

# Tempe South LATM Study

## Final Report

Inner West Council

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**Gold Coast**

Suite 26, 58 Riverwalk Avenue  
Robina QLD 4226  
P: (07) 5562 5377

**Brisbane**

Level 2, 428 Upper Edward Street  
Spring Hill QLD 4000  
P: (07) 3831 4442

**Sydney**

Studio 203, 3 Gladstone Street  
Newtown NSW 2042  
P: (02) 9557 6202

**W:** [www.bitziosconsulting.com.au](http://www.bitziosconsulting.com.au)

**E:** [admin@bitziosconsulting.com.au](mailto:admin@bitziosconsulting.com.au)

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# EXECUTIVE SUMMARY

## Background

As part of the conditions of consent for an approved Bunnings Warehouse at 728-750 Princes Highway, the Eastern City Planning Panel has conditioned that a Local Area Traffic Management (LATM) study to be undertaken for the Tempe South area, in order to manage the impacts of the proposed development.

## Study Area

The study area for the LATM study consists of local roads in Tempe South, which are Barden Street, Edwin Street, Fanning Street, Foreman Street, Hart Street, Holbeach Avenue, Smith Street, South Street, Stanley Street, Station Street, Tramway Street, Union Street, Wentworth Street and Zuitton Lane. Data analysed and concept designs developed during the study are limited to these roads.

At the beginning of the study, background information and documents relating to the proposed Bunnings development were reviewed, providing information on future proposed traffic and road changes in the area. This included a desktop study of existing site conditions and review of surrounding land uses and road network information.

## Data Review

Crash history, traffic and parking data were analysed as part of the study. Traffic and parking surveys were conducted to capture the levels of traffic and parking demand within the study area. This included tube counts, parking occupancy surveys and intersection counts

Crash history data between January 2014 and December 2018 were analysed. It was found that 12 crashes occur within the study area, with two (2) involving vehicles at intersections with Princes Highway. Five (5) of the crashes occurred along Holbeach Avenue, two (2) occurred along Smith Street and two (2) occurred along Edwin Street. Out of the five (5) Holbeach Avenue crashes, four (4) involved Vulnerable Road Users (VRU), which included motorcyclists, pedal cyclists and pedestrians.

Traffic surveys were undertaken on 19 March 2020, Thursday and 21 March 2020, Saturday, recording relevant data such as traffic volumes, heavy vehicle volumes and 85th percentile speeds. The surveys were undertaken during the early stages of the COVID-19 pandemic, therefore, the surveys may not have accurately reflected typical traffic conditions. However, Council decided to proceed with the LATM study and the traffic survey data was subsequently deemed suitable for the study.

From the traffic surveys, it was found that some of the local roads have relatively higher average daily traffic volumes than other roads in the study area. The 85<sup>th</sup> percentile speeds on these roads are also relatively higher than the other roads, with speeds of more than 40 km/h but lower than the speed limit of 50 km/h. Some roads with a truck load limit were also found to be used by heavy vehicles.

The crash history and traffic survey data analysed helped to identify roads that require LATM devices in order to provide traffic calming and reduce vehicle speeds, reduce general traffic volumes by deterring traffic, reduce heavy vehicle volumes and reduce crash. Parking occupancy and duration surveys were undertaken for Barden Street, Fanning Street, Smith Street and a section of South Street on 19 March 2020, Thursday and 21 March 2020, Saturday. The parking surveys were also undertaken during the early stages of the COVID-19 pandemic, and may not accurately reflect typical parking conditions. The parking data showed that on average, Smith Street had 18 vacant spaces on Thursday and 27 vacant spaces on Saturday.

It is understood that up to 13 parking spaces along Smith Street will be removed as part of the Bunnings development. The parking survey data was used to determine the number of available kerbside parking spaces on a typical Thursday and Saturday and assess the impact of removing spaces due to Bunnings. These numbers then influenced the LATM treatment options proposed along Smith Street, as different LATM devices may also require removal of some kerbside parking spaces. It was found that Smith Street will have very few or no available parking spaces left when excluding parking that was removed due to the



Bunnings and the LATM devices. This may result in any parking overflow onto surrounding streets. The existing parking occupancy of around 50% along the surrounding Barden and South Streets mean that these roads are able to absorb any of the Smith Street parking overflow.

## Site Audits

Site audits of existing traffic and parking signage, bicycle and pedestrian facilities, LATM devices and refuse collection issues were undertaken on Wednesday 4 March 2020. Audits for Edwin and Tramway Streets were undertaken on Tuesday 15 September 2020, including site observations of current school traffic operations.

A finding of the audit was the lack of truck load limit signage on the northern end of Wentworth Street near Princes Highway, which is peculiar due to the presence of such signage on the southern end of Wentworth Street and other local roads in the study area. This finding was taken into consideration when developing the LATM concept designs.

## Traffic Generation and Impact

Approximated traffic generation rates and traffic volumes from previous studies were reviewed and adjusted to better represent potential traffic using local streets north of Princes Highway, namely Union Street. It was determined that Union Street could accommodate up to approximately 30% of Bunnings generated traffic leaving the site, based on acceptable performance limits of a local road.

The closure of Union Street was also explored and was determined as not feasible due to the effects to other local streets and required alternative routes.

## Risk Priority Scoring Assessment

A scoring system was developed to determine streets that require LATM treatments. This was based on the crash history and traffic data analysed, and other factors such as existing road width, availability of existing LATM devices, distance to schools and existing and future land use. Points were allocated to each road or road section based on the level of risk. The higher the points, the higher the risk for future crashes, and hence the higher the need for LATM devices.

Based on the scoring criteria, seven (7) streets (priority streets), being Smith Street, Edwin Street, Holbeach Avenue, Stanley Street, Union Street, Wentworth Street and Tramway Street, had relatively higher scores than other roads in the study area. Therefore, LATM devices are recommended to be implemented on these roads.

## Proposed Treatments Justification

A detailed selection criteria and list of suitable LATM measures were developed based on existing devices in the area and typical LATM devices presented in *Austrroads Guide to Traffic Management Part 8 - Local Area Traffic Management*.

Treatment options were then proposed for each of the four priority streets to address the specific issue(s) identified:

- **Smith Street Option 1:** Road narrowing using kerb blisters to slow down traffic, with contrasting pavement to highlight the change in road environment
- **Smith Street Option 2:** Mountable concrete median to provide a horizontal deflection and slow down traffic
- **Other Smith Street treatments:** on-road and off-road bicycle transitions, extension of shared path and angled on-ramp for cyclists, along with a widened footpath on the western side of Smith Street. An optional landscaped verge may also be provided between the widened footpath and roadway, which will result in the removal of kerbside parking.
- **Holbeach Avenue Option 1:** A set of four speed cushions at mid-block to provide a vertical deflection and slow traffic down
- **Holbeach Avenue Option 2:** A set of two speed cushions at mid-block to provide a vertical deflection and road narrowing using kerb blisters, with the aim of slowing down traffic



- **Stanley Street Option 1:** Flat top road humps at two mid-block locations to provide a vertical deflection and slow traffic down
- **Stanley Street Option 2:** Road narrowing using kerb blisters at two mid-block locations to slow traffic down
- **Wentworth Street Option 1:** Road narrowing using kerb blisters at both ends of the road to slow traffic down, with contrasting pavement to highlight the change in road environment
- **Wentworth Street Option 2:** Flat top road humps at both ends of the road to provide a vertical deflection and slow traffic down
- Other Wentworth Street treatment: Truck restriction signage at the northern end of Wentworth Street where there is no existing signage.
- **Union Street Option 1:** Flat top road humps at two mid-block locations to provide a vertical deflection and slow traffic down
- **Union Street Option 2:** A 10 km/h shared zone between Princes Highway and School Lane to slow down traffic and providing priority to pedestrians
- **Edwin Street:** A flat top road hump west of Stanley Street to slow traffic and deter non-local traffic
- **Tramway Street:** Contrasting Pavement Threshold at Unwins Bridge Road and Edwin Street to act as a visual gateway and deter non-local traffic
- Other Union Street treatments: A contrasting pavement at the entry of Union Street at Princes Highway to deter non-local traffic from using these streets.

Where possible, landscaping is proposed to improve the aesthetics of the street environment and enhance sense of place.

Additionally, contrasting thresholds have also been proposed for Barden Street, Fanning Street, Hart Street and Station Street to visually separate the local streets and the Princes Highway. This assists in highlighting the local road environment and deter non-local traffic from using these streets. This treatment can also be used to support a reduction in speed limit in the future, subject to discussion and approval by Transport for NSW.

The existing bus stop along Princes Highway outside the site of the development may be impacted by the development. The provision of replacement bus stops would be a matter for Transport for NSW and is outside the scope of this study

The traffic movements in and out of Bunnings site via Princes Highway and Smith Street have been considered during the Development Application (DA) stage of the development. Any changes to traffic movements to Bunnings cannot be changed during the development of this LATM study.

### Infrastructure Itemisation

Each option was broken down into individual components including signage. Treatments requiring signage include bicycle infrastructure at Smith Street, speed cushions and flat top road humps.

### Cost Estimation

Indicative costs for each component were estimated based on average standard costs provided by Inner West Council, as well as rates presented within *Local Infrastructure Benchmark Costs (IPART NSW)*. Naturally, the highest cost treatments include those requiring substantial civil works, such as flat top road humps, footpath widening, and kerb blisters.

Estimated costs for each option and measure ranges from \$18,000 to \$190,000, with the lowest cost treatment being the contrasting pavement, and the highest cost being the Smith Street treatment options.

### Community Engagement and Further Tasks

A draft version of the LATM report was released for exhibition online between 3<sup>rd</sup> November 2020 and 12<sup>th</sup> January 2021.

On the Your Say Inner West website, participants could undertake a survey to vote for their most preferred treatment option. They could also provide additional comments. The community could also submit the feedback via email to Council.

Comments from the community engagement were collated and have been summarised into themes. Many of the comments were concerned with the effectiveness of the proposed treatments in deterring non-local traffic.

