 Restricted Access from Arterial Road Network

Currently, there is direct access to the arterial road network from all local roads within the study area adjacent to New Canterbury Road and Old Canterbury Road. This is contrary to the theory that access to an arterial road network should be limited, where possible, to local collector roads.

As such, a combination of permanent and peak period turn bans are applied at a number of intersections along New Canterbury Road to limit the through traffic impact of vehicles turning into local roads.

Community feedback, along with site observations, indicates that vehicles are disregarding existing turn bans, in particular, time-restricted turn bans.

To quantify the number of drivers that disregard existing turn bans, traffic movement counts were completed at the New Canterbury Road intersections with Pigott Street and with Lewisham Street for two hours during the weekday AM and PM peak periods.

A 'No Right Turn' restriction is applied for southbound traffic on New Canterbury Road at Pigott Street during the weekday PM peak period (3:00pm to 7:00pm Monday to Friday), as shown in Figure 5.4.

Figure 5.4: 'No Right Turn' restriction – New Canterbury Road into Pigott Street



The Pigott Street intersection is located in close proximity to a bend in New Canterbury Road that limits the available sight distance between an approaching vehicle and a turning vehicle; a factor that would have contributed to the implementation of the turn ban.

A review of crashes at the New Canterbury Road/ Pigott Street intersection indicates that, between June 2008 and 2013, there were five crashes at the intersection:

- Two rear-end crashes involving three vehicles, one crash in each direction
- A northbound vehicle in the kerbside lane changing lanes into a vehicle in the centre lane
- A vehicle turning right into Pigott Street colliding with a vehicle travelling northbound
- A vehicle turning right out of Pigott Street colliding with a vehicle travelling northbound.

Based on the above, there has been one crash that involved a vehicle turning right into Pigott Street. The crash occurred in 2008 at 6:30am.

As a result of the weekday PM peak period right turn restriction at Pigott Street, southbound vehicles are required to turn right at Lewisham Street to access the study area. Lewisham Street is located approximately 85m south of Pigott Street, with a signalised mid-block pedestrian crossing located between the two intersections.

The traffic counts indicate that during the AM peak period, there were 69 vehicles that turned right into Pigott Street. This is compared to 16 vehicles that turned right into Lewisham Street. The opportunities created by the activation of the signalised mid-block pedestrian crossing would contribute to the higher use of Pigott Street. However, the activation would also result in northbound queuing through the intersection with Lewisham Street, restricting right turn access.

In the PM peak period, when the right turn movement is banned, 36 vehicles disregarded the restriction and turned into Pigott Street. There were 71 vehicles that turned right into Lewisham Street during the same period. The high portion of vehicles that disregarded the restriction could be a result of drivers taking gap opportunities in northbound traffic flows, particularly when the mid-block pedestrian crossing was activated.

6. Future Traffic Conditions

This section determines the future traffic conditions resulting from anticipated development in the study area, noting that this is based on future land use targets set out in the 'Marrickville Section 94/94A Contributions Plan 2014' prepared by Council.

There are other major transport infrastructure projects, such as the WestConnex and Sydney Metro projects and resulting Urban Renewal Corridor studies that would influence the broader future traffic conditions, however have not been considered in detail as part of this study. Details regarding these projects are discussed in Section 6.4.

6.1 Projected Floor Area and Jobs Growth

Future residential dwelling targets for each Sydney Local Government Area (LGA) are set out in the Metropolitan Plan for Sydney 2036 and the Draft South Subregional Strategy prepared by the Department of Planning and Infrastructure (now Department of Planning and Environment). In this regard these documents set out an additional dwelling target of 4,150 dwellings for the Marrickville LGA to 2031 (+16 years).

Subsequent to the above, Marrickville Council has identified future land use targets (residential and employment) for each suburb in the LGA in the 'Marrickville Section 94/94A Contributions Plan 2014'.

Non-Residential Land Uses

The projected change in worker population by suburb is provided in Table 6.1. The projected floor area changes are also included in the table and are based on the floor area to employee assumptions provided in the report.

Table 6.1: Future Non-Residential Land Use Forecasts (+16 years)

Suburb	Worker Population			Floor Area Change [1] (sq.m)		
	Commercial	Industrial	Retail	Commercial	Industrial	Retail
Marrickville	+305	-37	+231	+6,100	-3,700	+4,620
Dulwich Hill	+99	-50	+185	+1,980	-5,000	+3,700
St Peters	+766	-237	+667	+15,320	-23,700	+13,340
Petersham	0	-33	0	0	-3,300	0
Lewisham	-26	-101	0	-520	-10,100	0
Sub-Total	+1,143	-458	+1,085	+22,860	-45,800	+21,700
Total	+1,770			-1,240		

[1] Commercial = 1 employee per 20sq.m, Industrial = 1 employee per 100sq.m, Retail = 1 employee per 20sq.m

Table 6.1 indicates a net change of 1,770 additional employees in the Marrickville LGA and a net reduction of 1,240sq.m non-residential floor area. Specifically the data indicates an increase of 234 jobs and a net increase of 680sq.m non-residential floor area in Dulwich Hill.

It is envisaged that the additional commercial floor area will be distributed amongst the existing non-residential areas provided within the study area.

Residential Land Uses

The projected change in the number of dwellings by suburb is provided in Table 6.2.

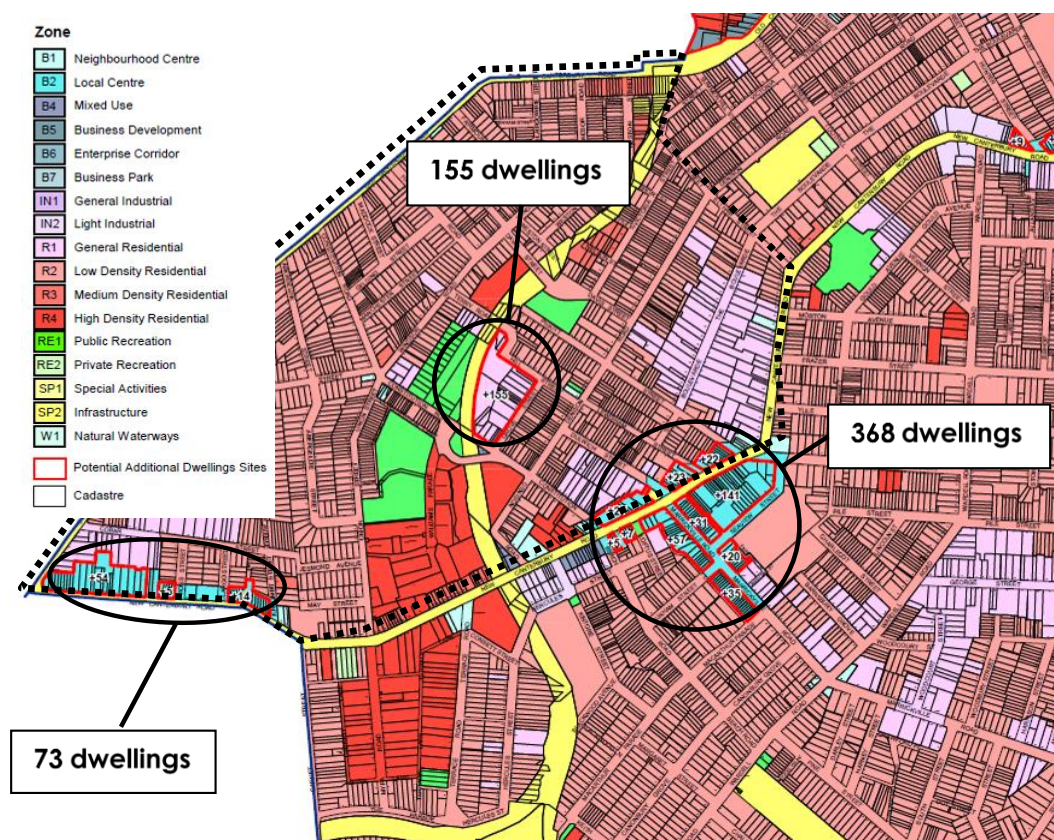
Table 6.2: Future Residential Dwelling Land Use Forecasts (+16 years)

Suburb	Additional Dwellings [1]
Dulwich Hill	604
Lewisham	452
Petersham	672
Marrickville	1,722
Sydenham	7
Tempe	0
Mascot	0
St Peters	450
Enmore	58
Stanmore	56
Camperdown	15
Newtown	342
Total	4,378

[1] Excludes a total of 610 secondary and subdivision dwellings.

Table 6.2 indicates that some 4,378 additional dwellings (4,988 dwellings when secondary and subdivision dwellings are included) are anticipated for the Marrickville LGA, including 604 dwellings in Dulwich Hill. The anticipated distribution of additional residential dwellings is defined in the Marrickville LEP 2010 and illustrated in Figure 6.1. It is noted that the Marrickville LEP 2010 had identified a total of 655 additional dwellings in Dulwich Hill, of which 596 dwellings are in Dulwich Hill North. This is more than anticipated for Dulwich Hill in the Marrickville Section 94/94A Contribution Plan 2014 (604 dwellings).

Figure 6.1: Forecast Additional Residential Dwellings



6.2 Traffic Generation

In order to determine the likely additional traffic generation from each of the development precincts reference has been made to traffic generation rates set out in the RMS Guide to Traffic Generating Developments (October 2002 and the Technical Direction August 2013).

In this regard the following daily traffic generation rates have been adopted for the future assessment:

- Residential: 4 trips per dwelling
- Office: 11 trips per 100sq.m GFA
- Retail: 55 movements per 100sq.m GFA

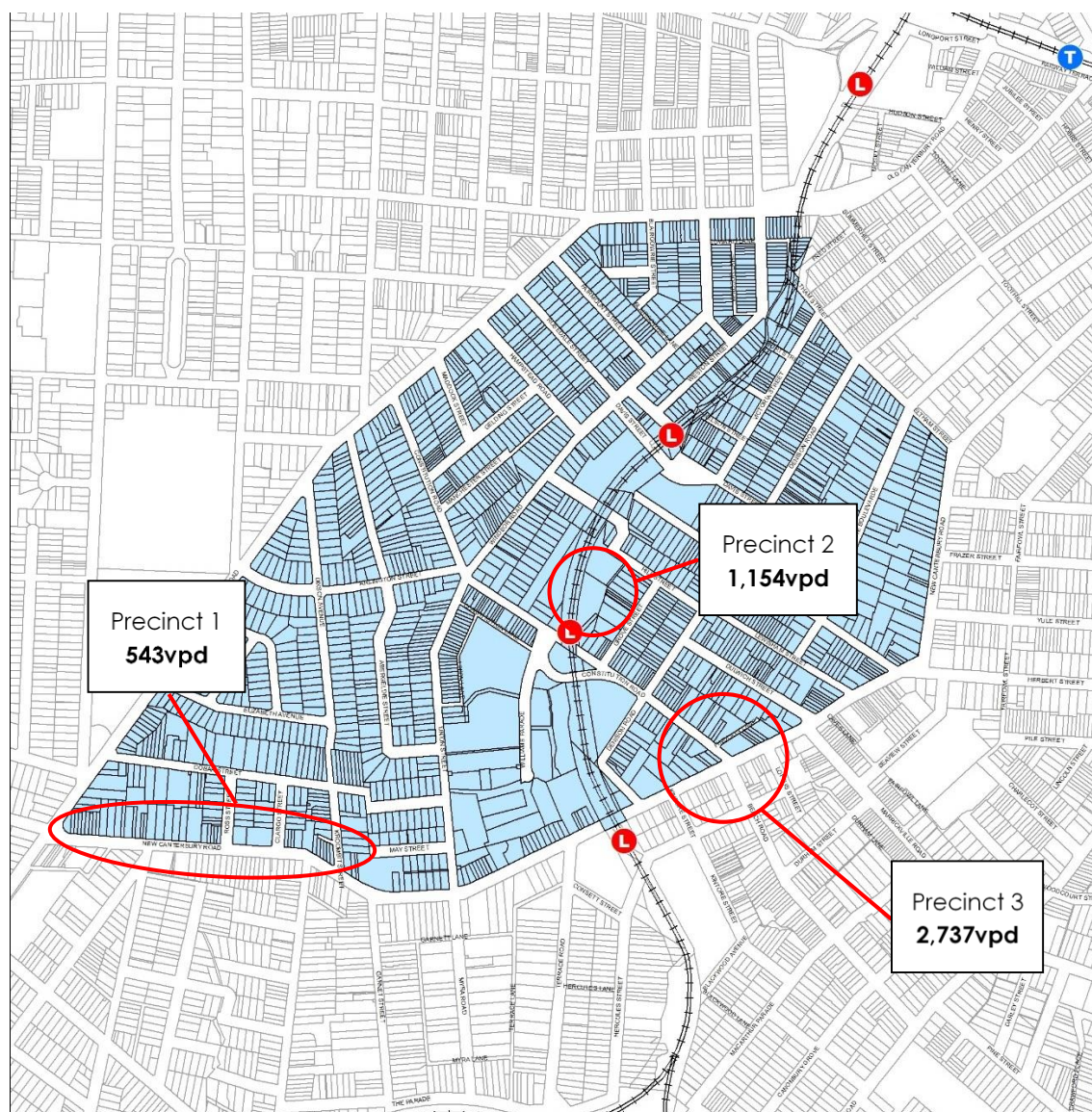
The above traffic generation rates have then been applied to the forecast future land uses for each of the development precincts. The anticipated future traffic generation estimates are presented in Table 6.3.

Table 6.3: Additional Daily Traffic Movements by Development Area / Precinct (+16 years)

Precinct	Residential Dwellings	Office Floor Area [1]	Retail Floor Area [1]	Additional Daily Traffic Generation (veh/day)			
				Residential	Office	Retail	Total
Precinct 1	73	221sq.m	412sq.m	292	24	227	543
Precinct 2	155	469sq.m	876sq.m	620	52	482	1,154
Precinct 3	368	1,112sq.m	2,079sq.m	1472	122	1,143	2,737
Total	596	1,802sq.m	3,367sq.m	2,384	198	1,852	4,434

[1] A proportion of the 3,700sq.m of Retail and 1,980sq.m of Commercial shown in Table 4.1 and distributed proportionately to the dwelling distribution.

Table 6.3 indicates that 4,434 additional vehicle movements are anticipated to be generated across the three development precincts.

Figure 6.2: Anticipated Additional Daily Traffic Generation (+16 years)

6.3 Future Impact Assessment

As shown in Figure 6.2, Precincts 1 and 3 are locations on the perimeter of the study area fronting New Canterbury Road (State Road). Even though vehicle access to these developments will likely be provided from the side roads it is anticipated that the majority of traffic generated will travel directly to New Canterbury Road and have minimal impact on the local road network.

Traffic generated by Precinct 2, located at the centre of the study area would predominately use the roads to the east of the site, namely Lewisham Street, Dulwich Street, Constitution Road and Denison Road, to access the arterial road network.

For the purposes of estimating vehicle movements, the directional distribution of the Precinct 2 traffic generation accessing the arterial road network has been assumed as follows:

- o Lewisham Street – 20%
- o Dulwich Street – 30%
- o Constitution Road (East) – 30%
- o Denison Road (North) – 20%.

It has also been assumed that access to Precinct 2 would be via Hill Street given the road is a no through road, have no through traffic.

Based on the above the increase in daily traffic volumes on the local road network is shown in Figure 6.3, with the future traffic volumes summarised in Table 6.4.

Figure 6.3: Additional Traffic Volumes from Precinct 2

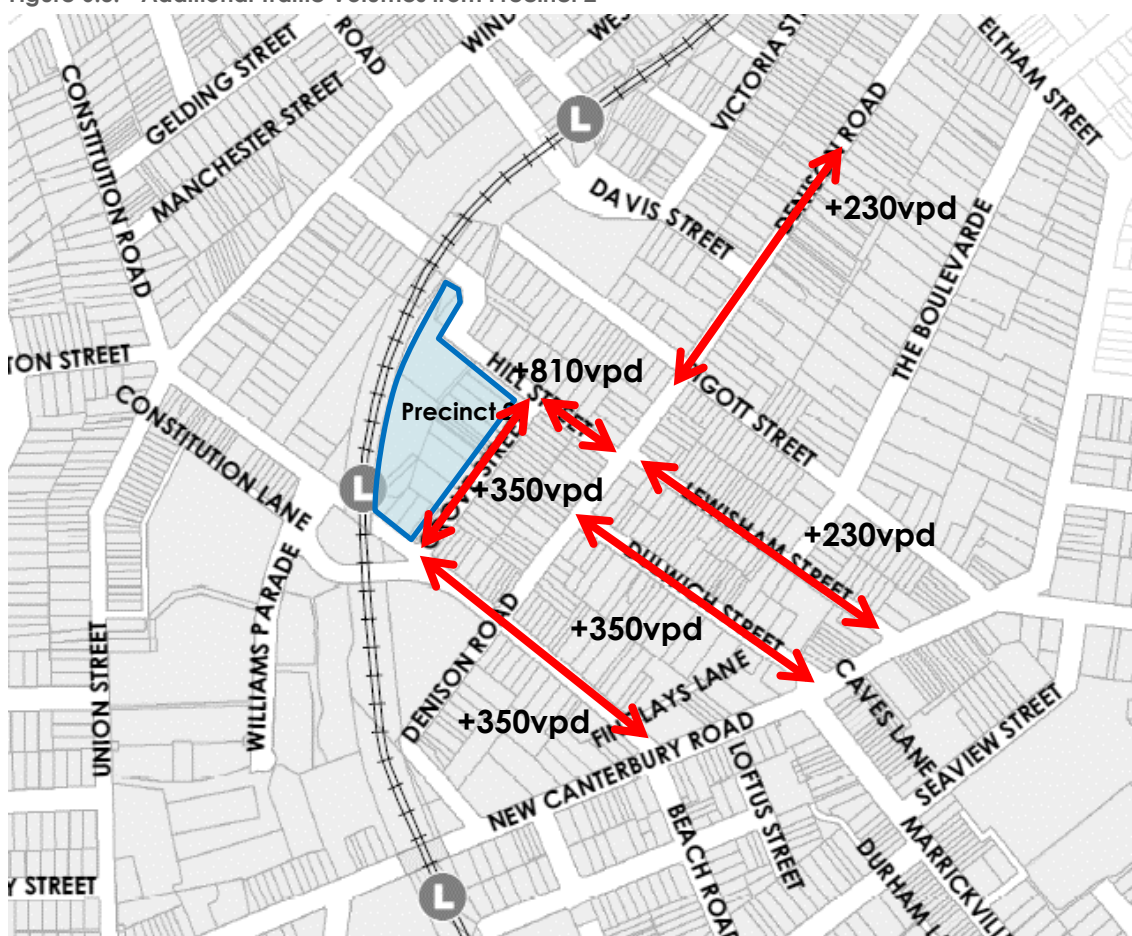


Table 6.4: Future Midblock Capacity

Road Sections	Environmental Capacity (vpd)	Daily Traffic Volumes (vpd)			Traffic Growth (%)
		Existing	Additional	Future	
Hill Street btw Grove Street and Denison Road	2,000-3,000	310	+810	1,120	361%
Grove Street btw Hill Street and Constitution Road	2,000-3,000	190	+350	540	284%
Lewisham Street btw Denison Road and New Canterbury Road	2,000-3,000	490-740	+230	720-970	131%-147%
Dulwich Street btw Denison Road and New Canterbury Road	3,000-5,000	1,720	+350	2,070	120%
Constitution Road btw Grove Street and New Canterbury Road	3,000-5,000	~4,300 [1]	+350	~4,650	108%
Denison Road btw Hill Street and New Canterbury Road	3,000-5,000	2,510	+230	2,740	109%

[1] No traffic data is available along this section of Constitution Road. The traffic volume presented is based on data collected between William Parade and Grove Street, which is expected to be higher than volumes east of Denison Road.

Table 6.4 indicates the traffic generated by Precinct 2 would result in a significant increase in traffic on the roads adjacent to the site (Hill Street by 361% and Grove Street by 284%). The existing traffic volumes largely contribute to the growth. Further from the Precinct, the growth ranges from 147% (Lewisham Street) and 108% (Constitution Road).

Notwithstanding, the future daily traffic volumes would remain within the desirable environmental limits along all affected roads, with the exception of Constitution Road. The volumes on Constitution Road would be within 10% of the maximum limit.

6.4 Other Influences on Future Traffic Conditions

6.4.1 WestConnex

The 33 kilometre WestConnex road project will link the M4 Motorway (Parramatta) and the M5 Motorway (Kingsgrove) via a new link tunnel between Haberfield and St Peters, when completed in 2023.

The project is expected to improve travel efficiency along the route, thus remove through traffic from local areas, such as through Dulwich Hill (New Canterbury Road and Old Canterbury Road).

6.4.2 Sydney Metro

The Sydney Metro rail project will connect North West Sydney (Hills District) with South West Sydney (Bankstown) via Sydney CBD, when in operation by 2024. The Metro line incorporates the existing Bankstown heavy rail line, which services Dulwich Hill Station.

The Metro Line will further improve traffic conditions in local areas, such as Dulwich Hill, by providing high frequency train services, with capacity for up to 30 train services an hour (each direction) through the CBD.

6.4.3 Urban Renewal Corridors

The WestConnex and Sydney Metro projects have resulted in Urban Renewal Corridor studies that look at opportunities to increase housing density, employment and connectivity within walking distance of the transport corridors. In this instance, the studies are concentrated along Parramatta Road and the Bankstown line (Sydenham to Bankstown).

The Dulwich Hill Precinct being investigated for Urban Renewal, largely comprises the land south of and along New Canterbury Road, with the vision to include a combination of low, medium and medium-high rise housing, as well as shop top housing along main roads.

7. Identified LATM Measures for Dulwich Hill

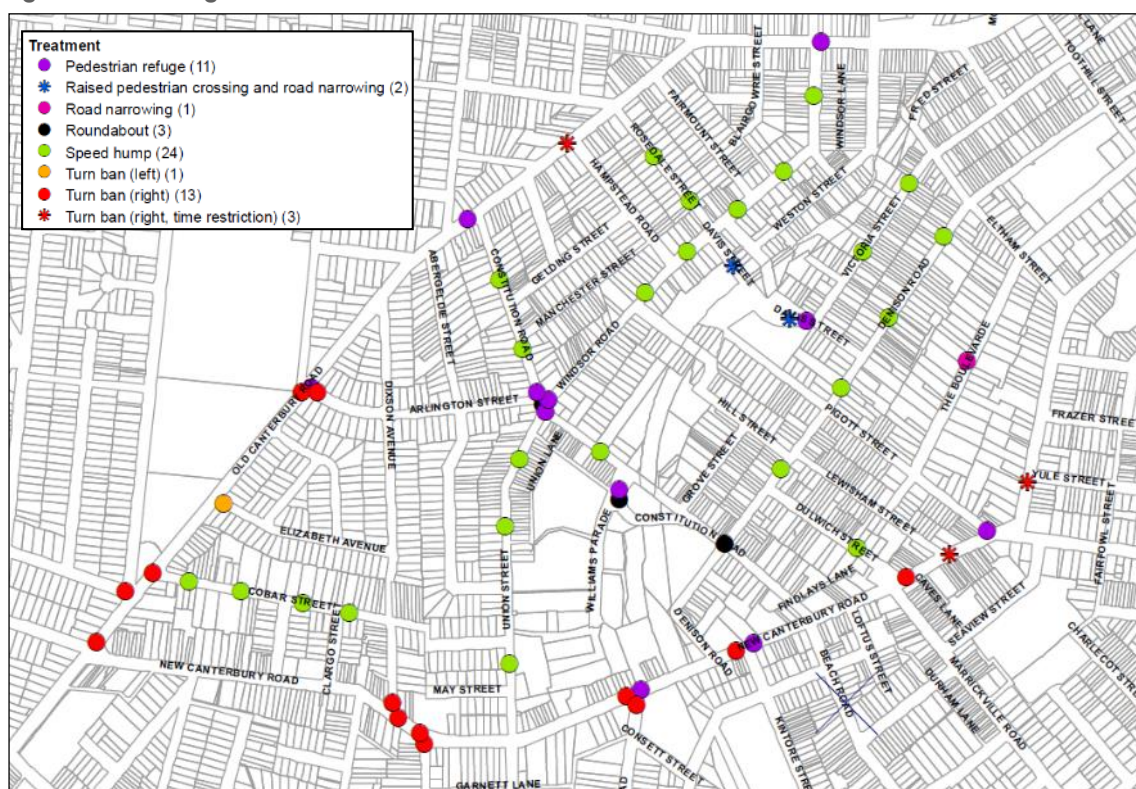
7.1 Introduction

This section suggests LATM measures to address existing and potential future issues in the study area, in order to further improve safety and accessibility within Dulwich Hill North.

7.2 Review of Existing LATM Conditions

A review was completed of all LATM devices in the Dulwich Hill North study area to understand the maintenance requirements for each device. The location of the existing LATM devices has been reproduced in Figure 7.1.

Figure 7.1: Existing LATM devices



The findings of the review of existing LATM conditions are as follows:

- There are several traffic and parking signs that have faded over time or been damaged/ removed.
- Most existing pedestrian refuge islands are less than the current minimum width requirement of RMS TDT 2011/01a (2.0 metres). It is however noted that the islands were constructed before the minimum width requirement was updated and to accommodate large vehicle turning movements in an otherwise constrained environment (available carriageway width).
- Painted median islands are used on approaches to the existing Denison Road roundabouts at Constitution Road and Eltham Street to maintain access through the intersection for large vehicles (garbage and removalist trucks) in an otherwise

constrained environment (available carriageway width). However, the painted islands are not suitable for pedestrians to stage a crossing at the intersections. It is noted that the roundabouts do not meet current guidelines, in particular the approach deflection angles, thus restricting the ability to provide pedestrian facilities.

- There are several road humps and raised pedestrian crossing facilities that have faded linemarking or missing/ damaged advisory signs, creating a safety hazard for drivers in low light conditions.

As such, as part of Council's maintenance works, it is recommended that all faded, damaged or missing traffic and parking signs be replaced through the study area.

Additionally, it is recommended that the location of 'No Stopping' signs be inspected by Council's maintenance works team to ensure the signs are positioned to include property driveways where applicable, thus discouraging parking in front of driveways. An example of where this issue is occurring is on Frazer Street, approaching New Canterbury Road. The 'No Stopping' sign has been attached to a power pole west of the driveway to House No. 6. On several occasions vehicles have been noted parking in front of the driveway, restricting property access.

The key maintenance works required is for the road humps and raised pedestrian crossings. The maintenance requirements for these vertical deflection devices are detailed in Table 7.1.

Table 7.1: Existing Road Humps and Pedestrian Crossings Condition Review

Street	Location	Maintenance Required
Constitution Road	between Old Canterbury Road & Gelding Street	Remark linemarking. Replace advisory signs on south approach.
	between Manchester Street & Windsor Road	Remark linemarking. Replace advisory signs on north approach.
Rosedale Street	north of Windsor Road	Replace advisory signs on north approach.
Cobar Street	between Old Canterbury Road & Clargo Street (3 road humps)	Remark linemarking. Replace advisory signs on west approach.
	between Clargo Street & Dixon Avenue	Remark linemarking.
Windsor Road	between Fairmount Street & Rosedale Street	Replace advisory signs on both approaches.
	between Hampstead Road & Terry Road	Replace advisory signs on south approach.
Union Street	Between Constitution Road & Abergeldie Street	Remark linemarking.
	between Jesmond Avenue & May Street	Remark linemarking. Trim tree branches covering advisory signs on north approach.
Davis Street	east of Windsor Road	Replace advisory signs on north approach.
Victoria Road	between Nelson Street & Little Street	Remark linemarking. Replace advisory signs on south approach.
	between Short Street & Eltham Street	Remark linemarking. Trim tree branches covering advisory signs on south approach.
Denison Road	south of Eltham Street	Replace advisory signs on north approach.
	between Davis Street & Pigott Street	Replace advisory signs on north approach.
	between Hill Street & Dulwich Street	Trim tree branches covering advisory signs on south approach.
Dulwich Street	between Denison Road & New Canterbury Road	Replace advisory signs on east approach.