The following tasks were undertaken after reviewing the comments and survey results:

- Analysis of tube count surveys undertaken in February 2021
- Recalculation traffic volumes generated by Bunnings using more conservative trip generation rates
- Changes to concept designs based on community feedback
- Adoption of treatment options as preferred design based on survey results
- Recalculation of cost estimate based on updated concept designs

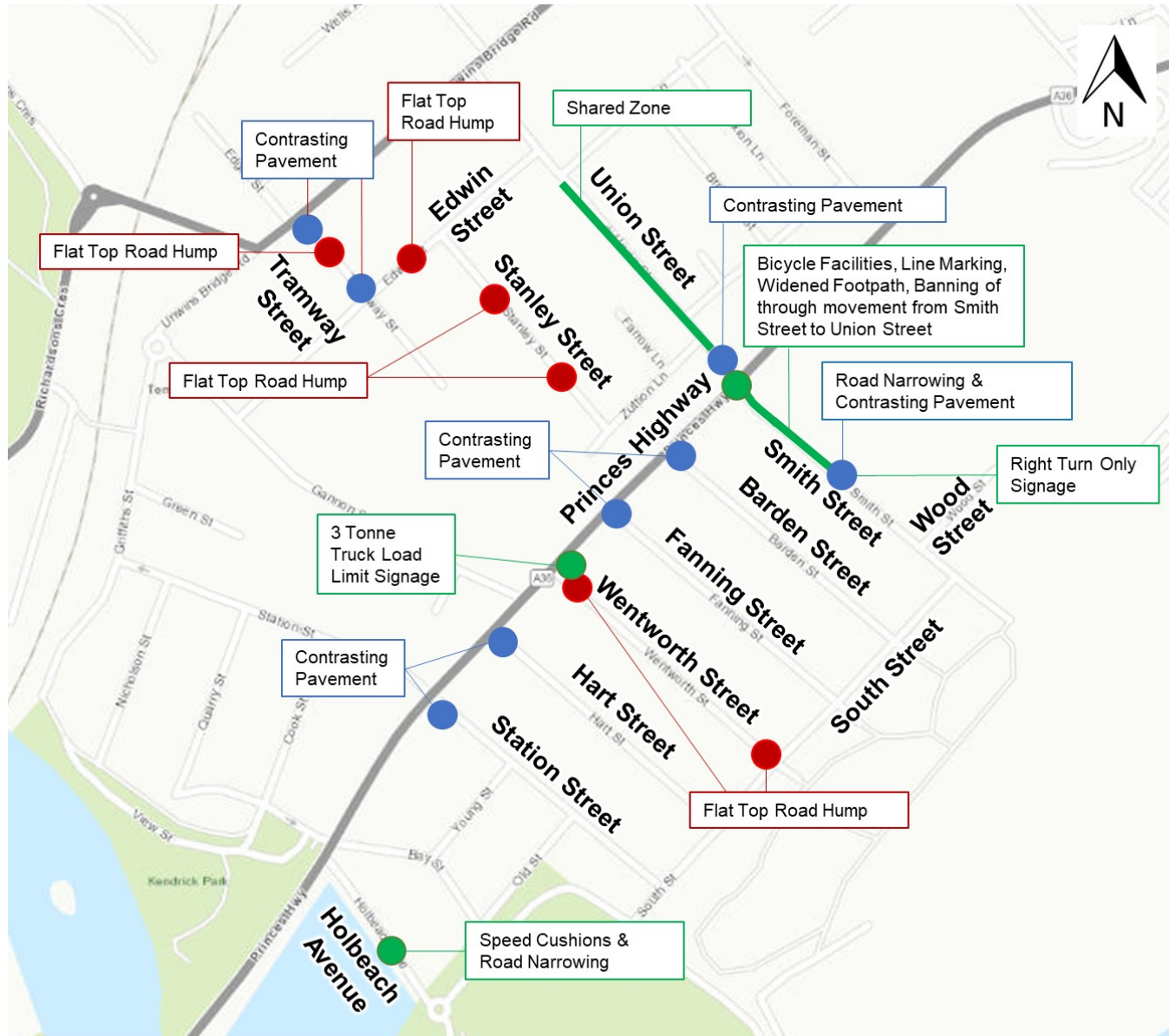
### Adopted Treatments

The adopted treatments are:

- **Smith Street:**
  - Road narrowing using kerb blisters
  - Contrasting pavement
  - On-road and off-road bicycle transitions
  - Extension of shared path and angled on-ramp for cyclists
  - Widened footpath on the western side of Smith Street between Princes Highway and Bunnings access
- **Holbeach Avenue:** A set of two speed cushions at mid-block and road narrowing using kerb blisters
- **Stanley Street:** Flat top road humps at two mid-block locations
- **Wentworth Street:** Flat top road humps at both ends of the road
- **Union Street:**
  - A 10 km/h shared zone between Princes Highway and School Lane
  - A 'soft' road closure at Union Street and Princes Highway to ban northbound through traffic travelling from Smith Street to Union Street (subject to further community consultation)
  - A contrasting pavement at the entry of Union Street at Princes Highway
- **Edwin Street:** A flat top road hump west of Stanley Street
- **Tramway Street:** Contrasting pavement thresholds at Unwins Bridge Road and Edwin Street, and a flat top road hump in mid-block outside 404 Unwins Bridge Road
- **Barden Street, Fanning Street, Hart Street and Station Street:** Contrasting pavement threshold at Princes Highway

The estimated costs for the adopted treatments, including contingency and design costs, range from **\$18,000 to \$135,000**.

## Proposed Treatment Locations



### Legend

- Flat Top Road Humps ●
- Contrasting Pavement Threshold ●
- Other Types of Treatments ●

Title:  
Proposed LATM Treatments  
Map

Date: 29/03/2021

Project Number: P4533

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Tempe South LATM Study





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Figure 7.2: Routes with Union Street Closure

Figure 7.3: Access to Gannon Street using Local Streets

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Figure 9.1: Examples of Treatments

Figure 9.2: Proposed Treatment Locations and Options

Figure 9.3: Sample Concepts of Proposed Treatments

Figure 12.1: Relative LATM Device Costs

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## **Appendices**

Appendix A: Crash Data Maps

Appendix B: Tube Count & Parking Data Maps

Appendix C: Site Audit Data and Maps

Appendix D: LATM Treatment Concept Designs

Appendix E: Engagement Outcomes Report



# 1. INTRODUCTION

## 1.1 Background

As part of the conditions of consent for an approved Bunnings Warehouse at 728-750 Princes Highway, the Eastern City Planning Panel has conditioned that a Local Area Traffic Management (LATM) study to be undertaken for the Tempe South area, in order to manage the impacts of the proposed development.

Inner West Council (Council) has commissioned Bitzios Consulting to undertake this LATM study.

## 1.2 Study Area

The LATM study area includes the local roads adjoining Princes Highway and Unwins Bridge Road in the Tempe South precinct, namely:

- Barden Street
- Edwin Street
- Fanning Street
- Foreman Street
- Hart Street
- Holbeach Avenue (excluding the Tempe Recreation Reserve access road)
- Smith Street
- South Street
- Stanley Street
- Station Street (between Princes Highway and South Street)
- Tramway Street
- Union Street
- Wentworth Street
- Zuitton Lane

The study area and the proposed development (728-750 Princes Highway) are illustrated in Figure 1.1.



Adapted from ESRI Maps

**Figure 1.1: Study Area**

### 1.3 Purpose and Scope

This report details the assessment of the traffic conditions within the Tempe South study area and its findings. The study included:

- Review of existing conditions, including:
  - Surrounding Land Uses
  - Road Hierarchy
  - Public Transport and Active Transport
  - Garbage Collection
  - Parking Controls
- Review of Future developments, including proposed developments and traffic generation
- Crash Data Analysis
- Traffic and Parking Data Analysis, including:
  - Intersection traffic counts
  - Vehicle tube count speed and volume data
  - Heavy vehicle proportions
  - Parking occupancy data
- On site audit, including:

- Traffic and parking signs
- LATM and traffic calming devices
- Bicycle and pedestrian facilities
- Waste management
- Development of a scoring system and identification of priority streets for treatment
- Development of potential LATM treatments
- Recommendation and assessment of LATM treatments and locations
- Development of an infrastructure schedule based on treatment options
- Cost estimation of each type of the recommended treatment
- Methodology and assumptions used for cost estimation.

## 1.4 Local Area Traffic Management

### 1.4.1 What is Local Area Traffic Management

According to Austroads Guide to Traffic Management Part 8 – Local Area Traffic Management (AGTM08-16) (summarised):

LATM is concerned with the planning and management of the usage of road space within a local traffic area. It 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 streets in local areas.

LATM is essentially system-based and area-wide. It considers neighbourhood traffic-related problems and their proposed solutions in the context of the local area or a group of streets within it, rather than only at isolated locations. In addition, it requires that physical traffic measures be seen as a sequence of interrelated devices rather than individual treatments.

The primary target 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 is to reduce traffic volumes and speeds in local streets to increase amenity, liveability, and improve safety and access for all road users.

The need for LATM usually arises from:

- an intent to reduce traffic-related problems
- orderly traffic planning and management
- a need to modify 'transport' behaviour
- a desire to improve the community space and sense of place
- a desire to improve environmental, economic and social outcomes
- traffic interventions associated with new development or the implementation of pedestrian and bicycle plans and other local policies (e.g. RTA 2002).

### 1.4.2 Stages of a LATM

The general stages involved in preparing a LATM study, as per *AGTM08-16*, are outlined in Table 1.1. This study primarily covers Stage 2 of the LATM process, with partial coverage of Stage 3 items.



**Table 1.1: Stages of a LATM**

| Tasks  | Status in this study   |
|--|--|
| <b>Stage 1: Initiating an LATM program (completed)</b>   |  |
| <ul style="list-style-type: none"> <li>Decide that action is needed</li> <li>Define study area, precincts and functional hierarchy of roads</li> <li>Develop study plan, including type of treatments and study costs</li> <li>Develop consultation strategy</li> <li>Council decision</li> <li>Prepare brief for consultant, if required</li> </ul> | Completed by Council prior to start of the study   |
| <b>Stage 2: Data collection and problem identification</b>   |  |
| <ul style="list-style-type: none"> <li>Define and collect required data</li> <li>Identify problems</li> <li>Identify potential solutions</li> <li>Define and confirm objectives</li> </ul>   | <ul style="list-style-type: none"> <li>Section 2 outlines the existing condition of the study area.</li> <li>Sections 3 to 5 outlines the data analysis and identification of problems.</li> <li>Section 6 outlines future conditions to be considered in the development of LATM plans.</li> <li>Section 9 outlines potential solutions that can be used in the study.</li> </ul> |
| <b>Stage 3: Development of plans</b>   |  |
| <ul style="list-style-type: none"> <li>Clarify suitable strategies (including confirmation of LATM as an appropriate response)</li> <li>Develop outline schemes and supporting arterial improvements</li> <li>Consult on draft plans</li> <li>Assess and refine alternatives</li> <li>Select, present to council for adoption</li> </ul>             | <ul style="list-style-type: none"> <li>Section 9 outlines treatment options proposed</li> </ul>  |
| <b>Stage 4: Scheme design</b>  |  |
| <ul style="list-style-type: none"> <li>Location and design of treatments</li> <li>Consult with nearby owners/occupiers</li> <li>Prepare contract documents</li> </ul>  | <ul style="list-style-type: none"> <li>Section 9 outlines the location of treatment options</li> <li>Section 10 lists the rationale for the location and design</li> <li>Section 11 outlines the components of treatments</li> <li>Section 12 outlines the estimated cost of the treatments</li> </ul>   |
| <b>Stage 5: Implementation</b>   |  |
| <ul style="list-style-type: none"> <li>Confirm timing and staging</li> <li>Conduct additional 'before' studies as required</li> <li>Community information</li> <li>Construct/install</li> <li>Safety audit</li> </ul>  | <ul style="list-style-type: none"> <li>Section 13 outlines a summary of feedback from community engagement</li> <li>Construction will be undertaken after approval by Local Traffic Committee and detailed design</li> </ul>   |
| <b>Stage 6: Monitoring and review</b>  |  |

| Tasks  | Status in this study |
|--|----------------------|
| <ul style="list-style-type: none"> <li>▪ After data collection, observation and reports</li> <li>▪ Identify unanticipated impacts or outcomes</li> <li>▪ Review technical and community assessment of scheme</li> <li>▪ Revise as needed and feasible</li> <li>▪ Record and report process and outcomes</li> </ul> | Not undertaken yet   |

Source: Austroads Guide to Traffic Management Part 8: Local Area Traffic Management

## 1.5 Referenced Documents

The following documents have been reviewed and referenced as part of this LATM study.

- Draft Integrated Transport Strategy 2019
- Marrickville Bicycle Strategy August 2007
- Marrickville Pedestrian Access and Mobility Plan (PAMP) 2009
- Draft Inner West Council Public Domain Parking Policy 2019
- Crash database provided by Council
- Local Traffic Committee Report and Correspondence relating to traffic and development issues in the study area
- Development Consent conditions in relation to 728—750 Princes Highway, Tempe
  - Joint Regional Planning Panels (JRPP) report
  - Initial and revised traffic assessment reports by Transport and Traffic Planning Associates (TPPA)
  - Peer review of traffic assessment report by GTA Consultants
  - Other assessments
- Austroads Guide to Road Design, Part 6A Pedestrian and Cyclist Paths (AGR06A-17)
- Austroads Guide to Traffic Management, Part 8 Local Area Traffic Management (AGTM08-16)
- RTA/RMS/Transport for NSW Technical Directions & Guidelines, including:
  - RTA NSW Bicycle Guidelines 2003
  - RTA Guide to Traffic Generating Development, 2002
  - Transport for NSW – Safer Speed policy and Guidelines Version 1 July 2012
  - RMS Permit Parking Guidelines 2005
- Australian Standards AS1742 - Manual of uniform traffic control devices:
  - AS1742.10 – 2009: Part 10: Pedestrian control and protection
  - AS1742.13 – 2009: Part 13: Local area traffic management
- Other RMS/Austroads Guidelines or Australian Standards

### 1.5.1 Previous LATM Studies

An LATM study was previously conducted by GTA Consultants (for Inner West Council) of the St Peters and Tempe area in 2010 (*St Peters/Tempe LATM Study 2010*). Details on this study are provided in Section 2.10.

## 2. EXISTING CONDITIONS

### 2.1 Geographic Location

The study area is located within the suburb of Tempe, approximately 7km south-east of the Sydney CBD (the City). Tempe is the southernmost suburb within the Inner West LGA.

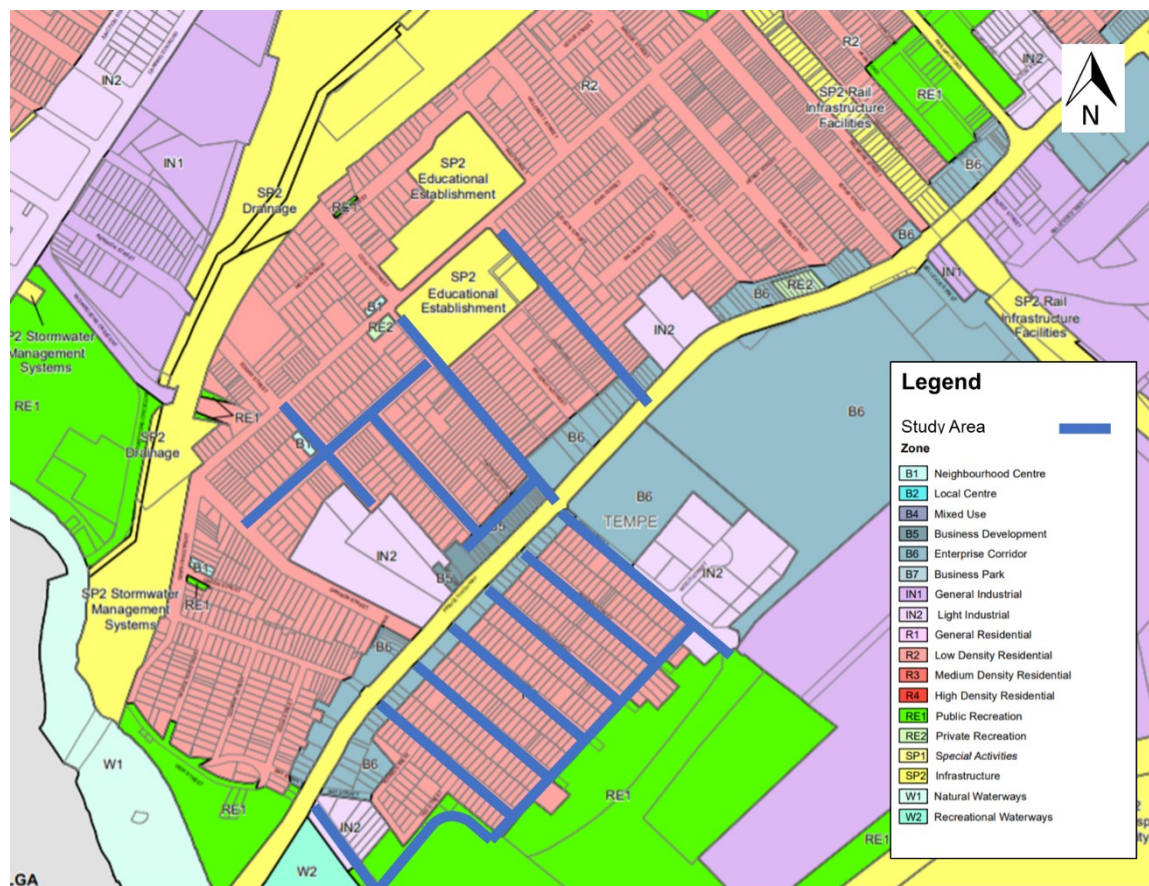
Cooks River and Alexandria Canal run along the western and southern boundaries of Tempe. Wolli Creek is located across Cooks River to the west and Sydney Airport land located across Alexandria Canal to the south.

### 2.2 Land Use

Based on the Marrickville Council LEP 2011, the study area is primarily comprised of the following land uses:

- R2 – Low Density Residential
- B6 – Enterprise Corridor (Commercial)
- IN2 – Light Industrial
- SP2 – Infrastructure (Educational Establishment i.e. schools)

The land zoning map is shown in Figure 2.1.



Source: Marrickville Local Environment Plan 2011, NSW Legislation

**Figure 2.1: Tempe Land Zoning Map**

### **2.2.1 Residential**

The study area and roads listed in Section 1.1, mostly access low density residential lots, with some service access to commercial lots fronting Princes Highway and Wood Street.

### **2.2.2 Non-Residential**

#### **2.2.2.1 Commercial**

Commercial lots are primarily located along the Princes Highway corridor, including tyre repair shops, motorcycle workshops, cafes, service stations, medical and dental clinics, a pub, a bus depot and other small retail. No large retail developments are located within the study area.

The larger commercial lots occupied by the IKEA Tempe and Decathlon sports stores are located towards the north east of the study area.

#### **2.2.2.2 Industrial**

Industrial land uses are located along the Princes Highway corridor, the eastern side of Smith Street, and Wood Street. As such, heavy vehicles access these lots using Smith Street and Wood Street.

The Tempe Bus Depot is located to the west of the study area on Princes Highway towards Gannon Street.

#### **2.2.2.3 Schools**

Two schools are located to the north of the study area along Unwins Bridge Road. Tempe Public School is bounded by Union Street, Foreman Street and Unwins Bridge Road.

### **2.2.3 Parks & Reserves**

Located towards the south of the study area are large recreation spaces, including Tempe Lands, Tempe Dog Park, Tempe Golf Range, Tempe Recreation Reserve and Tempe Reserve. They are accessed via Holbeach Avenue and South Street.

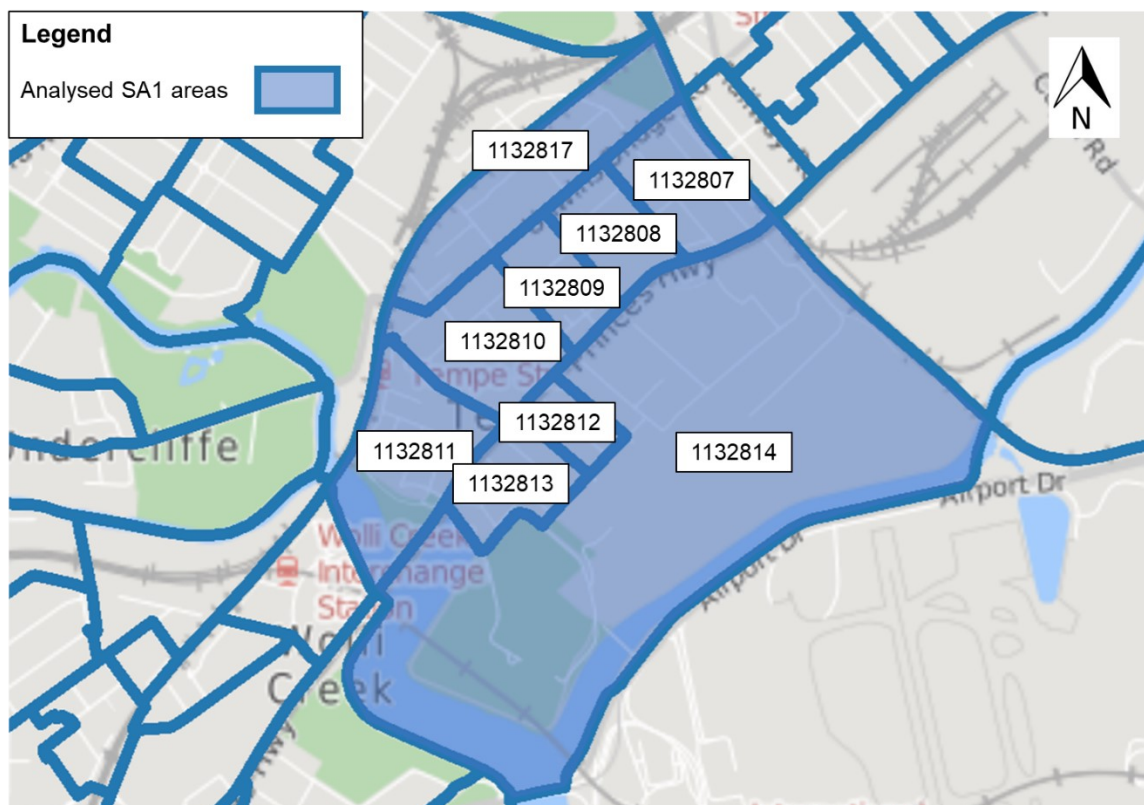
## **2.3 Garbage Collection**

Council garbage collection occurs on Fridays between 5:00 AM and 12:00 PM. Previous information indicates that 10.5m refuse collection vehicles are used. There are no fixed garbage collection routes.