7.3 LATM Measures Reviewed

This section reviews the key LATM measures that have been considered for the study area. Table 7.2 presents a review of the advantages/ disadvantages of each measure considered.

Table 7.2: Review of Potential LATM Measures

LATM Measure	Advantages/ Opportunities	Disadvantages/ Constraints
Marked parking lanes	<ul style="list-style-type: none"> Visual narrowing of roadway Clear defined parking areas Encourages vehicles to park closer to the kerb Inexpensive 	<ul style="list-style-type: none"> Additional cost for linemarking maintenance
Mixed traffic bicycle treatment (bicycle symbols)	<ul style="list-style-type: none"> Improved accessibility/ connectivity of bicycle network Improved awareness of cyclists on roadway Compatible with other LATM devices Maintains kerbside parking Inexpensive 	<ul style="list-style-type: none"> No separation between user groups Less safe than separated treatment Additional cost for bicycle symbol maintenance
On-road separated bicycle facility	<ul style="list-style-type: none"> Separation from other user groups Increased cyclist safety Improved accessibility/ connectivity of bicycle network Narrowed road width Visibly promotes use of alternative transport modes 	<ul style="list-style-type: none"> Expensive Not always compatible with other LATM devices Loss of kerbside parking for roads less than 12.8m wide Inefficient for lower bicycle volumes
Single lane slow point	<ul style="list-style-type: none"> Reduction in vehicle speeds Discourages through traffic through increased delays and driver effort Minimum inconvenience on local residents Opportunity for landscaping 	<ul style="list-style-type: none"> Restricts emergency vehicle speeds Typical loss of kerbside parking Squeeze point and increased conflict between vehicles and bicycles (bicycle bypasses can be provided)
Lane narrowing/ kerb extension	<ul style="list-style-type: none"> Shortened pedestrian crossing distance Improved inter-visibility between pedestrians and vehicles Reduction in vehicle speeds Opportunity for landscaping Less impacts on emergency vehicles Less disruptive to local traffic 	<ul style="list-style-type: none"> Typical loss of kerbside parking (when located mid-block) Squeeze point and increase conflict between vehicles and bicycles Ineffective at reducing speed if used alone Restricts (or constrains) commercial and emergency vehicle access (when located at intersections)

LATM Measure	Advantages/ Opportunities	Disadvantages/ Constraints
Modified T-Intersection (no change in priority)	<ul style="list-style-type: none"> Similar principle to kerb extensions Reduction in vehicle speeds Opportunity for landscaping Less impacts on commercial and emergency vehicles when designed appropriately Less disruptive to local traffic 	<ul style="list-style-type: none"> Expensive Typical loss of kerbside parking (when located mid-block) Squeeze point and increase conflict between vehicles and bicycles
Vertical deflection devices (raised pavement, road humps, flat top road humps or road cushions)	<ul style="list-style-type: none"> Significant reduction in vehicle speeds Reduced speeds for entire length of road if used in a series Discourages through traffic through increased travel time and reduced ride comfort 	<ul style="list-style-type: none"> Increased traffic noise level (braking, acceleration and suspension noise) Potential diversion of traffic to surrounding streets without LATM measures Comfort for vehicle passengers and cyclists Potentially mistaken for a raised pedestrian crossing facility
One-way road sections	<ul style="list-style-type: none"> Widen Footpaths (section or at intersections) Introduction of angled parking Control of traffic volumes (~50% less) 	<ul style="list-style-type: none"> Redistribution of one direction of traffic to surrounding roads Ineffective at reducing speed (can often increase) as there is no two-way flow friction Restricts emergency vehicle access
Angled parking	<ul style="list-style-type: none"> Increase on-street parking Shift traffic lanes by alternating sides Reduced carriageway width 	<ul style="list-style-type: none"> 12.8m road width required for 90-degree parking (majority of roads in study area are ~10m) Spaces constrained by separation of driveway crossovers Difficult to implement on roads with significant cross-falls and/or high kerbs Light pollution from headlights projecting into properties in low light as vehicle is perpendicular to house Air pollution from exhaust fumes directly onto footpath when vehicles reverse park

7.3.1 One-Way Road Conversion

A one-way road section has two key benefits; the potential to reduce any rat-running activities (by limiting connectivity) and the potential to include angled parking, thus increasing existing on-street supply.

This study determined that there is high traffic volumes experienced during the morning peak hour (8:00am to 9:00am) on several roads in the study area, particularly Constitution Road and Denison Road. However, for the majority of the day, the traffic conditions are within desirable limits, thus do not justify impact of one-way treatments.

Notwithstanding this, the suitability of the roads in the study area for one of the key benefits of one-way road sections, angled parking, has been reviewed. The Australian Standards Parking Facilities Part 5: On-Street Parking indicates that for a one way road in a residential area (low turnover), the minimum widths required for angled parking are as follows:

- o 30-degree parking: 8.6m
- o 45-degree parking: 10.4m
- o 60-degree parking: 11.8m
- o 90-degree parking: 12.6m.

The majority of the roads in the study area, including Denison Road and Constitution Road, are less than 10.4m, therefore are only suitable for 30-degree parking. However, the proximity of property accesses along these roads restricts the number of angled spaces achievable.

Existing on-street car parking conditions indicate that there is typically adequate supply to cater for existing demand, which is largely residential demand (noting increase in demand at select locations during school peak periods).

On the above basis, converting roads in the study area (such as Denison Road) to one-way to increase parking supply would not be able to achieve the intended outcome. However, for the purposes of this study, this option has been further considered for selected roads in the study area.

7.4 Tomorrow's Dulwich Hill – Stakeholder Group Options Testing

A consultation session was held with the Denison Road Group on 26 November 2015 to workshop parking options for Denison Road. The Denison Road Group are a group of residents that have been campaigning for improved traffic and parking conditions along Denison Road, which functions as collector road within the study area.

The session further reiterated that the key issue experienced along Denison Road is vehicle speed and volume during the morning peak hour. When combined with the relatively narrow carriageways (approx. 10m wide including parking), the conditions make it difficult for the residents to reverse out of their properties, access their vehicles parked on-street, as well as cross the road safely. Members of the Denison Road Group related experiences with incidents and near-misses along the road (both themselves and neighbours).

The workshop was an opportunity for GTA Consultants and Council to inform the Denison Road Group of the LATM options that had been identified for the road and corresponding benefits and implications.

The workshop identified the following LATM measures as preferred options to reduce traffic volumes along Denison Road and in the study area generally, as a staged approach:

- 'No Right Turn' restriction on Old Canterbury Road at Constitution Road
- Peak period 'No Left Turn' restrictions on New Canterbury Road at Denison Road and Dulwich Street
- Linemarking of parking lanes and on-road bicycle symbols
- Intersection priority changes along Denison Road at Dulwich Street and Pigott Street
- Kerb extensions at intersections with rain gardens
- Improve effectiveness of existing road humps
- Single lane slow points
- Road closure of Denison Road.

Another key outcome of the workshop was the support for trialling LATM measures in the short-term to validate the benefits and implications prior to a final decision and/or permanent infrastructure.

The feedback from the workshop has been assessed and incorporated, where relevant, into the suggested LATM measures detailed in the following section.

7.5 Suggested LATM Options

Based on the findings of the study, this section outlines the suggested LATM measures for the study area. For key roads in particular, more than one type of device has been suggested, in order to provide options for the implementation of either midblock, intersection or a combination of both treatments. There is also opportunity to remove existing treatments, such as flat top road humps that nearby preferred treatment locations. It is noted that where these treatment options are close together that only one treatment option would be implemented.

The rationale behind the suggested measures, as well as the implications have also been reviewed. The location and suitability of specific devices suggested was confirmed on-site or via desktop design review to avoid restricting vehicle accessibility or conflicting infrastructure, such as driveways.

An overview of the suggested LATM measures are shown graphically in Appendix D of the report.

7.5.1 Key Roads

The study identified that Constitution Road, Denison Road and Union Street/ Windsor Road are local residential streets that fulfil a collector road function for Dulwich Hill North.

These roads have also been identified as on-road bicycle routes that would provide connectivity with the broader bicycle network. Therefore, there is an opportunity to encourage cycling as well as walking along these key roads.

Road carriageways are approximately 10-12 metres wide and along Denison Road, property accesses are closely spaced due to the narrow property frontages.

Suggested options have been identified for these roads taking into account both technical analysis and community feedback. The options, which can generally be implemented individually or in combination as part of a staged approach, are presented in Table 7.3 to Table 7.5, with the intention of incorporating the following treatments on all four roads:

- Visual road narrowing through the provision of 2.1 metre wide marked parking lanes
- On-road bicycle symbols to create mixed traffic conditions for cyclists and vehicles.

Table 7.3: Constitution Road - Traffic Calming Options

Option	Description	Benefits/ Integration	Potential Implications
1 – 'No Right-Turn' restriction from Old Canterbury Road	Introduce a right-turn ban from Old Canterbury Road into Constitution Road during the weekday morning peak period to reduce through traffic	<ul style="list-style-type: none"> Reduces traffic volumes Improves environment for pedestrians and cyclists Low cost and quick to install 	<ul style="list-style-type: none"> Shifts affected traffic to adjacent streets Potentially impacts local resident access Education and enforcement required initially to be successful
2 – Rumble bars along centreline	Install cast in-situ rumble bars along the centreline between Williams Parade and Denison Road	<ul style="list-style-type: none"> Reduces vehicle speeds Discourages dangerous driving behaviours, including cutting corners, thereby improving road safety Long design life 	<ul style="list-style-type: none"> Potentially impacts property access (dependent on extent) and may require gaps which reduces effectiveness
3 – Entry treatment	Introduce an entry treatment at Old Canterbury Road with kerb extensions and/ or tactile surface	<ul style="list-style-type: none"> Narrows carriageway with opportunities for landscaping and improved visual and pedestrian amenity Discourages through traffic 	<ul style="list-style-type: none"> Requires drainage considerations Potentially reduces manoeuvring area for large vehicles
4 – Reconstruct and improve existing mid-block devices	Reconstruct existing flat top road humps to improve vertical delineation, with potential to include kerb extensions for a combination of two-way two-lane and single-lane slow points	<ul style="list-style-type: none"> Reduces vehicle speeds through consistent full-height devices Narrows carriageway with opportunities for landscaping and improved visual amenity Opportunities for water sensitive urban design (WSUD) Limits overall number of traffic control devices Maintenance of existing devices not required 	<ul style="list-style-type: none"> Minor reduction in on-street parking supply Potentially a squeeze point between user groups

Table 7.4: Denison Road - Traffic Calming Options

Option	Description	Benefits/ Integration	Potential Implications
1 – 'No Left Turn' restriction from New Canterbury Road	Introduce a left-turn ban from New Canterbury Road into Denison Road during the weekday morning peak period to reduce through traffic	<ul style="list-style-type: none"> Reduces traffic volumes Improves environment for pedestrians and cyclists Low cost and quick to install 	<ul style="list-style-type: none"> Shifts affected traffic to adjacent streets Potentially impacts local resident access Education and enforcement required initially to be successful (can be difficult to achieve compliance) Requires police enforcement to be effective
2 – Improve roundabout splitter islands	Install cast in-situ rumble bars or fully mountable islands in the painted roundabout splitter islands	<ul style="list-style-type: none"> Reduces vehicle speeds Discourages dangerous driving behaviours, thereby improving road safety Long design life 	<ul style="list-style-type: none"> Splitter islands would restrict garbage and removalist truck access due to geometric constraints Rumble bars may impact pedestrian crossing

Option	Description	Benefits/ Integration	Potential Implications
3 – Reconstruct and improve existing mid-block devices	Reconstruct existing flat top road humps to improve vertical delineation, with potential to include kerb extensions for a combination of two-way two-lane and single-lane slow points	<ul style="list-style-type: none"> Reduces vehicle speeds through consistent full-height devices Narrows carriageway with opportunities for landscaping and improved visual amenity Opportunities for water sensitive urban design (WSUD) Limits overall number of traffic control devices Maintenance of existing devices not required 	<ul style="list-style-type: none"> Minor reduction in on-street parking supply Potentially a squeeze point between user groups
4 – Change intersection priority	Introduce stop-control for Denison Road at Dulwich Street and Pigott Street	<ul style="list-style-type: none"> Breaks continuous through traffic flow and increases through traffic travel times Reduces average vehicle speeds and discourages through traffic Opportunities to remove existing flat top road humps in close proximity 	<ul style="list-style-type: none"> Potentially shifts local through traffic to adjacent streets
5 – Four-way intersection treatments	Introduce kerb extensions and/ or raised pavements at intersection with Pigott Street	<ul style="list-style-type: none"> Narrows carriageway with opportunities for landscaping and improved visual and pedestrian amenity 	<ul style="list-style-type: none"> Potentially a squeeze point between user groups (kerb extensions)
6 – T-intersection treatments	Introduce kerb extensions or modified T-intersection at intersection with Dulwich Street	<ul style="list-style-type: none"> Reduces average vehicle speeds and discourages through traffic Does not typically impact on-street parking supply Opportunities for water sensitive urban design (WSUD) Opportunities to remove existing flat top road humps in close proximity 	<ul style="list-style-type: none"> Requires drainage considerations Potentially impacts property access (dependent on extent) Potentially reduces manoeuvring area for large vehicles
7 – Full road closure	Mid-section closure/ discontinuity of road with access for pedestrians and cyclists only	<ul style="list-style-type: none"> Eliminates through traffic Potential improvements for pedestrian and cycling infrastructure 	<ul style="list-style-type: none"> Shifts all local through traffic to an adjacent streets such as Windsor Road or The Boulevard Turnaround facility required at end of road Minor reduction in on-street parking supply Restricts emergency vehicle access Restricts garbage and removalist truck access Does not contribute to general visual amenity of street for most residents (through street plantings/ trees)