## **2.4 Area Demographics**

The 2016 Census data was reviewed to identify travel trends to and from the study area. Nine (9) SA1 level statistical areas (codes 1132807-1132814 and 1132817) cover majority of the suburb of Tempe including the study area, shown in Figure 2.2.





Source: Australian Bureau of Statistics (ABS)

**Figure 2.2: Analysed SA1 areas**

Census data, including Journey to Work data, for the nine (9) SA1 areas were compared to the Greater Sydney average shown in Table 2.1.

**Table 2.1: Tempe Demographic Data**

| Category  | Tempe SA1 Areas | Greater Sydney Average |
|---|-----------------|------------------------|
| <b>Age</b>  |                 |                        |
| Young population between age 20 and 34              | 21%             | 23%                    |
| Aged population over age 65                         | 12%             | 14%                    |
| <b>Vehicle Ownership</b>                            |                 |                        |
| Vehicle ownership of one (1) motor vehicles or more | 85%             | 88%                    |
| Vehicle ownership of two (2) motor vehicles or more | 36%             | 50%                    |
| <b>Mode of Travel to Work</b>                       |                 |                        |
| Public transport as mode of travel to work          | 41%             | 26%                    |
| Private vehicles as mode of travel to work          | 50%             | 67%                    |
| Bicycle riders as mode of travel to work            | 3%              | 1%                     |
| Walking only as mode of travel to work              | 4%              | 5%                     |

A comparison of statistics reveals:

- The study area features a slightly higher proportion of younger residents and lower proportion of older residents than the Greater Sydney average
- Vehicle ownership in Tempe is less than the Greater Sydney average



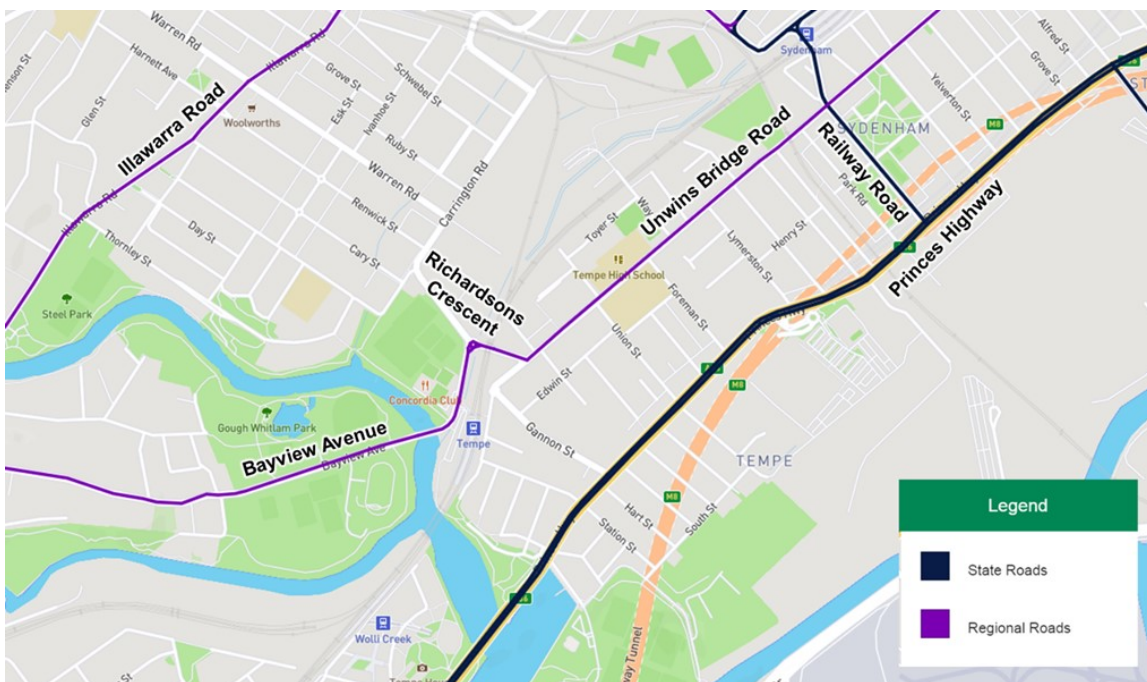
- Consistent with the lower vehicle ownership rate, a high proportion of Tempe residents use public transport to travel to work
- Proportion of residents cycling to work is higher than the Sydney average

Journey to work patterns are likely attributed to the number of public transport services available, including both buses and trains (detailed in Section 2.6) and active transport facilities (including cycling routes) nearby.

## 2.5 Road Classification

Road Classification in Tempe and surrounds is shown in Figure 2.3, featuring:

- State Road - Princes Highway within Tempe is a state road (HW1), while
- Regional Road – Unwins Bridge Road from Richardsons Crescent to Campbell Street, and Richardson Crescent from Cooks River to Unwins Bridge Road
- Local Roads - all other roads



Source: Transport for NSW – Road Classification Map

**Figure 2.3: Road Classification in Tempe and Surrounds**

## 2.6 Public Transport

### 2.6.1 Trains

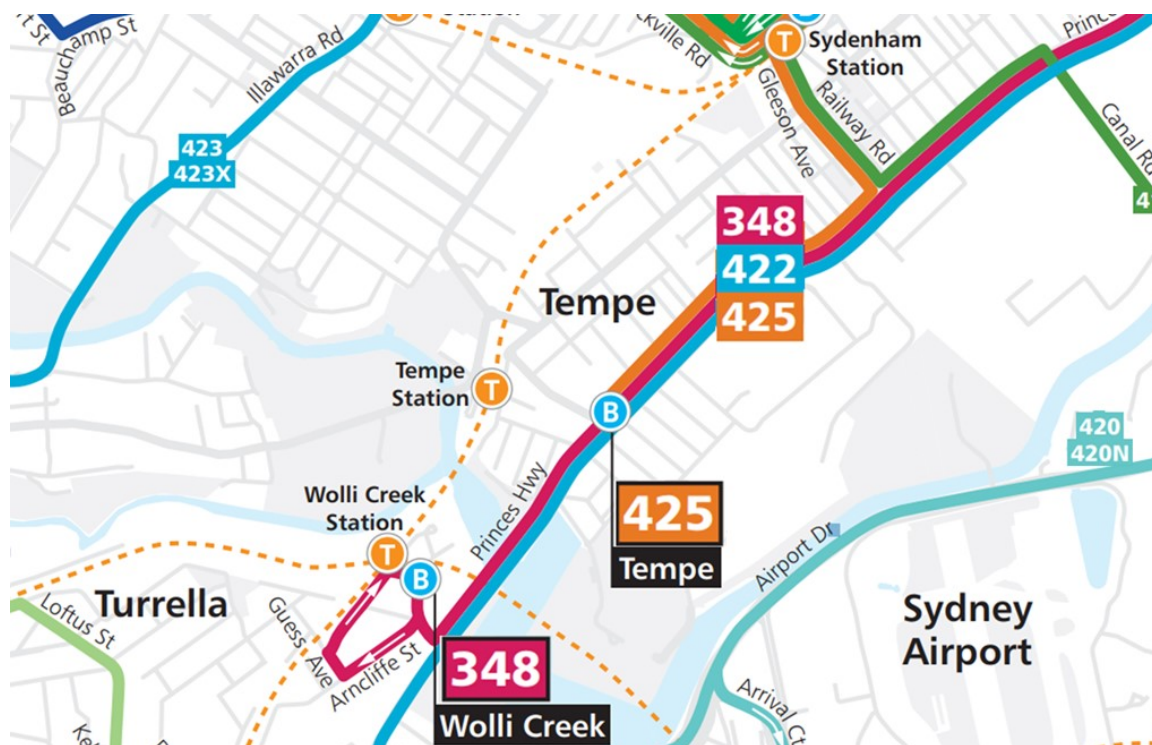
The nearest train station to the study area is Tempe railway station in the west, serviced by the T4 (Eastern Suburbs & Illawarra Line), with services running every 10 minutes per direction on weekdays off-peak. The next nearest station is Wolli Creek railway station located approximately 1km west of the study area and is within walking distance. Wolli Creek is serviced by both the T4 and T8 (Airport & South Line) services. Both T4 and T8 services stop at stations within the City.

### 2.6.2 Buses

Three public bus routes operate in the Tempe area along Princes Highway. The public bus network is shown in Figure 2.4. Additionally, there is one school bus route servicing Tempe High School students, which runs along Unwins Bridge Road.

The Tempe bus depot is located at the corner of Princes Highway and Gannon Street, accessed via Princes Highway.

The public and school bus services in Tempe are summarised in Table 2.2.



Source: Transit Systems

**Figure 2.4: Public Bus Services in Tempe**

**Table 2.2: Bus Routes**

| Route Number         | Route Description              | Roads Serviced   | Weekday Off-peak Frequency (min)                          |
|----------------------|--------------------------------|--|---|
| 348                  | Bondi Junction to Wolli Creek  | Princes Highway  | 30  |
| 422                  | Kogarah to Central Pitt Street | Princes Highway  | 15  |
| 425                  | Tempe to Dulwich Hill          | Princes Highway  | 60  |
| 700S<br>(School bus) | Earlwood to Tempe High School  | Richardsons Crescent, Unwins Bridge Road, Collins Street | One AM service towards school, one PM service from school |

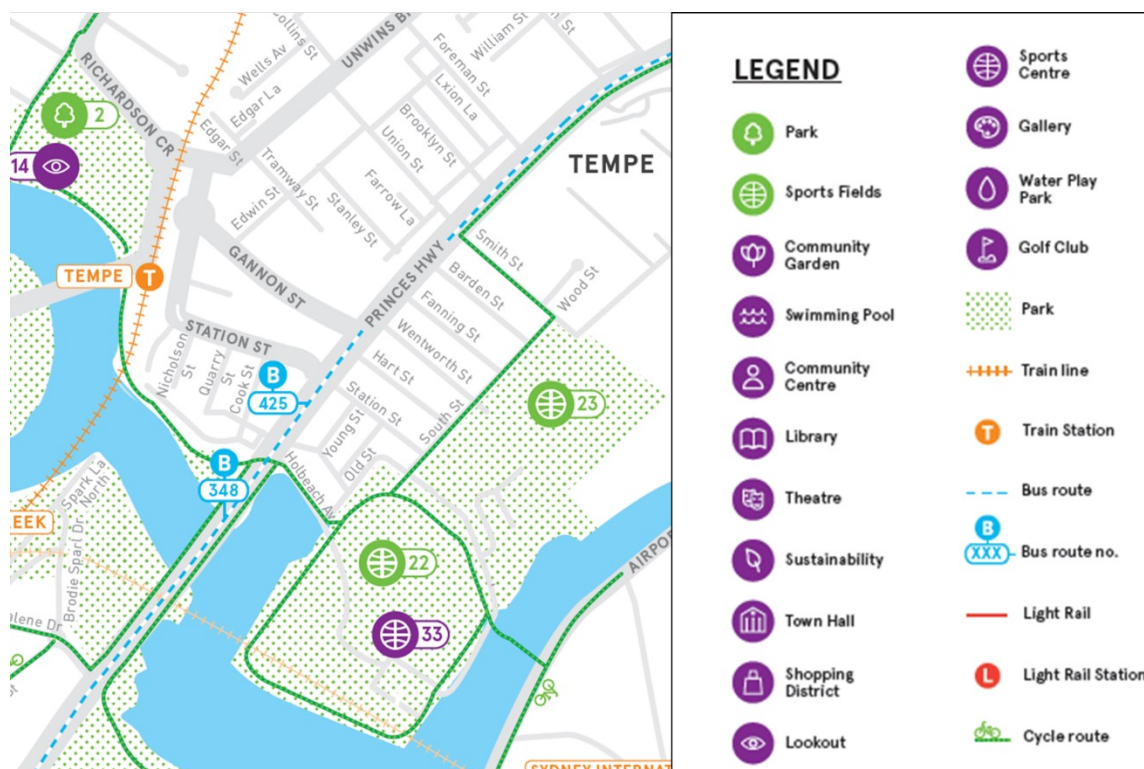
## 2.7 Other Transport

### 2.7.1 Bicycles

The local bicycle network (based on the Stay Active in Marrickville Map) is shown in Figure 2.5, and the (previously) proposed bicycle network in the Marrickville Bicycle Strategy 2007 is shown in Figure 2.6.

Two routes are present within the study area:

- Local Route L13 (shown as LR08 in Figure 2.6) – following Holbeach Avenue, South Street and Smith Street
- Alexandra Canal cycleway - following Holbeach Avenue, through Tempe Reserve and along Airport Drive on the southern bank of Alexandria Canal



Source: Staying Active in Marrickville Map (Inner West Council)

**Figure 2.5: Existing Bicycle Routes in Tempe**





### 2.7.3.2 Go Get

Go Get is another carshare service, where members are able to rent GoGet vehicles from their pods on an hourly or daily basis. As of March 2020, there are no GoGet pods within the study area; however, there are seven (7) nearby car pods within walking distance from the study area, including two (2) within the IKEA Tempe carpark. Additionally, IKEA Tempe has 12 van pods, with vans available to be rented. It is important to note that the pods in IKEA Tempe are located within its carpark and therefore can only be rented during the carpark's opening hours.

The location of GoGet car and van pods around the study area are shown in Figure 2.7.



Source: GoGet & Car Next Door, Adapted from GoogleMaps

**Figure 2.7: GoGet Pod Locations in Tempe**

### 2.7.3.3 Bunnings Car Share

As part of the Bunnings development application Consent Condition No.5 four (4) car share spaces are to be provided within the Bunnings development.



## 2.8 Parking Controls

Kerbside parking controls within the study area are shown in Figure 2.8). Most of the kerbside parking available is unrestricted on-street parallel parking with some time limited parking (one hour) along Union Street and Foreman Street. Due to the narrow nature of the roads in the study area, many vehicles were observed partially parking on the footpath (See Section 5).

Angled parking is provided along Holbeach Avenue near Bay Street. It provides unrestricted parking for residents as well as users of Tempe Recreation Reserve.

Persons with a disability (PWD) spaces are located along Edwin Street, Union Street, Foreman Street, Wentworth Street and Union Street.

There are 'No Parking' restrictions along Zuitton Lane and Farrow Lane due to their narrow widths. No Stopping restrictions are found along Union Street where kerb blisters are located.



Adapted from ESRI Maps

**Figure 2.8: Existing Parking Restrictions**

## 2.9 Truck Load Limits

A 3-tonne truck load limit is implemented in the study area and surrounds, covering local side roads near or connecting to Princes Highway, shown in Figure 2.9.

Wentworth Street was identified to maintain an inconsistent truck restriction, with signage only present at South Street (see traffic sign audit, section 5.1.2). It was confirmed the truck restriction applied along Wentworth street with signage missing at Princes Highway.

Another inconsistency of signage was at Tramway Street facing Unwins Bridge Road, where a “Gannon Street” tag plate was affixed to the truck limit sign. With the tag plate, it gives an indication that the truck limit applies to Gannon Street but not Tramway Street. It is possible that the tag plate was wrong affixed to this sign and should have been affixed to another sign on Unwins Bridge Road.

A 3-tonne truck load limit does not apply to Holbeach Avenue, South Street, Smith Street, Wood Street, Princes Highway and most of Unwins Bridge Road



Adapted from ESRI Maps

**Figure 2.9:** Truck Load Limit in Tempe

## 2.10 Previous LATM Study in Tempe

Planning approval of 630-726 Princes Highway (IKEA Tempe development) was granted by the NSW Department of Planning in July 2009. A condition of the approval required an LATM study to

be undertaken by Council “to identify the traffic and transport impacts of the proposed development and recommend ways in which any potential adverse impacts on local residential streets could be mitigated.” GTA Consultants was commissioned by the then-Marrickville Council to undertake the study which was completed in October 2010. IKEA Tempe opened in November 2011.

The study identified:

- Smith Street, South Street, Union Street and Wentworth Street have higher 85<sup>th</sup> percentile speeds compared to the other roads in the areas, ranging between 40 and 50 km/h on Thursdays and Saturdays, with 85<sup>th</sup> percentile speeds along Smith Street exceeding 50 km/h on Saturdays.
- One ‘fixed object’ crash occurred on Station Street near South Street.
- Speed humps on South Street and Union Street, median island rumble bars at Edwin Street, and the pedestrian crossing on Union Street outside Tempe Public School required repainting of line marking
  - It is important to note that the school crossing on Union Street was not a raised crossing as of 2010, and the nearby speed hump had since been replaced by a pair of kerb blisters with contrasting pavement.
  - The rumble bar at Edwin Street at Union Street had since been replaced by contrasting pavement
- Recommendation to introduce further LATM devices

The devices and measures implemented included:

- speed cushions on Smith Street
- the right turn ban from Princes Highway to Union Street
- the right turn ban from Gannon Street to Edwin Street
- the median island rumble strips at Edwin Street and Tramway Street
- closing the median gap at Station Street
- raised thresholds on Foreman Street, only at Unwins Bridge Road and Princes Highway

The speed cushions on Smith Street were eventually removed in 2012 and 2017 respectively, as a result of resident complaints about the noise produced by trucks driving over the speed cushions.

## 2.11 Existing LATM Devices & Measures

Existing LATM devices and traffic controls were identified during site audits, detailed in Section 5.1.

## 3. CRASH DATA ANALYSIS

### 3.1 Crash History Data

The NSW Speed Zoning Guidelines recommend a minimum of three years of crash data for a statistical crash analysis. For the purpose of this assessment, crash data between 1 January 2014 and 31 December 2018 was sourced from Council representing five (5) years of data. The data included reported crash events within the entire Inner West Council LGA and were filtered to include crashes within the study area. Crashes along Princes Highway within 15 metres from intersections of the study area roads were also included.

As per Rule 287 (3) of the NSW Road Rules 2014, crashes are only recorded if they are reported to police and when one of the following occurs:

- Any person is killed or injured
- Drivers involved in the crash do not exchange particulars
- When a vehicle involved in the crash is towed away.

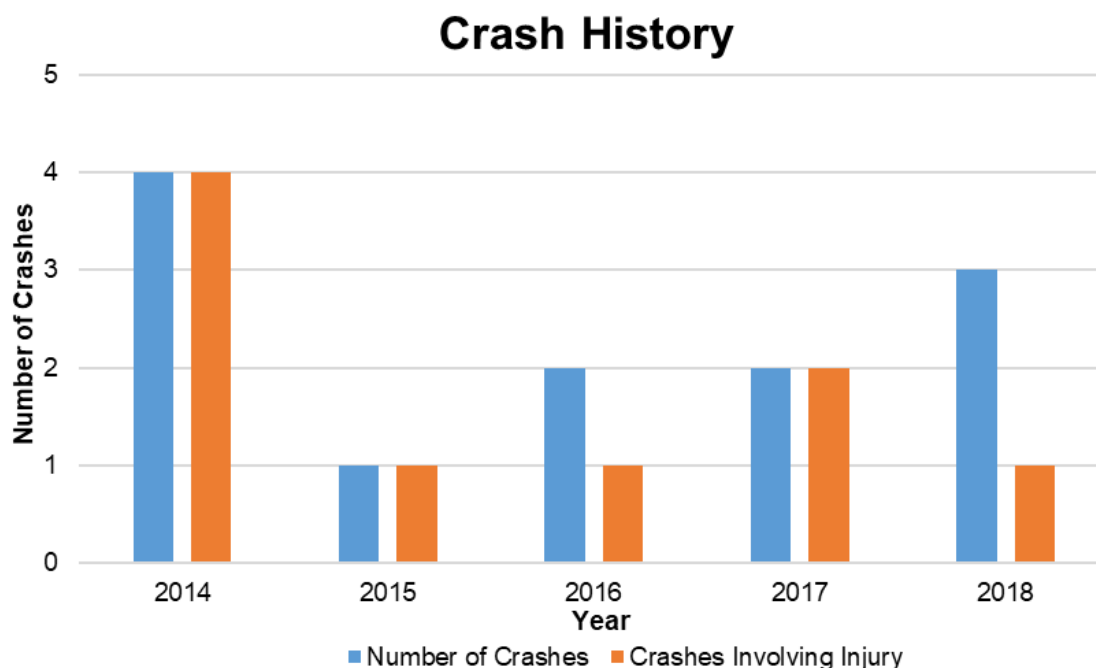
The crash history between the five (5) years of data within and surrounding the study area were analysed, and a total of 12 crashes were recorded along streets within the study area. Out of the 12 crashes in the study area, two (2) involved vehicles at intersections with Princes Highway.

### 3.2 Crash Statistics

#### 3.2.1 Crash History

Figure 3.1 shows the crash history between January 2014 and December 2018.

There is an overall trend of steady number of crashes per year, with less than 4 crashes happening each year. Most of the crashes involve an injury.