Table 7.5: Union Street/ Windsor Road - Traffic Calming Options

Option	Description	Benefits/ Integration	Potential Implications
1 - Entry treatment	Introduce an entry treatment at Old Canterbury Road and at New Canterbury Road with kerb extensions and/ or tactile surface	<ul style="list-style-type: none"> ○ Narrows carriageway with opportunities for landscaping and improved visual and pedestrian amenity ○ Discourages through traffic 	<ul style="list-style-type: none"> ○ Requires drainage considerations ○ Potentially reduces manoeuvring area for large vehicles
2 – Reconstruct and improve existing mid-block devices	Reconstruct existing flat top road humps to improve vertical delineation, with potential to include kerb extensions for a combination of two-way two-lane and single-lane slow points	<ul style="list-style-type: none"> ○ Reduces vehicle speeds through consistent full-height devices ○ Narrows carriageway with opportunities for landscaping and improved visual amenity ○ Opportunities for water sensitive urban design (WSUD) ○ Limits overall number of traffic control devices ○ Maintenance of existing devices not required 	<ul style="list-style-type: none"> ○ Minor reduction in on-street parking supply ○ Potentially a squeeze point between user groups
3 – Intersection priority	Introduce stop-control for Union Street at Abergeldie Street and/ or Windsor Road at Terry Road	<ul style="list-style-type: none"> ○ Breaks continuous through traffic flow and increases through traffic travel times ○ Reduces average vehicle speeds and discourages through traffic ○ Opportunities to remove existing flat top road humps in close proximity 	<ul style="list-style-type: none"> ○ Potentially shifts local through traffic to adjacent streets
4 – T-intersection treatments	Introduce kerb extensions or modified T-intersection at Abergeldie Street, Hampstead Road and Terry Road	<ul style="list-style-type: none"> ○ Narrows carriageway with opportunities for landscaping and improved visual and pedestrian amenity ○ Reduces average vehicle speeds and discourages through traffic ○ Does not typically impact on-street parking supply ○ Opportunities for water sensitive urban design (WSUD) ○ Opportunities to remove existing flat top road humps in close proximity 	<ul style="list-style-type: none"> ○ Potentially a squeeze point between user groups (kerb extensions) ○ Requires drainage considerations ○ Potentially impacts property access (dependent on extent) ○ Potentially reduces manoeuvring area for large vehicles

7.5.2 Other Roads

Consideration should be given to the suggested LATM measures presented in Table 7.6 for other roads in the study area.

Table 7.6: Other Potential Measures

Treatment	Street	Location	Rationale	Potential Implications
Fixed radar speed display (See Figure 7.2)	Constitution Road	Between Grove Street and Denison Road (and potentially other future temporary locations)	Alert drivers of their travel speed approaching Denison Road from the light rail overpass	N/A
No Stopping linemarking	Denison Road/ Davis Street intersection	To the extents of the regulatory 'No Stopping' distances	Formalises 'No Stopping' area to improve turning area, improve sight distances and reduce illegal car parking	N/A
'No Left Turn' restriction (AM peak period)	New Canterbury Road	At Dulwich Street	Reduces traffic volumes Low cost and easy to install	Shifts affected traffic to adjacent streets Potentially impacts local resident access Education and enforcement required initially to be successful (can be difficult to achieve compliance)
Pedestrian refuge island	Windsor Road	At Davis Street (both legs of intersection)	Provides safe pedestrian crossing points between Waratah Mills Light Rail Stop and residential area north of roadway	N/A
Pedestrian refuge island + kerb extensions	Constitution Road	At Williams Parade (south leg of roundabout)	Creates a safe pedestrian crossing point between Arlington Light Rail Stop and residential area south of roadway	Potentially reduces manoeuvring area for large vehicles
	Williams Parade	At Constitution Road	Creates a safer pedestrian crossing point	
	Davis Street	At Windsor Road	Creates a safer pedestrian crossing point	
Kerb Extensions	Weston Street	At Windsor Road	Between Waratah Mills Light Rail Stop and residential area north of roadway	
Linemark 2.1 metre wide parking lanes	Arlington Street	Old Canterbury Road to Constitution Road	Defines extent of parking and visually narrows the roadway along these collector roads	Additional cost for linemarking maintenance
	Davis Street	Windsor Road to Denison Road		
	Dulwich Street	Denison Road to New Canterbury Road		
On-road bicycle symbols	Arlington Street	Old Canterbury Road to Constitution Road	Creates a mixed traffic conditions on these roads identified as on-road cycling routes	No separation between user groups Additional cost for bicycle symbol maintenance
	Davis Street	Windsor Road to Denison Road		
	Dulwich Street	Denison Road to New Canterbury Road		

Treatment	Street	Location	Rationale	Potential Implications
Entry treatment (Kerb extensions and/ or tactile surface)	Dixon Avenue	At Old Canterbury Road	Narrows carriageway with opportunities for landscaping and improved visual and pedestrian amenity Discourages through traffic	Requires drainage considerations Potentially reduces manoeuvring area for large vehicles
New mid-block device (raised and/or narrowed device for two-way two-lane or single-lane slow point)	Abergeldie Street	Adjacent to House No. 18	Reduces mid-block vehicle speed on these roads that have recorded 85 th percentile speeds above the posted speed limit	Potentially increases traffic noise levels Requires a well-lit environment (street lighting) Potential loss of on-street car parking
		Adjacent to House No. 60		
	Arlington Street	Adjacent to House No. 7		
		Adjacent to House No. 19		
		Adjacent to House No. 40		
	Dixon Avenue	Adjacent to House No. 8		
		Adjacent to House No. 39		
	Elizabeth Street	Adjacent to House No. 31		
	Gelding Street	Adjacent to House No. 4 Adjacent to House No. 21		
	Hampstead Road	Adjacent to House No. 12		
Four-way intersection treatments (Kerb extensions and/or raised pavement)	Arlington Street	At Abergeldie Street	Narrows carriageway with opportunities for landscaping and improved visual and pedestrian amenity	Potentially a squeeze point between user groups (kerb extensions)
		At Dixon Avenue		Requires drainage considerations
Modified T-intersections	Gelding Street	At Maddock Street	Reduces average vehicle speeds and discourages through traffic	Potentially impacts property access (dependent on extent)
	Hampstead Road	At Gelding Street	Opportunities to remove existing flat top road humps in close proximity	Potentially reduces manoeuvring area for large vehicles
Left-in/ Left-out via central median	Lewisham Street	Denison Road	7.1 metre wide carriageway may not be sufficient for the additional traffic generated future developments	Shifts through traffic to an adjacent street Restricts direct local resident access, although access can be maintained via Lewisham Street/ The Boulevard
One-way northbound road section	Lewisham Street	The Boulevard to New Canterbury Road	7.1 metre wide carriageway may not be sufficient for the additional traffic generated future developments	Shifts one direction of all traffic or through traffic to an adjacent street, such as Pigott Street or Dulwich Street

Figure 7.2: Radar speed display



Source: Leichhardt Council accessed December 2015

(<http://www.leichhardt.nsw.gov.au/Living-Here/Traffic-Management/Radar-Speed-Displays>)

7.6 Options for Suggested LATM Measures

7.6.1 Entry Treatments

Entry treatments are primarily used where a local road intersects with an arterial road.

The desirable result of an entry treatment is to alert drivers that they are entering a local area and slowing entry/ exit movements (depending on specific treatment), thus discouraging through traffic from entering the local road network.

The entry treatments suggested in this study would incorporate a combination of the following:

- Horizontal deflections such as road narrowing (etc. kerb extensions or pedestrian refuge islands)
- Textured road surface treatments.

Vertical deflections, such as road humps, were considered for integration with the suggested entry treatments. However, the use of such device was discarded at these locations to minimise the impact of vehicles excessively decelerating to enter the local road on traffic flows along the arterial roads, as well as, limit any confusions of the treatment being a continuous footpath.

The ideal approach the suggested treatments will vary and depend on the available carriageway width, function of the road and the pedestrian volumes across the road. Consideration must be given to ensuring a garbage or removalist vehicle is not restricted by the selected treatment when manoeuvring into or out of the road. Likewise emergency vehicle access must be considered.

Examples of entry treatments are shown in Figure 7.3 and Figure 7.4.

Figure 7.3: Entry Treatment – Kerb Extensions

Source: Nearmap

Figure 7.4: Entry Treatment – Textured Road Surface

7.6.2 Midblock Options

New or reconstructed midblock devices suggested in the study area should be designed to narrow the road width to one or two traffic lanes and/ or provide adequate vertical deflection to control traffic volume and vehicle speed.

Where kerb extensions are installed, it is suggested that rain gardens are included to further limit visibility, thus forcing drivers to slow down. Rain gardens also provide significant community benefits by enhancing the streetscape and/or allowing additional street trees where such gaps exist in the streetscape.

An example of a rain garden kerb extension that could be incorporated with the road humps is shown in Figure 7.5 and Figure 7.6.

Figure 7.5: Rain Garden Kerb Extension**Figure 7.6: Rain Garden Kerb Extension**

Rain garden kerb extensions can be fully incorporated into the road verge (Figure 7.5 and Figure 7.6) or maintain the existing kerb and gutter as shown in Figure 7.7 and Figure 7.8, which are road humps with two lane and single lane configurations respectively.

Figure 7.7: Road hump with planted kerb extensions



Figure 7.8: Single lane road hump with planted kerb extensions



The additional of single traffic lane treatments at strategic locations discourages the use of the local road network for any rat-running activities. The need to give-way to oncoming vehicles introduces additional delays and driver effort for through traffic, which is key to reducing the benefits of these routes. Key roads where a single lane treatment should be considered include Denison Road and Union Street/ Windsor Road, however does not necessarily have to be provided at all proposed midblock device locations.

At a single lane treatment, 'Give Way' control signage and linemarking should be considered for the directions of heavy peak period traffic flow, which is northbound for Denison Road and Union Street/ Windsor Road, to give priority to the minor traffic flows in support of the above objectives.

Where vertical deflection is provided at a midblock treatment, it is suggested that a watts profile device is included. Compared to a flat top device which are required to be 5-9m in length, watts profile devices are shorter in length (3-4m), thus have less impact on on-street car parking area, critical in the study area.

One recommended option is to reconstruct existing mid-block devices along the key roads within the study area to improve their effectiveness at reducing traffic volume and vehicle speed. The reconstruction of these devices would involve one of the following:

- Retrofit existing devices with planted kerb extensions
- Replace with watts profile device with planted kerb extensions.
- Increase height of flat top device and provide planted kerb extensions.

7.6.3 Intersection Treatment Options

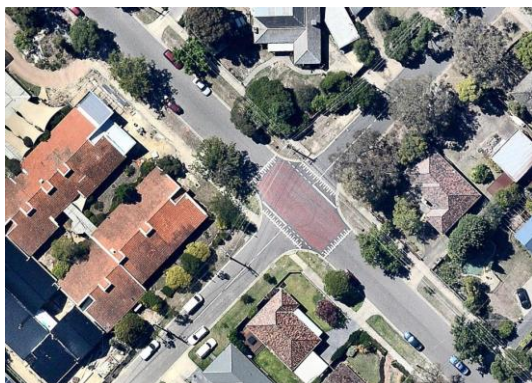
Multiple options for intersection treatments are suggested for selected intersections within the study area. These treatments include:

- Intersection priority change
- Kerb extensions on selected and/ or all approaches
- Modified T-intersection
- Raised pavement
- Combination of the above (where applicable).

Similar to entry treatment, the ideal treatment will vary for intersections, with consideration required for garbage, removalist and emergency vehicle access and manoeuvrability.

An example of a raised pavement intersection and a modified T-intersection are shown in Figure 7.9 and Figure 7.10 respectively.

Figure 7.9: Raised Pavement



Source: Nearmap

Figure 7.10: Modified T-intersection



Source: Nearmap

7.7 Other External Considerations

In addition to the LATM measures suggested for the study area in Section 7.3.1, consideration should be given to improving the traffic/ pedestrian conditions within the surrounding arterial road network that is associated with several traffic issues experienced in the study area. The following potential arterial road network improvements have been identified:

- **New Canterbury Road/ Frazer Street** – introduction of a pedestrian crossing on the northern leg of the signalised intersection. RMS' Traffic Signal Design' guidelines states that "a signalised marked foot crossing must be provided on each leg of a signalised intersection (including T Junctions) in a built-up area". There are a number of circumstances that can exempt the provisions; however Manager Network Operations, Transport Management Centre approval is required.
- **New Canterbury Road/ Lewisham Street** – introduction of "Keep Clear" linemarking on New Canterbury Road, adjacent to Lewisham Street (northbound lanes only). Lewisham Street is one of the only access points to the study area that does not have turning movement restrictions. When the adjacent mid-block pedestrian crossing is activated, the "Keep Clear" linemarking would reduce the frequency that right turn access into Lewisham Street is blocked by queued northbound vehicles.
- **New Canterbury Road intersections with Constitution Road/ Beach Road and Dulwich Street/ Marrickville Road** – introduction of split phasing during peak periods. Turning movements to/ from the side roads of New Canterbury Road are impacted by the heavy through movements. A review of crash data and community feedback indicates that the current single phase for the minor roads at the two intersections are a safety concern during peak periods. Split phasing for the side roads during peak periods should be investigated, noting improved turning opportunities into New Canterbury Road could reduce through movements along local roads resulting from the limiting turning opportunities.
- **New Canterbury Road/ Union Street/ Myra Road and/ or Old Canterbury Road/ Windsor Road/ Spencer Street** – install traffic signals, maintaining all turning movements. Windsor Road and Union Street function as collector roads in a similar manner to Denison Road. The signalisation of one or both intersections should be investigated as a potential long-term solution to improve access to the study area, west of the light rail line, thus relieving the strain on Denison Road. The mid-block signalised pedestrian crossing on

New Canterbury Road, located west of Union Street, could be removed as a result of the signalisation.