**Figure 3.1: Crash History between January 2014 and December 2018**



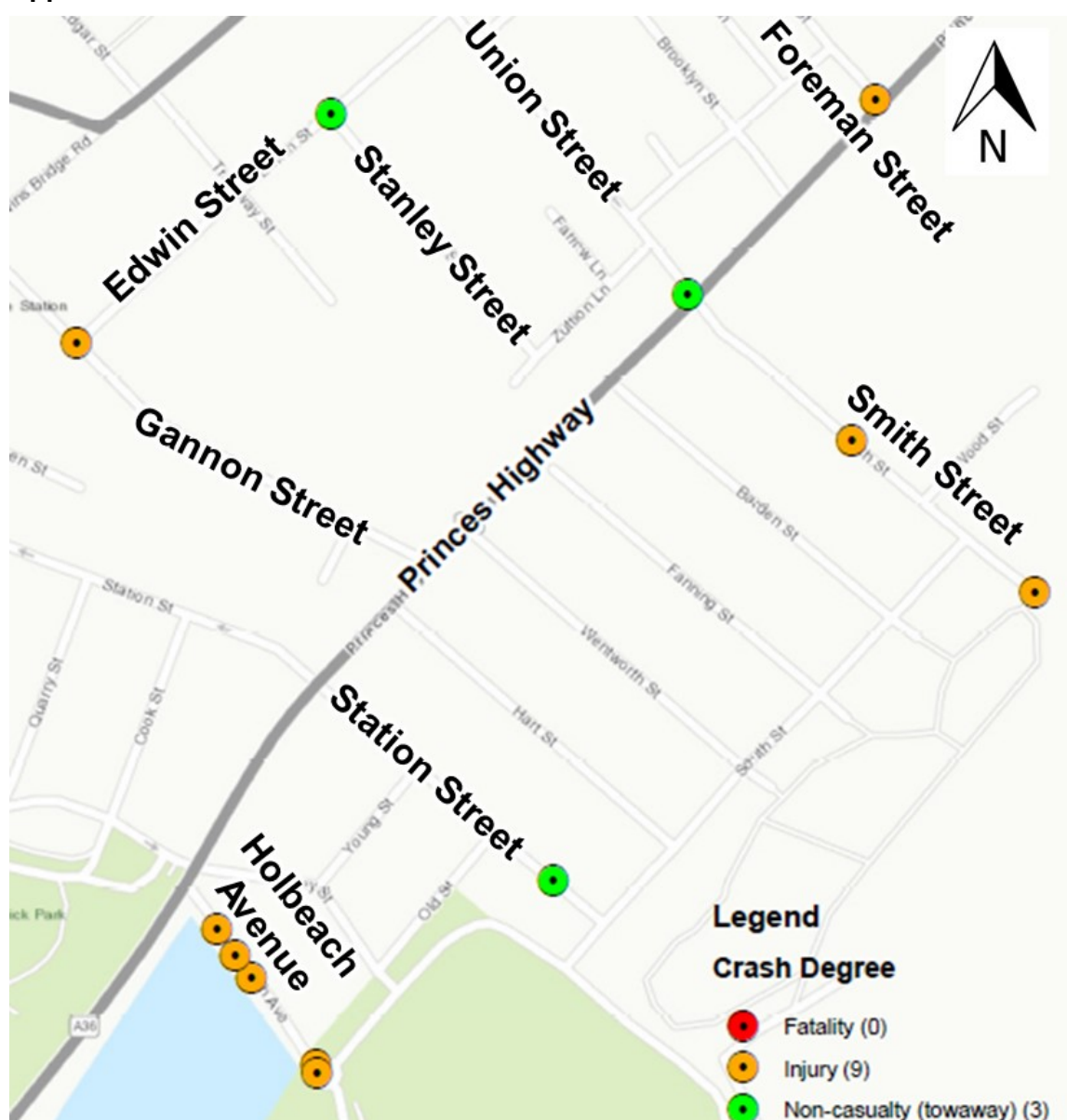
### 3.2.2 Crash Severity

Table 3.1 summarises the number of crashes within the 5 years of crash data based on crash severity.

**Table 3.1: Number of Crashes Based on Crash Severity**

| Crash Severity         | Number of Crashes | Percentage  |
|------------------------|-------------------|-------------|
| Fatal                  | 0                 | 0%          |
| Injury                 | 9                 | 75%         |
| Non-casualty (towaway) | 3                 | 25%         |
| <b>Total</b>           | <b>12</b>         | <b>100%</b> |

The crash data shows that the majority of crashes within the study area were not fatal but resulted in injury (75%). The locations of the crashes are shown in Figure 3.2. They are also shown in **Appendix A**.



Adapted from ESRI Maps

**Figure 3.2: Crash Degree Severity**

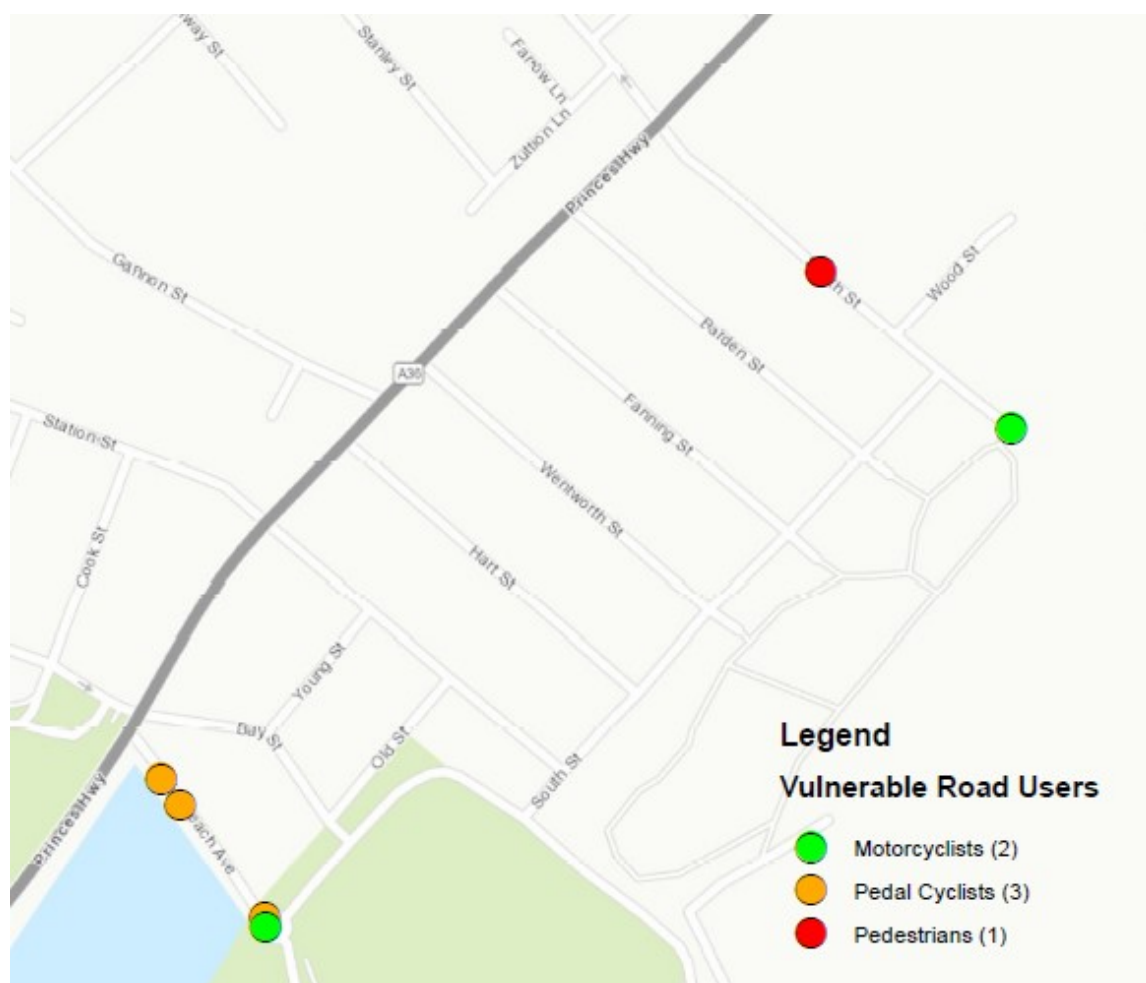
### 3.2.3 Vulnerable Road Users

Table 3.2 summarises the number of vulnerable road user (VRU) crashes within the 5 years of crash data based on crash severity. VRUs are classified into motorcyclists, pedal cyclists and pedestrians.

**Table 3.2: Number of Vulnerable Road User Crashes Based on Crash Severity**

| Crash Severity         | Vulnerable Road User |               |            | Total    |
|------------------------|----------------------|---------------|------------|----------|
|                        | Motorcyclist         | Pedal Cyclist | Pedestrian |          |
| Fatal                  | 0                    | 0             | 0          | 0        |
| Injury                 | 2                    | 3             | 1          | 6        |
| Non-casualty (towaway) | 0                    | 0             | 0          | 0        |
| <b>Total</b>           | <b>2</b>             | <b>3</b>      | <b>1</b>   | <b>6</b> |
| <b>Percentage</b>      | <b>33%</b>           | <b>50%</b>    | <b>17%</b> | <b>-</b> |

The crash data shows that all crashes involving vulnerable road users were not fatal, however, resulted in an injury. There were six (6) vulnerable road user crashes out of the total of 12 crashes, which is a relatively high percentage (50%). Pedal cyclists were recorded to have the highest percentage of vulnerable road user crashes (50%). The location of crashes involving VRU are shown in Figure 3.3. They are also shown in **Appendix A**.



Adapted from ESRI Maps

**Figure 3.3: Vulnerable Road Users**

## 3.3 Analysis of Trends and Contributing Factors

### 3.3.1 Crash Type

The 12 crashes were classified into road user movement (RUM) codes, as shown in Table 3.3. The crashes are also further detailed in Table 3.4, ordered by crash severity.

**Table 3.3: Crash Summary by Crash Type**

| Crash Type  | RUM Codes | Number of Crashes | Percentage of Total |
|---|-----------|-------------------|---------------------|
| Crashes involving pedestrians   | 00 – 09   | 1                 | 8                   |
| Crashes involving vehicles from adjacent directions   | 10 – 19   | 3                 | 25%                 |
| Crashes involving vehicles from opposing directions   | 20 – 29   | 0                 | 0%                  |
| ▪ Crashes involving vehicles from the same direction  | 30 – 39   | 1                 | 8%                  |
| Crashes involving manoeuvring vehicles  | 40 – 49   | 4                 | 33%                 |
| Crashes involving vehicles overtaking   | 50 – 59   | 0                 | 0%                  |
| Crashes involving vehicles on path – vehicles hitting parked vehicles or objects on the roadway (e.g. animals, temporary objects) | 60 – 69   | 0                 | 0%                  |
| Crashes involving vehicles leaving the roadway on a straight length of road   | 70 – 79   | 2                 | 17%                 |
| Crashes involving vehicles leaving the roadway on a curve   | 80 – 89   | 1                 | 8%                  |
| Crashes involving vehicle passengers and miscellaneous crashes  | 90 – 99   | 0                 | 0%                  |
| <b>Total</b>  |           | <b>10</b>         | <b>100%</b>         |

From Table 3.3, the majority of the crashes resulted from manoeuvring issues (33%).