8. Implementation

8.1 Prioritisation of Treatments

Having regard for the suggested LATM measures, the following priority tables have been prepared. Each measure in the priority tables have been described providing the following information:

- o ID. Number
- o Benefits Rating
 - o L – Low benefits to other users and urban planning aspects
 - o M – Medium benefits other users and urban planning aspects
 - o H – High benefits other users and urban planning aspects

Other users refer to resident, walking and cycling benefits; whilst urban planning aspects include landscaping, shading (street trees) and drainage opportunities.

- o Priority Rating
 - o S – Short term to address existing issues
 - o L – Long term to address future issues associated with growth

The priority was determined based on a number of factors, including existing traffic issues, community demand and planning required. It is noted that these are indicative timing frames with the opportunity to implement some measures sooner depending on ongoing review of the traffic conditions and outcomes of trialled measures.

Table 8.1: Treatment Prioritisation – Key Roads

ID. No.	Location	Suggested Measure	Other Benefits (L / M / H)	Priority (S / L)
1.1	Constitution Road	'No Right Turn' from Old Canterbury Road	L	S
1.2		Rumble bars along centreline between Williams Parade and Denison Road	L	S
1.3		Entry threshold treatment at Old Canterbury Road	M	S
1.4		Reconstruct existing devices	M	S
2.1	Denison Road	'No Left Turn' from New Canterbury Road	L	S
2.2		Improve roundabout splitter islands at Constitution Road and Eltham Street	L	S
2.3		Reconstruct existing devices	M	S
2.4		Change intersection priority at Dulwich Street and Pigott Street intersections	M	S
2.5		Four-way intersection treatment at Pigott Street	M	S
2.6		T-intersection treatment at Dulwich Street	M	S
2.7		Mid-section closure/ discontinuity of road	H	L
3.1	Union Street/ Windsor Road	Entry threshold treatment at Old Canterbury Road and New Canterbury Road intersections	M	S
3.2		Reconstruct existing devices	M	S
3.2		Change intersection at Abergeldie Street and Terry Road intersections	M	S
3.4		T-intersection treatment at Abergeldie Street, Hampstead Road and Terry Road intersections	M	S

Table 8.2: Treatment Prioritisation – Other Roads

ID. No.	Suggested Measure	Location	Other Benefits (L / M / H)	Priority (S / M / L)
4.0	Fixed radar speed display	Constitution Road between Grove Street and Denison Road (and potentially other future temporary locations)	L	S
5.0	No Stopping linemarking	Denison Road/ Davis Street intersection	L	S
6.0	'No Left Turn' restriction (AM peak period)	New Canterbury Road at Dulwich Street	L	S
7.0	Pedestrian refuge island	Windsor Road at Davis Street (both legs of intersection)	L	S
8.1	Pedestrian refuge island + kerb extensions	Constitution Road at Williams Parade (south leg of roundabout)	M	S
8.2		Williams Parade at Constitution Road	M	S
9.1	Kerb extensions	Davis Street at Windsor Road	M	S
9.2		Weston Street at Windsor Road	M	S
10.1	Linemark 2.1 metre wide parking lanes	Arlington Street	L	S
10.2		Davis Street	L	S
10.3		Dulwich Street	L	S
11.1	On-road bicycle symbols	Arlington Street	L	S
11.2		Davis Street	L	S
11.3		Dulwich Street	L	S
12.0	Entry threshold treatment	Dixon Avenue at Old Canterbury Road	M	S
13.1	New mid-block device	Abergeldie Street	L	S
13.2		Arlington Street	L	S
13.3		Dixon Avenue	L	S
13.4		Elizabeth Street	L	S
13.5		Gelding Street	L	S
13.6		Hampstead Road	L	S
14.1	Four-way intersection treatment	Arlington Street intersection with Abergeldie Street and Dixon Avenue intersection	M	S
15.1	Modified T-intersections	Gelding Street/ Maddock Street intersection	M	S
15.2		Hampstead Road/ Gelding Street intersection	M	S
16.0	Left-in/ Left-out via central median	Lewisham Street at Denison Road	H	L
17.0	One-way northbound road section	Lewisham Street between The Boulevard and New Canterbury Road	H	L

8.2 Trial LATM Treatment Opportunities

As previously identified, there is a general support for trialling of LATM measures, given there will be additional planning, thus time required, before some LATM measures (particularly those with any significant infrastructure works) are approved and implemented. As such, it is suggested that a trial plan/ program be considered that enables early temporary installation of specific LATM measures to investigate their effectiveness, thus confirm the suitability of a permanent installation.

LATM measures suitable for investigation in the trial plan/ program include turn ban restrictions, single-lane slow points and radar speed displays.

It is noted that the trialling of measures would still need to go through Traffic Committee; and where an arterial road is affected, RMS be consulted. Upon approval of a trial, the community in the affected area would need to be notified and advance warning signs installed prior to the trial to inform drivers of the imminent road condition changes.

As such, in the first instance, the following LATM measures are suggested for inclusion in the trial plan/ program:

- Fixed radar speed display on Constitution Road between Grove Street and Denison Road for eastbound traffic
- Right-turn ban restriction from Old Canterbury Road into Constitution Road
- Left-turn ban restriction from New Canterbury Road into Denison Road and/ or Dulwich Street
- Single-lane slow points on Denison Road and Windsor Road at selected flat top road humps (using water filled barriers), with 'give-way' control for northbound traffic.

It is suggested that the trials be implemented for a minimum of one month to observe the benefits and implications once traffic conditions settle around the temporary measure.

8.3 Strategic Cost Estimates

Strategic cost estimates have been determined from typical rates provided by Marrickville Council and GTA experience.

All cost estimates prepared by GTA Consultants are for broad level or initial feasibility planning only and must not be relied on for the purposes of quoting, budgeting or construction. Detailed cost estimates should be sought from a suitably qualified civil engineer or quantity surveyor in this regard.

Table 8.3 provides a summary of estimated costs of the suggested LATM measures for the study area, noting that these do not include allowances for site specific issues such as drainage modifications and/or services relocations.


Table 8.3: Strategic Cost Estimates


LATM Measure	Estimated Cost (per unit)
Fixed radar speed display	\$5,000
No Stopping linemarking at intersections	Less than \$2,000
Pedestrian refuge island	\$10,000
Kerb extensions	\$5,000-\$10,000
Parking lanes linemarking	Less than \$500 per 100m
On-road bicycle symbols	\$150 per symbol
Entry threshold treatment	\$15,000
Retrofit existing midblock devices with kerb extensions	\$5,000
Watt profile road hump	\$20,000
Flat top road hump	\$25,000
Intersection priority change	\$5,000
Raised pavement intersection	More than \$50,000
Modified T-intersection	\$40,000
Central median (Rumble bar)	\$5,000 per 100m road length
Splitter island (Rumble bar or island)	\$2,500-\$5,000
Conversion of two-way road section to one-way	\$10,000
Mid-section closure/ discontinuity of road	More than \$50,000


Appendix A


Existing LATM Scheme


Legend


 Turn ban (right)


 Turn ban (right, time restriction)


 Turn ban (left)

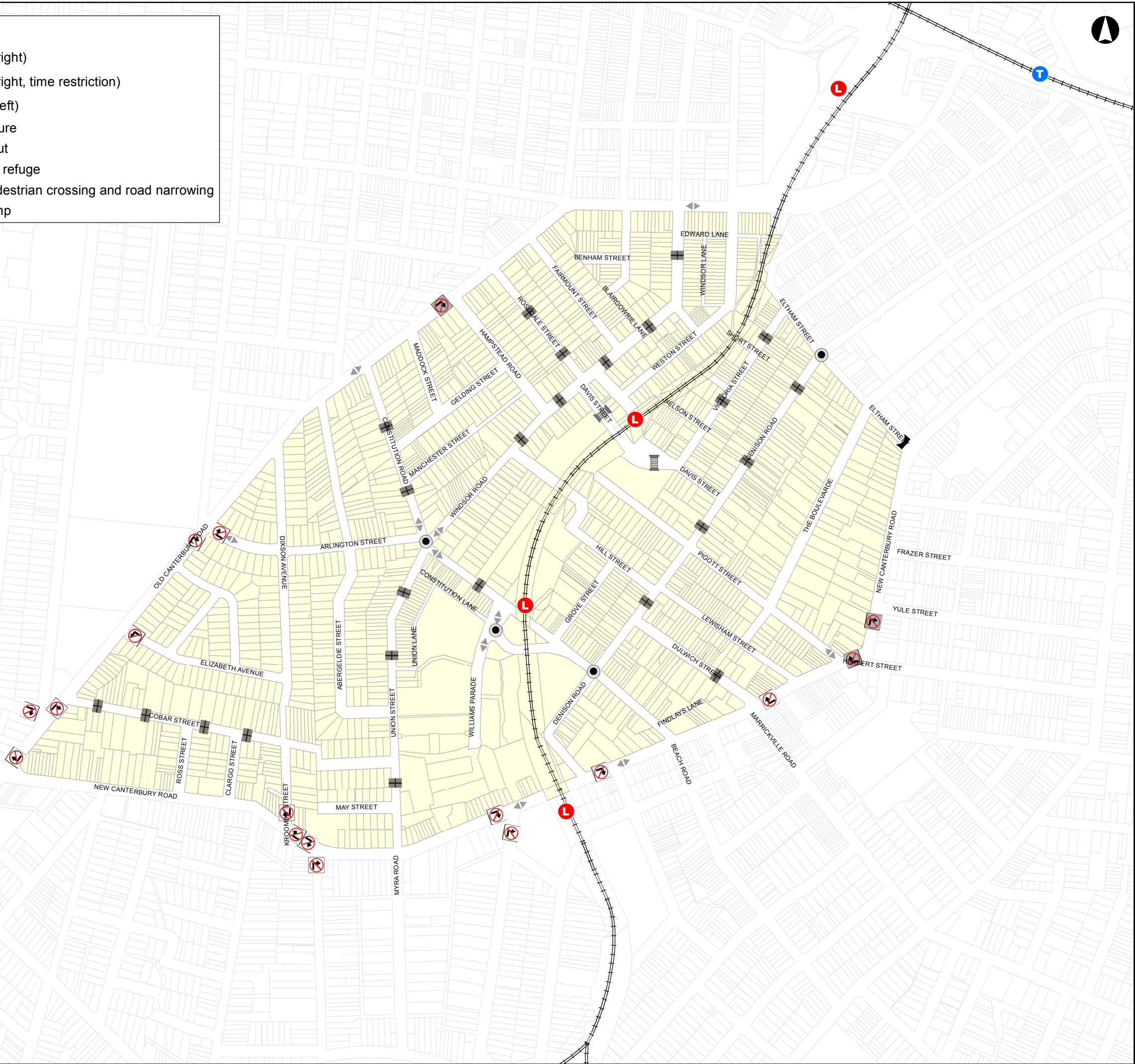
 Road Closure

 Roundabout

 Pedestrian refuge

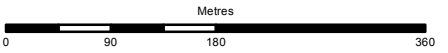
 Raised pedestrian crossing and road narrowing

 Speed hump



P1	21-08-15	ADM	BDM	BDM
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Issue	Date	By	Chkd	Appd
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Client