Holbeach Avenue has the highest number of crashes, recording five (5) out of 12 crashes (42%). Out of the five crashes, three (3) crashes involved pedal cyclists (60%), and four (4) crashes resulted from manoeuvring issues (80%).

Considering this, this analysis will identify any trending issues and/or contributing factors that may have contributed to the likelihood of the aforementioned crash types.

**Table 3.4: Crash Details by Road**

| Road                              | Crash Severity         | Crash Type  | Specific RUM Code   | Vulnerable Road User |
|-----------------------------------|------------------------|---|---|----------------------|
| Holbeach Avenue                   | Injury                 | Involving manoeuvring vehicles  | RUM 48: From footpath                                     | Pedal Cyclist        |
| Holbeach Avenue                   | Injury                 | Involving manoeuvring vehicles  | RUM 47: Emerging from driveway                            | -                    |
| Holbeach Avenue                   | Injury                 | Involving manoeuvring vehicles  | RUM 48: From footpath                                     | Pedal Cyclist        |
| Holbeach Avenue at South Street   | Injury                 | Involving vehicles from adjacent directions                                       | RUM 10: Cross traffic                                     | Motorcyclist         |
| Holbeach Avenue                   | Injury                 | Involving manoeuvring vehicles  | RUM 49: Other Manoeuvring                                 | Pedal Cyclist        |
| Smith Street                      | Injury                 | Involving vehicles leaving the roadway on a straight length of road               | RUM 74: Out of control on carriageway                     | Motorcyclist         |
| Smith Street                      | Injury                 | Involving pedestrians   | RUM 3: Playing, working, lying, standing on carriageway   | Pedestrian           |
| Princes Highway at Foreman Street | Injury                 | Involving vehicles from adjacent directions                                       | RUM 13: Right near  | -                    |
| Station Street                    | Non-casualty (towaway) | Involving vehicles leaving the roadway on a straight length of road               | RUM 71: Left off carriageway into object / parked vehicle | -                    |
| Princes Highway at Smith Street   | Non-casualty (towaway) | Involving vehicles from adjacent directions                                       | RUM 10: Cross traffic                                     | -                    |
| Edwin Street                      | Injury                 | Involving vehicles from the same direction  | RUM 30: Rear end  | -                    |
| Edwin Street at Stanley Street    | Non-casualty (towaway) | Involving vehicles leaving the roadway on a curved length of road or when turning | RUM 85: Right off left bend into object / parked vehicle  | -                    |

### 3.3.2 Crash Casualty Rates

Typical casualty crash rates for urban and rural roads are provided within the NSW Speed Zoning Guidelines. A table of typical urban casualty rates from the NSW speed zoning guidelines is shown in Table 3.5.

**Table 3.5: Typical Urban Casualty Rates**

| URBAN TYPICAL CASUALTY RATE (casualties per km per year) |             |       |       |       |       |       |       |
|--|-------------|-------|-------|-------|-------|-------|-------|
| Road category  | Speed zones |       |       |       |       |       |       |
|  | 50          | 60    | 70    | 80    | 90    | 100   | 110   |
| Motorway / freeway                                       | —           | —     | 0.049 | 0.039 | 0.463 | 0.148 | 1.219 |
| State highway  | 0.014       | 0.450 | 0.827 | 0.217 | 0.177 | 0.101 | 0.177 |
| Other classified road                                    | 0.102       | 1.351 | 1.361 | 0.360 | 0.253 | 0.111 | 0.007 |
| Unclassified road  | 0.446       | 0.874 | 0.376 | 0.154 | 0.077 | 0.064 | 0.008 |

**NOTE:**

- Discretion is needed in comparing these rates to the rate on a particular section of road. A specific road section may not fall comfortably into any single category.
- The values do not suggest an acceptable level.

Source: Transport for NSW Centre for Road Safety - NSW Speed Zoning Guidelines (Section 3)

The typical urban casualty rate for a 50km/h unclassified road is 0.446 casualties per km per year.

Table 3.6 summarises the number of crashes per year and calculated casualty rate (casualties per year per km) for each section of road. Princes Highway was excluded as all other crashes along the road were not analysed. Station Street was also excluded as its only crash had no casualties.

**Table 3.6: Crash Casualty Rate by Road**

| Road   | Length (km) | Casualties |          |          |          |          |          | Rate     |                 |
|--|-------------|------------|----------|----------|----------|----------|----------|----------|-----------------|
|  |             | 2014       | 2015     | 2016     | 2017     | 2018     | Total    | Per year | Per km per year |
| Holbeach Avenue (south of Princes Highway, between Princes Highway & roundabout) | 0.15        | 3          | 1        | 0        | 1        | 0        | 5        | 1        | 6.7             |
| Smith Street   | 0.30        | 0          | 0        | 0        | 1        | 1        | 2        | 0.4      | 1.3             |
| Edwin Street   | 0.34        | 1          | 0        | 0        | 0        | 0        | 1        | 0.2      | 0.6             |
| <b>Total</b>   |             | <b>4</b>   | <b>1</b> | <b>0</b> | <b>2</b> | <b>1</b> | <b>8</b> | <b>-</b> | <b>-</b>        |

From the crash casualty rate results calculated in Table 3.6, it can be seen that Holbeach Avenue, Smith Street and Edwin Street present a rate exceeding the typical urban casualty rate of 0.446 casualties per km per year.

### 3.4 Crash Data Analysis Summary

Based on the crash analysis results, the majority of the crashes resulted from manoeuvring issues. Most of them also involved a vulnerable road user. Holbeach Avenue has the highest number of crashes, the highest number of crashes involving vulnerable road users, and the highest crash casualty rate in the study area.



## 4. TRAFFIC SURVEY DATA ANALYSIS

### 4.1 Environmental Capacity and Speed Performance Standards

The *RTA Guide to Traffic Generating Developments 2002* (GTGD) provides justification for an acceptable environmental limit for each road classification, listed in Table 4.1.

**Table 4.1: Environmental Capacity Performance Standards**

| Road Class | Type       | Maximum Speed (km/h) | Max Peak Hour Volume (veh / hour) |
|------------|------------|----------------------|-----------------------------------|
| Local      | Access way | 25                   | 100                               |
|            | Street     | 40                   | 200 goal<br>300 maximum           |
| Collector  | Street     | 50                   | 300 goal<br>500 maximum           |

The *GTGD* also recommends that a typical residential street should ideally exhibit a flow of traffic less than 2,000 vehicles per day (vpd), with a design objective of less than 1,500 vpd to maintain a comfortable traffic environment for local residents.

### 4.2 Traffic Surveys

#### 4.2.1 Data List

In March 2020, Council has commissioned Austraffic to undertake traffic surveys as part of the study and provided the surveys to Bitzios Consulting for analysis. In September 2020, Bitzios Consulting commissioned Matrix Data Collection to undertake further traffic survey for analysis. The traffic surveys undertaken are listed in Table 4.2. The data collected were analysed to provide information about traffic operation in the study area, such as volumes and speed.

**Table 4.2: Traffic Survey Data**

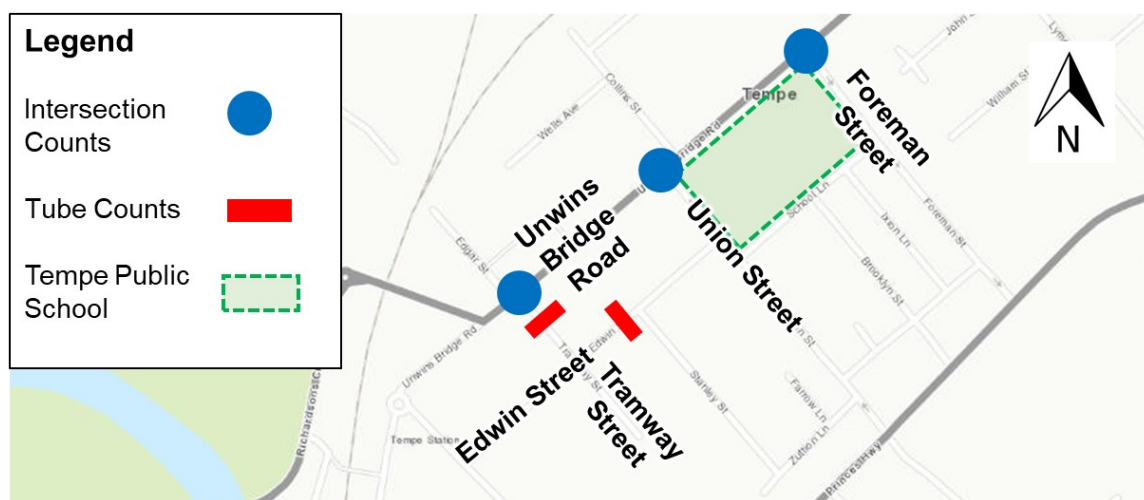
| Survey                        | Date(s)   | Time                                       | Locations  |
|-------------------------------|---|--|--|
| Intersection Counts           | 19 March 2020, Thursday                                   | 16:00 PM to 18:00 PM                       | At four locations, shown in Figure 4.1: <ul style="list-style-type: none"> <li>Princes Highway / Union Street / Smith Street</li> </ul>  |
|                               | 21 March 2020, Saturday                                   | 11:00 AM to 13:00 PM                       | <ul style="list-style-type: none"> <li>Smith Street / Wood Street</li> <li>Unwins Bridge Road / Union Street</li> <li>Princes Highway / Holbeach Avenue</li> </ul>   |
|                               | 8 September 2020, Tuesday                                 | 7:30 AM to 9:30 AM<br>14:00 PM to 16:00 PM | At three locations, shown in Figure 4.2: <ul style="list-style-type: none"> <li>Unwins Bridge Road / Union Street</li> <li>Unwins Bridge Road / Foreman Street</li> <li>Unwins Bridge Road / Tramway Street</li> </ul> |
| Tube Counts (Volumes & Speed) | 19 March 2020, Thursday to 25 March 2020, Wednesday       | 24-hour                                    | At multiple locations shown in Figure 4.1  |
|                               | 9 September 2020, Wednesday to 15 September 2020, Tuesday | 24-hour                                    | At Edwin Street and Tramway Street, shown in Figure 4.2  |

| Survey                       | Date(s)                 | Time               | Locations                        |
|------------------------------|-------------------------|--------------------|----------------------------------|
| Parking Occupancy & Duration | 19 March 2020, Thursday | 7:00 AM to 7:00 PM | At locations shown in Figure 4.3 |
|                              | 21 March 2020, Saturday | 7:00 AM to 7:00 PM |                                  |