Marrickville Council

Job Title

Dulwich Hill Traffic Plan

Drawing Title

Existing LATM Scheme

Scale at A3

1:6,500

Drawing Status

Preliminary

Job No	Drawing No	Issue
15S1012000	005	P1

Appendix B

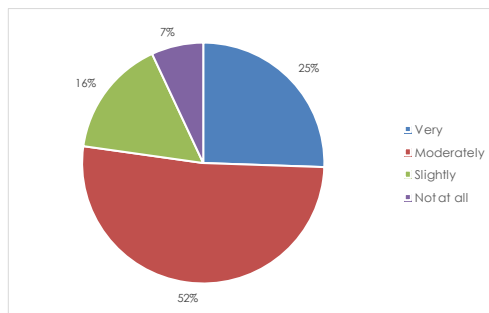
Community Consultation Findings

Community Consultation Survey – Transport Findings

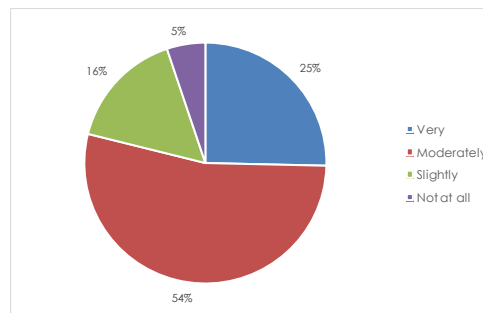
1. General

1.1 My street (including the footpath, nature strip and road) feels - Safe

Marrickville LGA

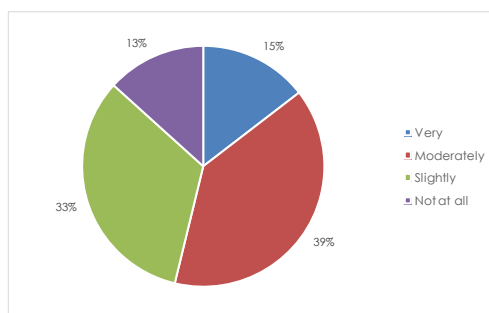


Dulwich Hill, Lewisham & Riverside

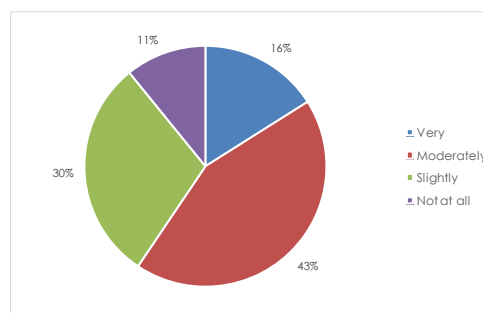


1.2 My street (including the footpath, nature strip and road) feels – Well-Maintained

Marrickville LGA



Dulwich Hill, Lewisham & Riverside



1.3 What would improve the feel of your street, if anything?

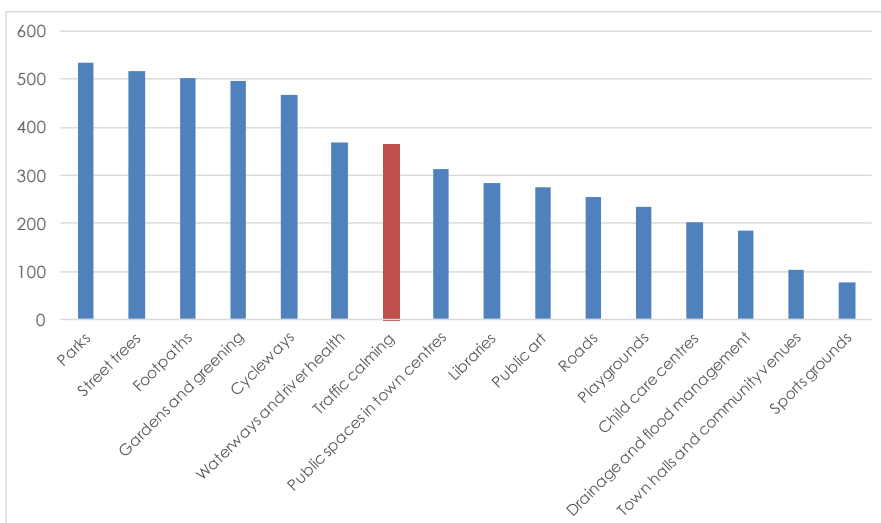
- Improve/ introduce car parking linemarking particularly for angled parking spaces
- Resident parking scheme in busy areas
- Alternative traffic calming to speed humps (noisy) to deter speeding
- Maintenance of roadways and footpaths
- Improve street lighting.

1.4 Imagine you have been granted three wishes to design better streets (footpaths, roads and nature strips) and public spaces (parks, town centres and squares). What would you wish for?

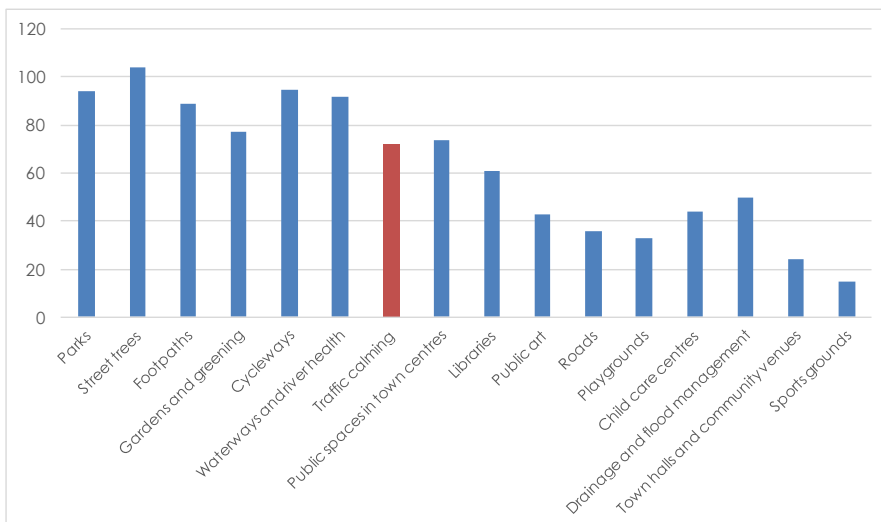
- Separated cycleways
- Link cycleways with rail and light rail
- Well maintained and wider network of footpaths
- Safer pedestrian crossing on Toothill Street
- More street trees
- Improved street lighting near Waratah Mills light rail stop
- Shared zones in shopping areas
- Traffic calming that prioritises cycling and walking
- More parking in busy areas
- Resident parking on Seaview Street
- More commuter parking near stations and bus stops
- More human activity, less vehicles.

1.5 Council doesn't have all the resources needed to improve and build new infrastructure assets and we'd like to know what's most important to you.

Marrickville LGA



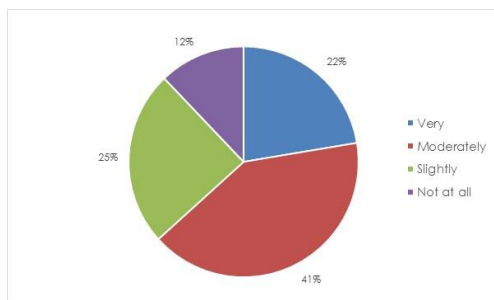
Dulwich Hill, Lewisham & Riverside



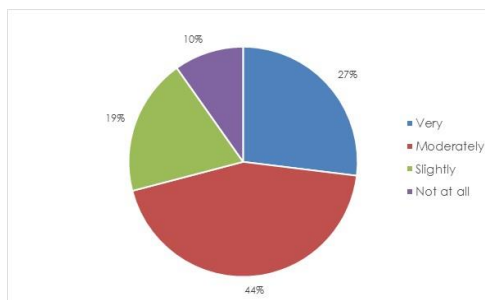
2. Pedestrian

2.1 How much do you agree with the following statement? It is easy to move around my neighbourhood (e.g. footpaths are free from obstructions, roads are easy to cross)

Marrickville LGA

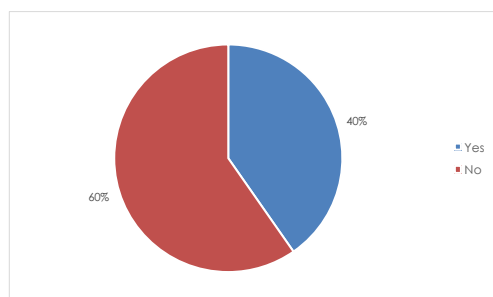


Dulwich Hill, Lewisham & Riverside

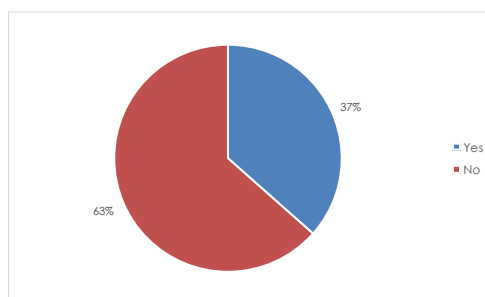


2.2 Are there barriers that prevent you and your family/ household walking more in your neighbourhood?

Marrickville LGA

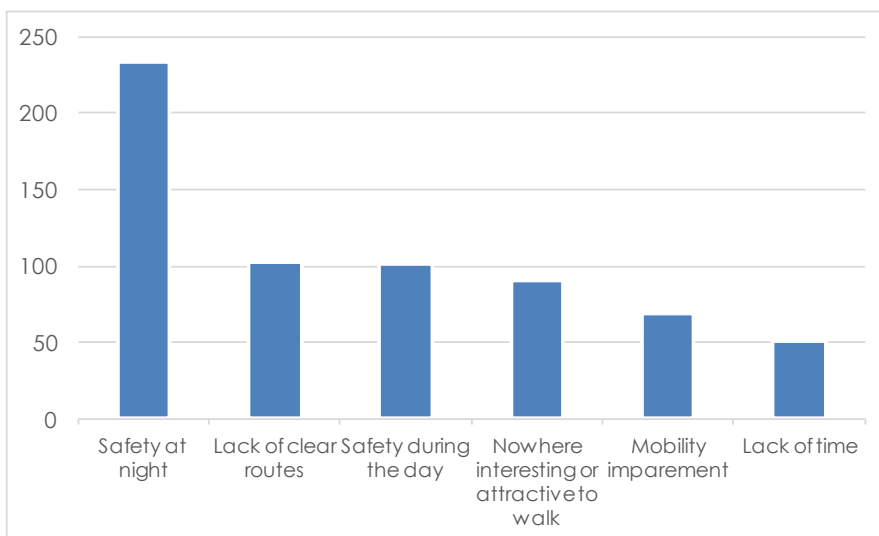


Dulwich Hill, Lewisham & Riverside

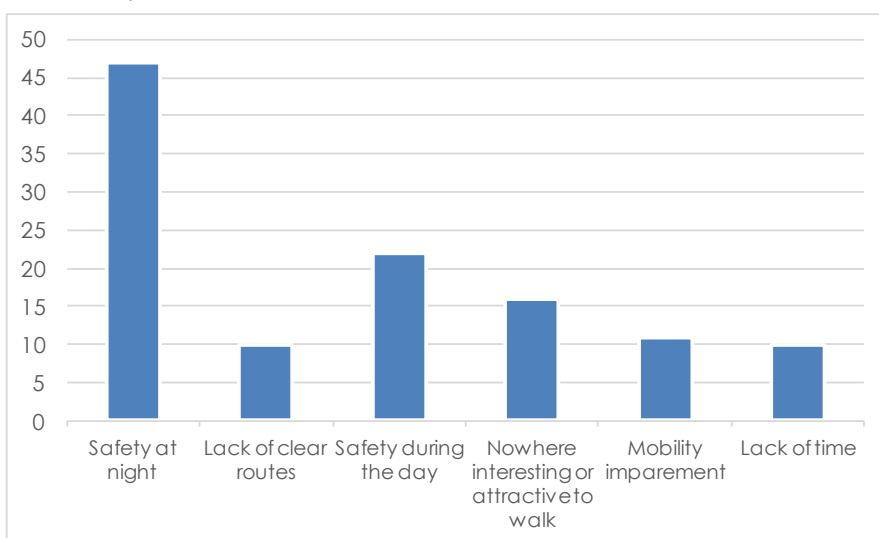


2.2.1 What are the barriers?

Marrickville LGA



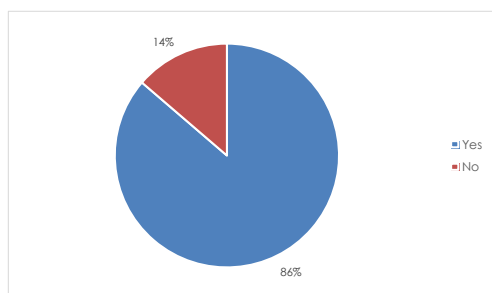
Dulwich Hill, Lewisham & Riverside



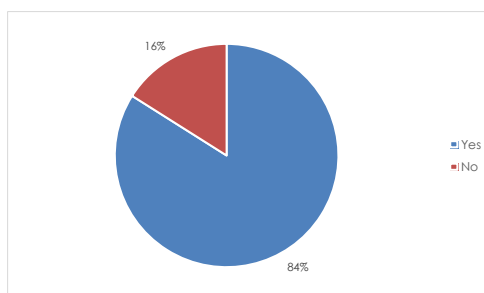
- Other common barriers mentioned?
 - Quality of footpaths causing trip hazards (uneven surface and obstructions on footpaths)
 - Limited street lighting
 - Speeding cars.

2.3 Could your neighbourhood be improved to make getting around easier and more attractive?

Marrickville LGA



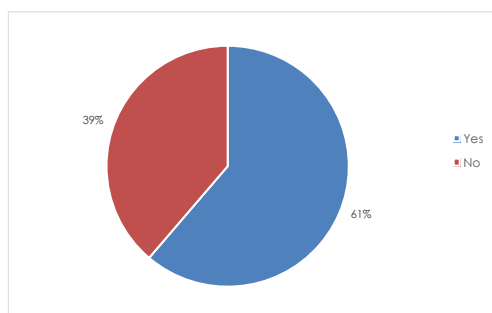
Dulwich Hill, Lewisham & Riverside



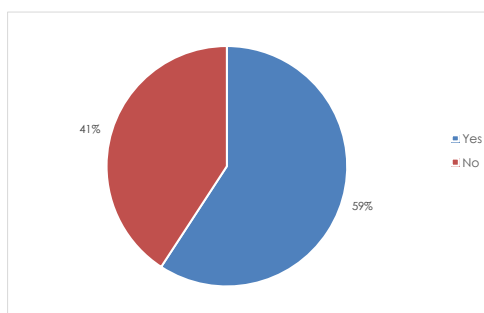
- How? (Where in Dulwich Hill, Lewisham & Riverside?)
 - Improve footpaths (New Canterbury Road, Victoria Street, Denison Road, Hercules Street, Dixon Avenue)
 - Improve street scaping, including shading (Wardell Road, New Canterbury Road, Denison Road, Yule Street)
 - Improve or addition safe crossing points (Denison Road, Toothill Street, Davis Street, The Boulevard, Frazer Street, Constitution Street, New Canterbury Road)
 - Improve street lighting (Hunter Street, near railway station and parks)
 - Additional traffic calming measures, including closure of some residential streets at main roads to reduce rat running (Moncur Street, Jersey Street)
 - Remove excess rubbish from roads and footpaths (Williams Parade).

2.4 Thinking about the bus stops, light rail, train stations, parks, schools and shops in your neighbourhood, could the routes to these be improved?

Marrickville LGA



Dulwich Hill, Lewisham & Riverside



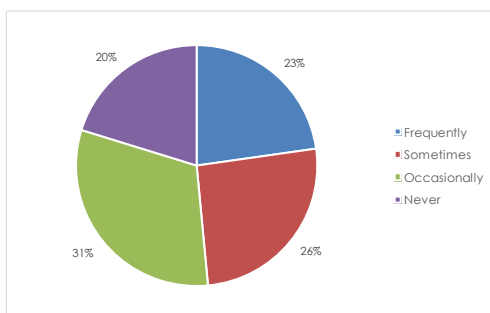
- How? (Where – Dulwich Hill, Lewisham & Riverside only)
 - Improve street lighting (Lewisham light rail stops, bus stops)
 - Improve access to Lewisham West light rail stop across Old Canterbury Road
 - Direct walking routes at Waratah Mills light rail stop from the corner of Frazer Street and New Canterbury Road
 - Safer pedestrian crossings to schools (Denison Road, The Boulevard and Toothill Street)
 - Improve link between Dulwich Hill light rail stop and Dulwich Hill Railway Station.
 - Improve wayfinding signage (general)
 - Additional pedestrian crossing near Arlington light rail stop (across Constitution Road)
 - Additional pedestrian crossing near Dulwich Grove light rail stop (across New Canterbury Road)
 - Improved bus stop facilities (general).

2.5 If there was one major walking route in Marrickville local government area that you would like to see created, where would it be and why?

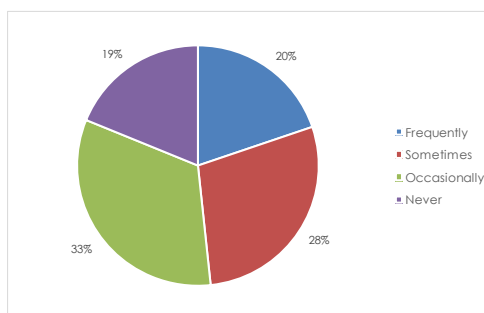
- The Greenway shared path (Cooks River to Iron Cove) along the light rail line – safety and convenience.
- Lewisham/ Dulwich Hill to Newtown/ Enmore – connecting to entertainment hub
- All laneways – more inviting walking experience.

2.6 How often do the following happen in your street? – Times when pedestrians are in danger.

Marrickville LGA

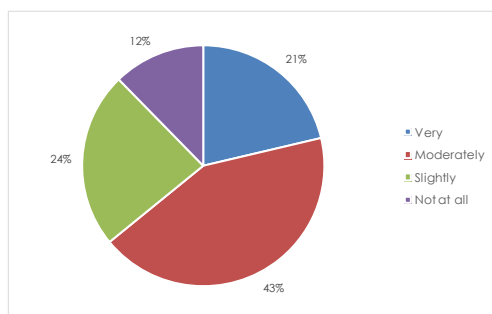


Dulwich Hill, Lewisham & Riverside

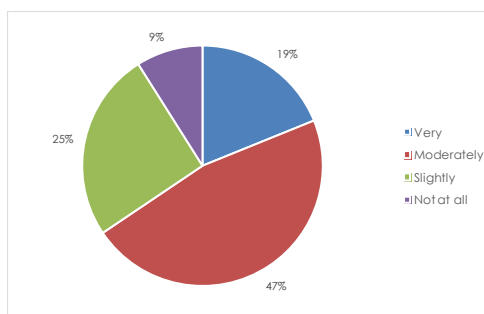


2.7 My street (including the footpath, nature strip and road) feels? – Pedestrian friendly.

Marrickville LGA



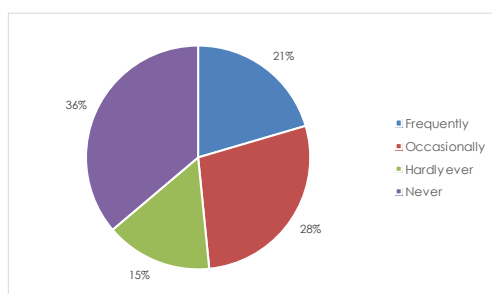
Dulwich Hill, Lewisham & Riverside



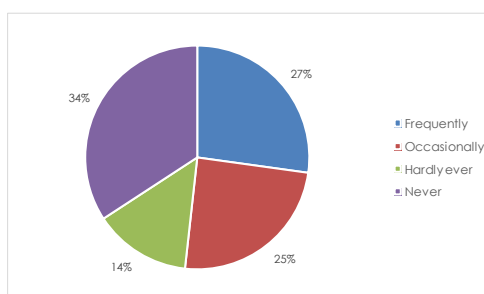
3. Cyclists

3.1 I and/ or members of my family/ household ride a bicycle in my neighbourhood.

Marrickville LGA

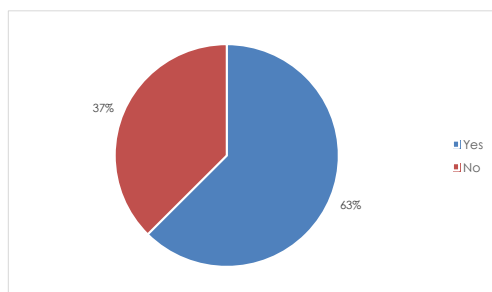


Dulwich Hill, Lewisham & Riverside

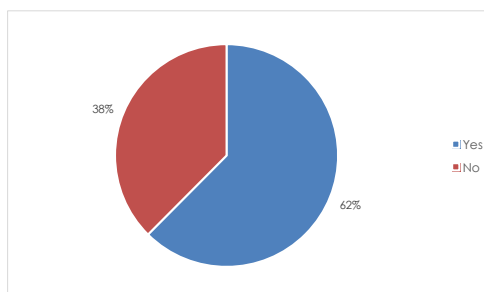


3.2 Are there barriers that prevent you and your family/ household cycling or cycling more often in your neighbourhood

Marrickville LGA

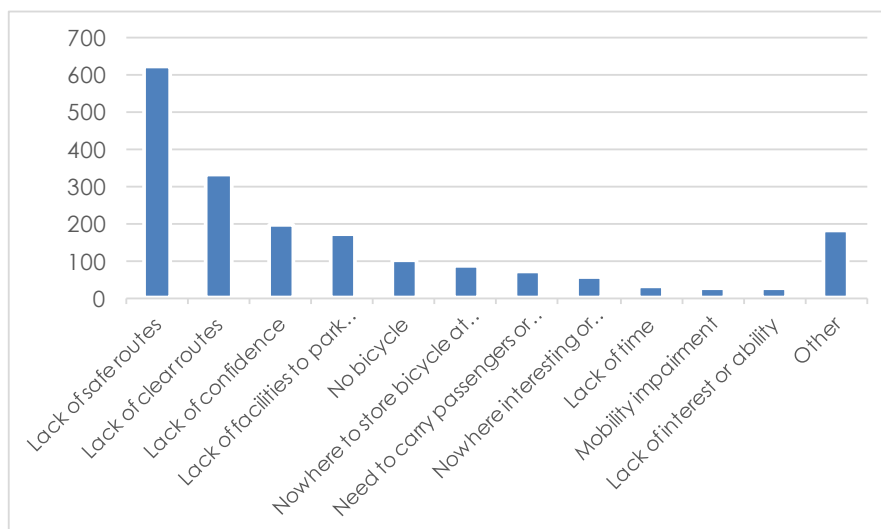


Dulwich Hill, Lewisham & Riverside

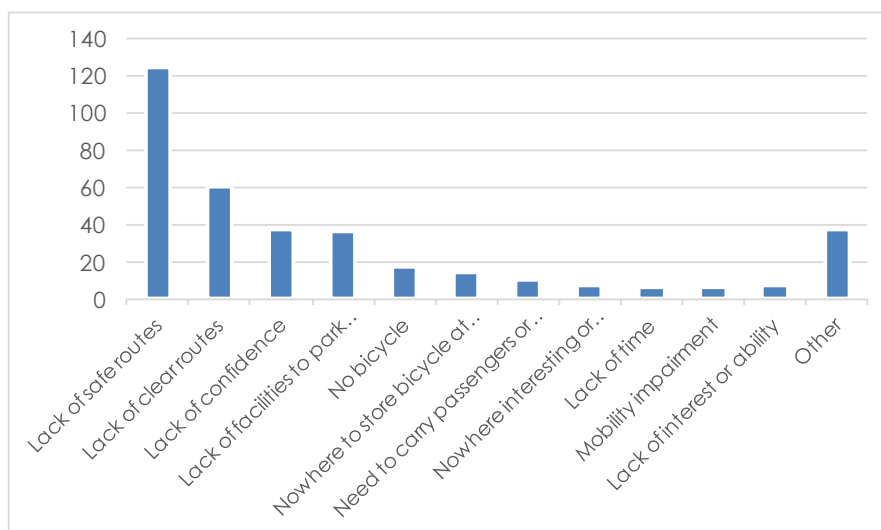


3.2.1 What are the barriers?

Marrickville LGA



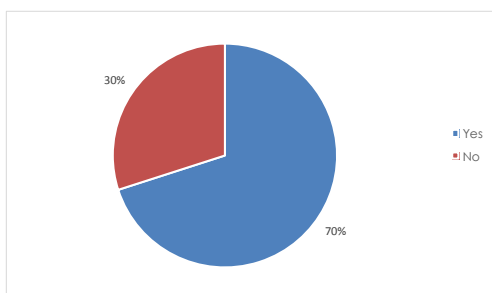
Dulwich Hill, Lewisham & Riverside



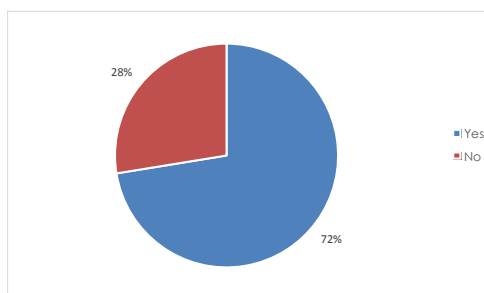
- Other common barriers mentioned?
 - Speeding cars
 - Too dangerous.

3.3 Would anything about the streets and public spaces need to change to improve cycling in your neighbourhood?

Marrickville LGA



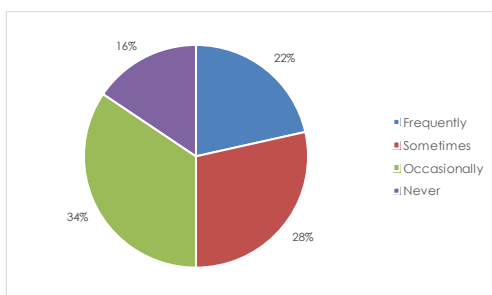
Dulwich Hill, Lewisham & Riverside



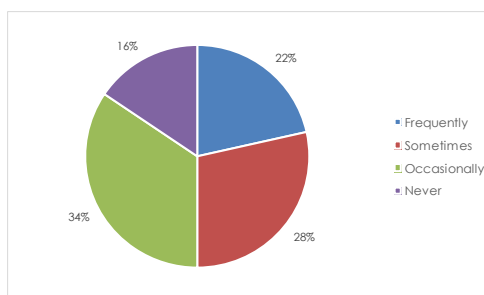
- What? (Where in Dulwich Hill, Lewisham & Riverside?)
 - Dedicated separated cycle paths (on all main roads and near railway stations)
 - Direct cycle routes to the city
 - Driver awareness.
- 3.4 If there was one major cycling route in Marrickville local government area that you would like to see created, where would it be and why?
- The Greenway shared path (Cooks River to Iron Cove) along the light rail line – safety, convenience and connectivity
 - Dulwich Hill to Sydenham Station – access rail services
 - Dulwich Hill to Newtown – access to entertainment and leisure.

3.5 How often do the following happen in your street? – Times when cyclists are in danger.

Marrickville LGA

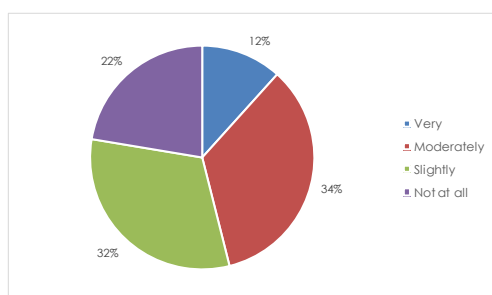


Dulwich Hill, Lewisham & Riverside

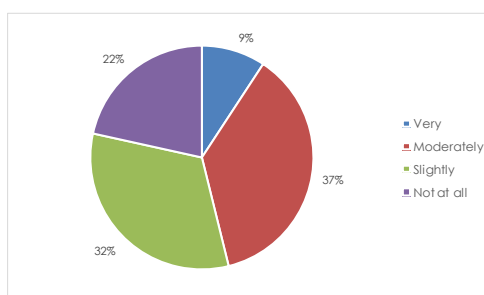


3.6 My street (including the footpath, nature strip and road) feels.... – Bike friendly.

Marrickville LGA



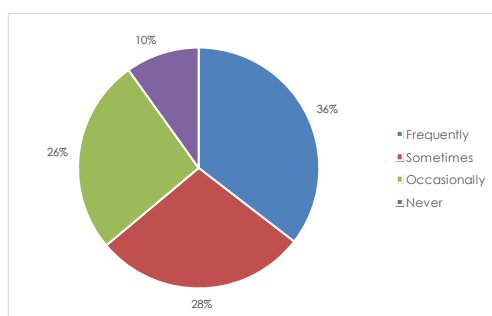
Dulwich Hill, Lewisham & Riverside



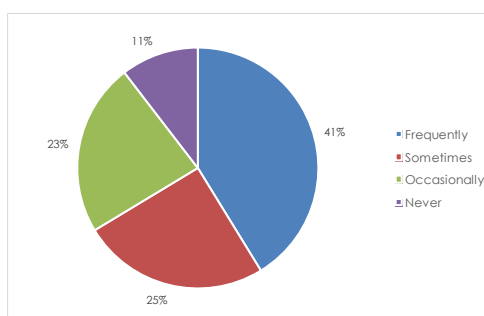
4. Traffic

4.1 How often do the following happen in your street? – Speeding traffic

Marrickville LGA

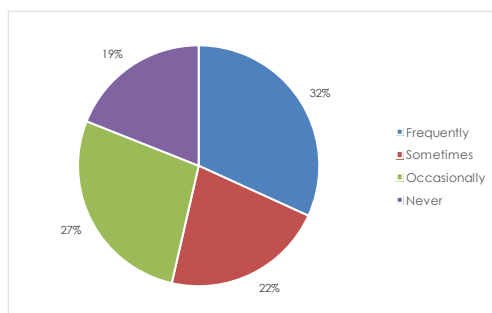


Dulwich Hill, Lewisham & Riverside

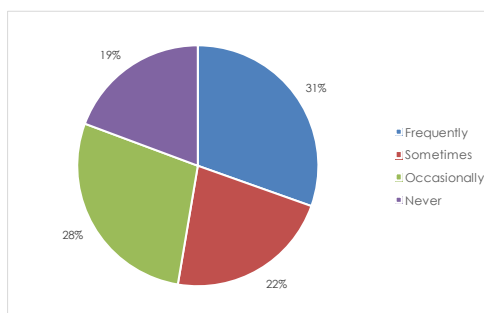


4.2 How often do the following happen in your street? – Too much traffic or 'rat-running'

Marrickville LGA



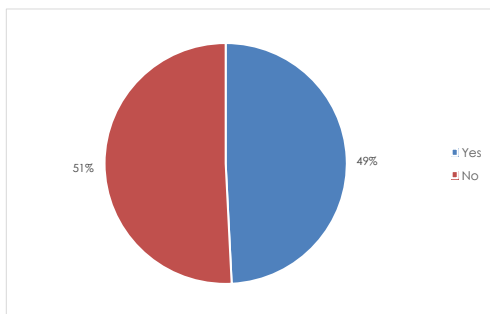
Dulwich Hill, Lewisham & Riverside



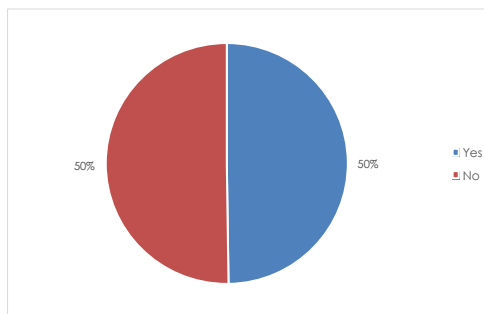
5. Parking

5.1 Does your neighbourhood need more taxi zones, bicycle parking, accessible parking, car share spaces, loading zones or 15 minute drop-off zones?

Marrickville LGA



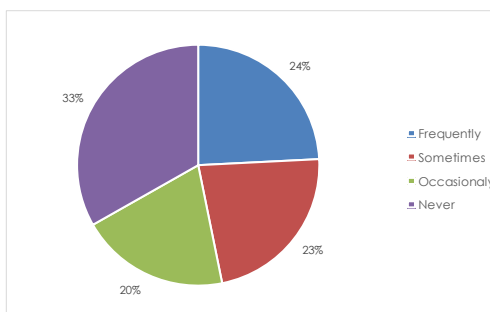
Dulwich Hill, Lewisham & Riverside



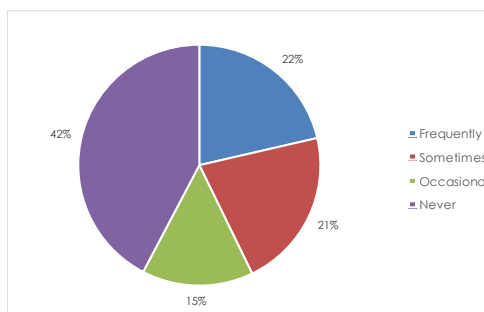
- What? (Where in Dulwich Hill, Lewisham & Riverside)
 - Car share spaces (Old Canterbury Road, Frazer Street)
 - Bicycle parking (around Railway stations, light rail stops, near bus stops, near shops along Marrickville Road)
 - Resident parking (near light rail stops and sporting grounds)
 - 15 minute drop-off zones (near shops along Marrickville Road, outside railway stations and Dulwich Hill public school)
 - Taxi Zone (near shops along Marrickville Road)
 - Accessible parking (near Lewisham Station, near doctors/ medical centres)

5.2 How often do the following happen in your street? – Can't find a parking spot within two blocks

Marrickville LGA



Dulwich Hill, Lewisham & Riverside



Appendix C

Road User Movement (RUM) Codes

PEDESTRIAN (ON FOOT OR IN TOY/PRAM)	VEHICLES FROM ADJACENT DIRECTIONS (INTERSECTIONS ONLY)	VEHICLES FROM OPPOSING DIRECTIONS	VEHICLES FROM SAME DIRECTION	MANOEUVRING	OVERTAKING	ON PATH	OFF PATH, STRAIGHT	OFF PATH, ON CURVE OR TURNING	PASSENGERS & MISCELLANEOUS
NEAR SIDE 00	CROSS TRAFFIC 10	HEAD ON (not overtaking) 20	REAR END 30	U TURN 40	HEAD ON (incl. side swipe) 50	PARKED 60	OFF CARRIAGEWAY TO LEFT 70	OFF CARRIAGEWAY TO LEFT ON RIGHT BEND 80	FELL IN/FROM VEHICLE 90
EMERGING 01	RIGHT FAR 11	RIGHT THRU 21	LEFT REAR 31	U TURN INTO FIXED OBJECT/ PKD VEHICLE 41	OUT OF CONTROL 51	DOUBLE PARKED 61	LEFT OFF CARRIAGEWAY INTO OBJECT/ PARKED VEH 71	OFF CARRIAGEWAY, LEFT ON R.H. BEND INTO OBJECT/ PKD VEH 81	LOAD OR MISSILE STRUCK VEHICLE 91
FAR SIDE 02	LEFT FAR 12	LEFT THRU 22	RIGHT REAR 32	LEAVING PARKING 42	PULLING OUT 52	ACCIDENT OR BROKEN DOWN 62	OFF CARRIAGEWAY TO RIGHT 72	OFF CARRIAGEWAY TO RIGHT ON RIGHT BEND 82	STRUCK TRAIN / AEROPLANE 92
PLAYING, WORKING LYING, STANDING ON CARRIAGEWAY 03	RIGHT NEAR 13	RIGHT/LEFT 23	LANE SIDE SWIPE 33	ENTERING PARKING 43	OVERTAKE TURNING 53	VEHICLE DOOR 63	RIGHT OFF CARRIAGEWAY INTO OBJECT/ PARKED VEH 73	OFF CARRIAGEWAY, RIGHT ON R.H. BEND INTO OBJECT/ PKD VEH 83	PARKED VEH RUN AWAY INTO OBJECT/ PKD VEH 93
WALKING WITH TRAFFIC 04	TWO R TURNING 14	RIGHT/RIGHT 24	LANE CHANGE RIGHT (not overtaking) 34	PARKING VEHICLES ONLY 44	CUTTING IN 54	PERMANENT OBSTRUCTION ON CARRIAGEWAY 64	OUT OF CONTROL ON CARRIAGEWAY 74	OFF CARRIAGEWAY TO RIGHT ON LEFT BEND 84	PARKED VEH RUN AWAY INTO VEHICLE 94
FACING TRAFFIC 05	RIGHT/LEFT FAR 15	LEFT/LEFT 25	LANE CHANGE LEFT 35	REVERSING 45	PULLING OUT REAR END 55	TEMPORARY ROADWORKS 65	OFF END OF ROAD/ 'T' INTERSECTION 75	OFF CARRIAGEWAY TO RIGHT ON L.H. BEND INTO OBJ/PKD VEH 85	STRUCK WHILE BOARDING OR ALIGHTING VEHICLE 95
ON FOOTPATH/ MEDIAN 06	LEFT NEAR 16		RIGHT TURN SIDE SWIPE 36	REVERSING INTO FIXED OBJECT/ PKD VEHICLE 46		STRUCK OBJECT ON CARRIAGEWAY 66		OFF CARRIAGEWAY TO LEFT ON LEFT BEND 86	
DRIVEWAY 07	LEFT/RIGHT FAR 17		LEFT TURN SIDE SWIPE 37	EMERGING FROM DRIVEWAY 47		ANIMAL (not ridden) 67		OFF CARRIAGEWAY TO LEFT ON L.H. BEND INTO OBJ/PKD VEH 87	
	TWO LEFT TURNING 18			FROM FOOTPATH 48				OUT OF CONTROL ON CARRIAGEWAY 88	OTHER 98
OTHER PEDESTRIAN 09	OTHER ADJACENT 19	OTHER OPPOSING 29	OTHER SAME DIRECTION 39	OTHER MANOEUVRING 49	OTHER OVERTAKING 59	OTHER ON PATH 69	OTHER STRAIGHT 79	OTHER CURVE 89	UNKNOWN 99

This is recorded for the first impact according to the table below
Note: The 'key' vehicle is represented by the dark arrow: →
and is the first vehicle listed for each accident in the accident description list (ADL).

Appendix D

Suggested LATM Scheme

Legend

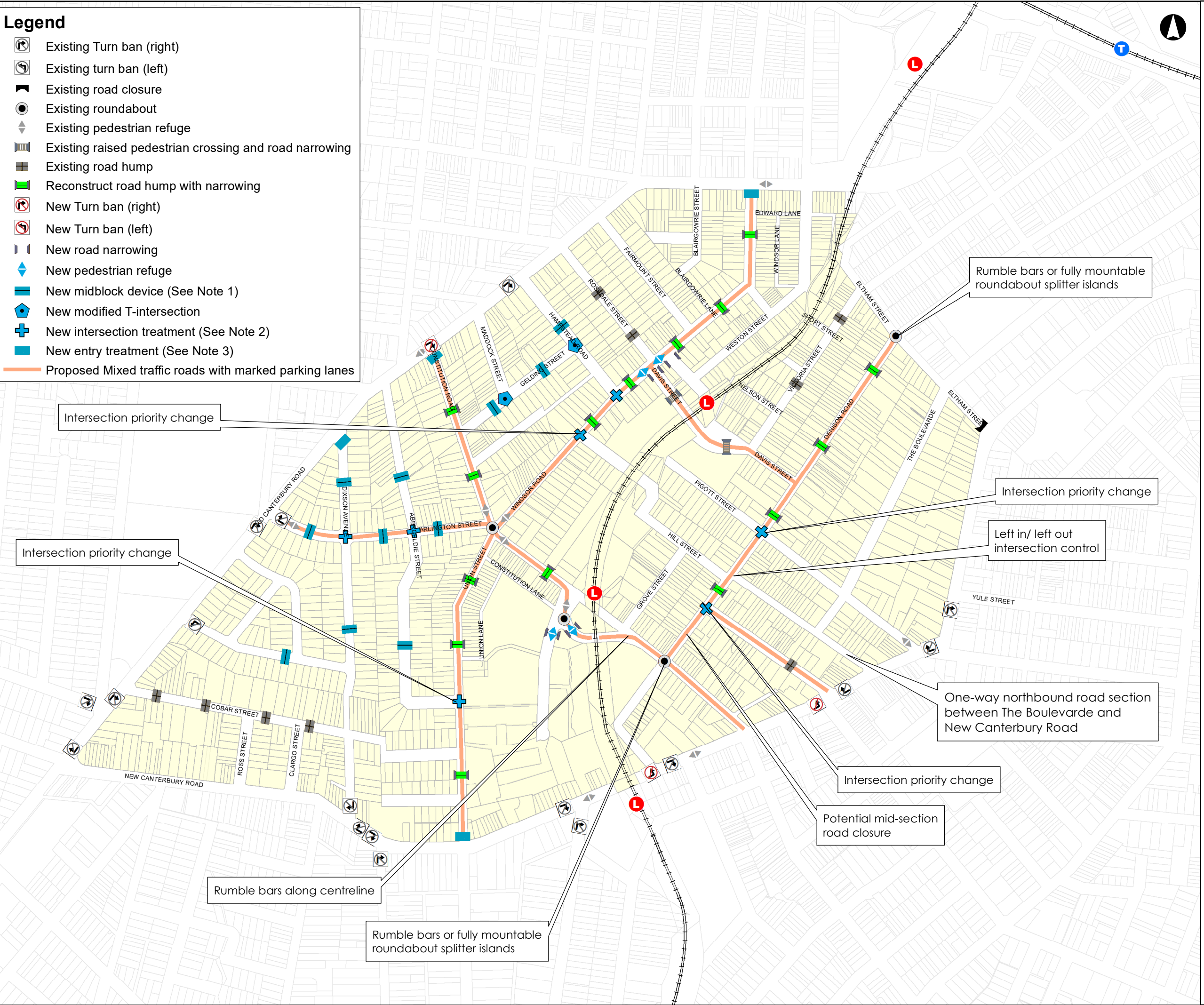
- Existing Turn ban (right)
- Existing turn ban (left)
- Existing road closure
- Existing roundabout
- Existing pedestrian refuge
- Existing raised pedestrian crossing and road narrowing
- Existing road hump
- Reconstruct road hump with narrowing
- New Turn ban (right)
- New Turn ban (left)
- New road narrowing
- New pedestrian refuge
- New midblock device (See Note 1)
- New modified T-intersection
- New intersection treatment (See Note 2)
- New entry treatment (See Note 3)
- Proposed Mixed traffic roads with marked parking lanes

NOTES

- (1) Midblock device:
- Raised and/ or narrowed
- Two-way, two lane or single-lane slow point
- (2) Intersection treatment:
- Modified T-intersection and/ or kerb extensions
- Raised pavement and/ or kerb extensions at four-way intersection
- (3) Entry treatment:
- Kerb extension and/ or tactile surface

It is suggested either midblock or intersection or combination of both treatments be implemented along a street.

There is opportunity to remove existing road humps if a new intersection treatment is preferred nearby.



P3	31-03-16	ADM	BDM	BDM
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Issue	Date	By	Chkd	Appd
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Client

Marrickville Council

Job Title

Dulwich Hill North
Local Area Traffic Management
Study

Drawing Title

Suggested LATM Options

Scale at A3

1:6,000

Drawing Status

Preliminary

Job No	Drawing No	Issue
15S1012000	Appendix D	P3

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