Adapted from ESRI Maps

**Figure 4.1:** Intersection Count & Tube Count Locations (March 2020)



Adapted from ESRI Maps

**Figure 4.2:** Intersection Count & Tube Count Locations (September 2020)



Adapted from ESRI Maps

**Figure 4.3: Parking Survey Locations**

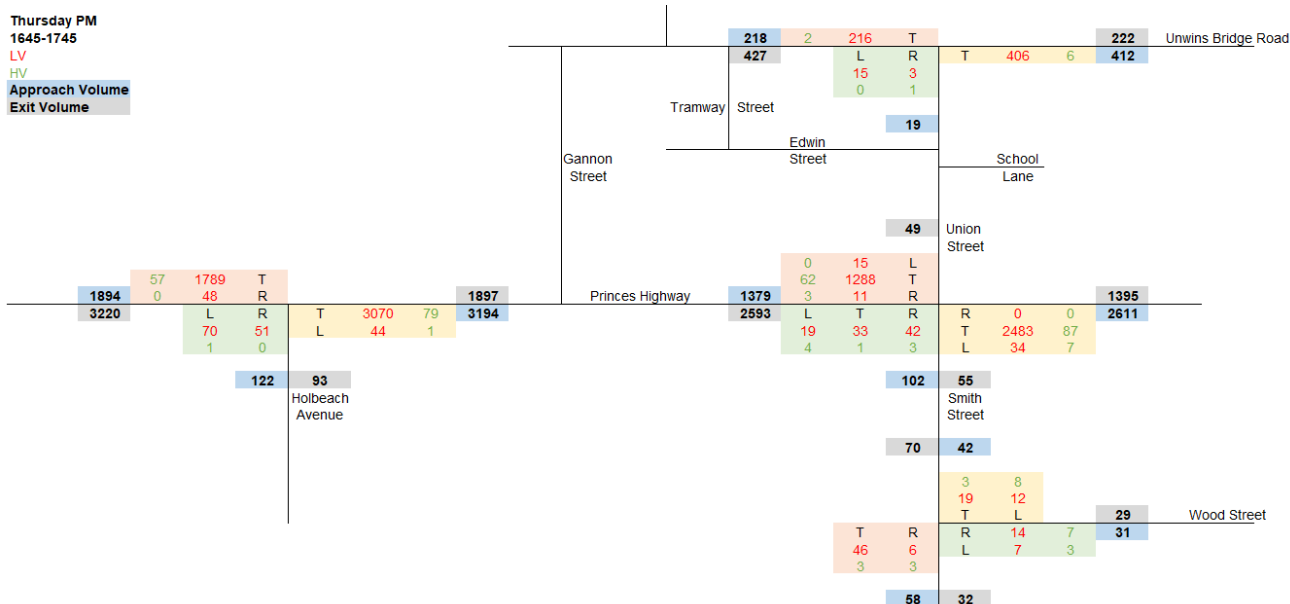
It is important to note that the surveys in March were undertaken shortly after the start of the COVID-19 pandemic in New South Wales, when limits to gatherings have started to be imposed. The surveys in September were also undertaken in the midst of the COVID-19 pandemic. As such, some workers would be working from home during the survey dates. Therefore, the surveys may not accurately reflect the usual traffic operation or parking condition before the pandemic. Schools were not closed and were operating as usual on both surveys.

Despite the potential inaccuracies in the data, Council made the decision to proceed with the LATM study with these volumes. This is acceptable as no traffic modelling is involved and hence volumes do not have to be accurate. **Any traffic volumes obtained are to be compared relative to other streets in the study area.** Streets with relatively higher volumes or heavy vehicle compositions than other streets would be identified as a potential location for LATM devices. This will likely be the same using pre-COVID or post-COVID traffic data. Vehicular speed is a representative of driver behaviour which is not influenced by changes in traffic volumes.

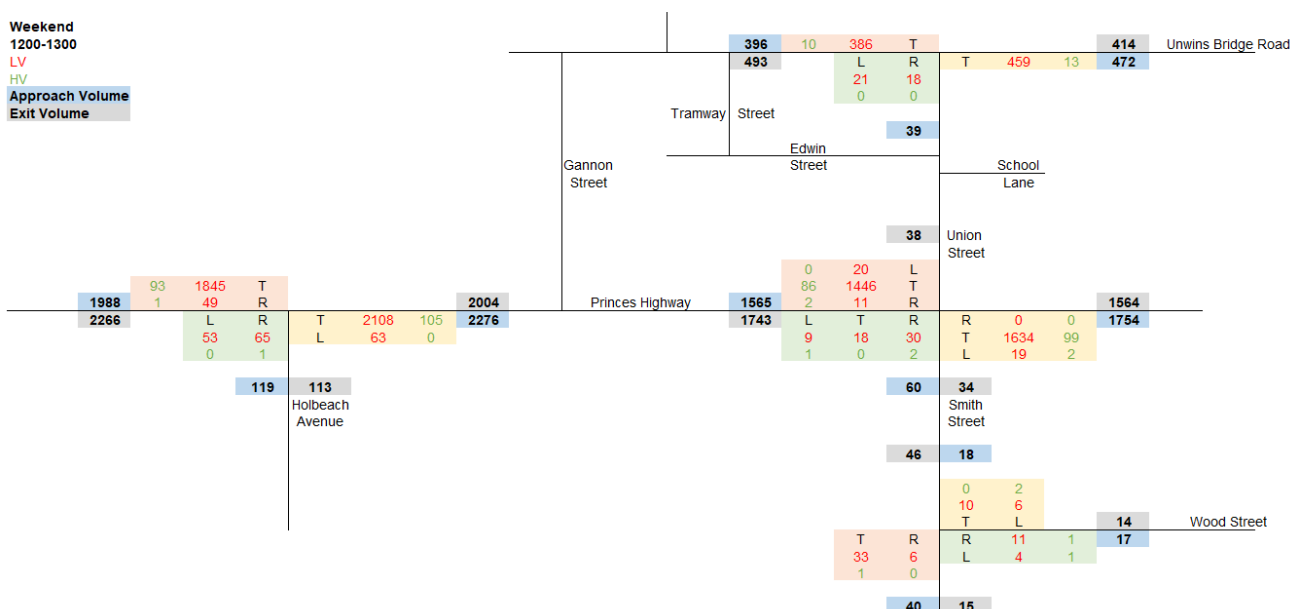
A comparison of the intersection counts data to previous traffic assessments or surveys are shown in Table 4.3.

#### 4.2.2 Intersection Counts

In March 2020, intersection count surveys were undertaken on a Thursday afternoon and Saturday weekday, for the four intersections listed in Table 4.2. The peak hour intersection counts for the intersections for the Thursday and Saturday are shown in Figure 4.4 and Figure 4.5. It is important to note that there is a No Right Turn restriction from Princes Highway (southwest bound) to Union Street.



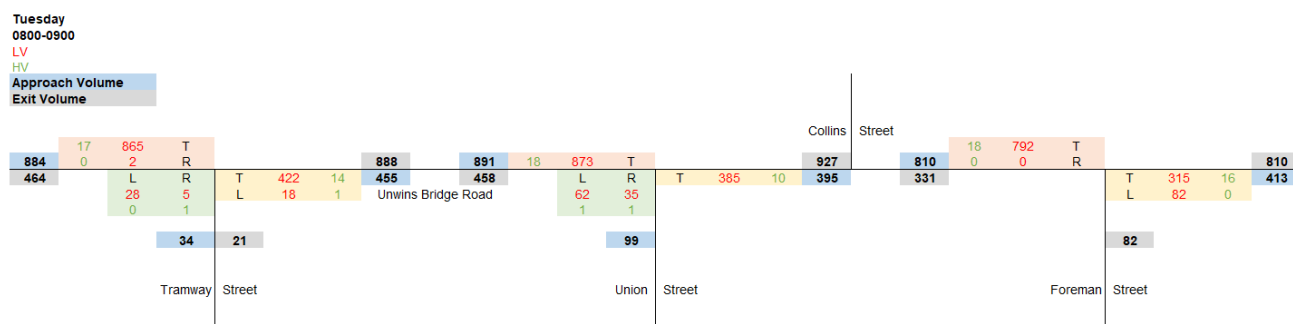
**Figure 4.4: Thursday PM Peak Hour Intersection Counts (March 2020)**



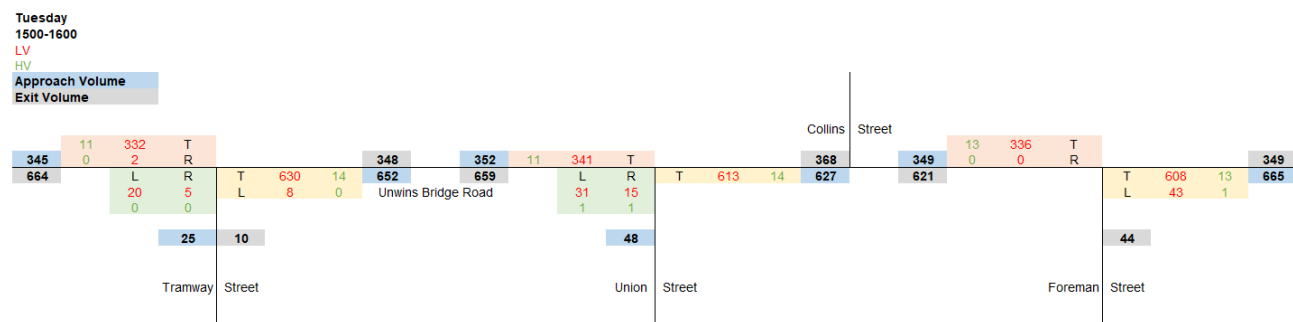
**Figure 4.5: Saturday Peak Hour Intersection Counts (March 2020)**

In September 2020, further intersection count surveys were undertaken on a Tuesday morning and afternoon, for the three intersections listed in Table 4.2. The surveys were undertaken to understand the traffic operations surrounding Tempe Public School before and after school hours. The peak hour intersection counts for the intersections for the Thursday and Saturday are shown in Figure 4.6 and Figure 4.7. It is important to note that there is a No Right Turn restriction from Unwins Bridge Road (eastbound) to Foreman Street, and a peak-hour only No Right Turn restriction from Unwins Bridge Road (eastbound) to Tramway Street.

It can be seen that the major vehicular routes are along Princes Highway and along Unwins Bridge Road for the Thursday and Saturday. This is expected as Princes Highway and Unwins Bridge Road are state and regional roads respectively.



**Figure 4.6: Tuesday AM Peak Hour Intersection Counts (September 2020)**



**Figure 4.7: Tuesday PM Peak Hour Intersection Counts (September 2020)**

As for heavy vehicular movement, due to the truck load limits in the Tempe area (see Section 2.9), heavy vehicles are only found along roads without any truck load limit, such as Princes Highway, Smith Street, Wood Street and Unwins Bridge Road. With the exception of Princes Highway, the number of heavy vehicles is not high, with at most 15 heavy vehicles per hour.

There are occasional heavy vehicles turning in and out of Holbeach Avenue and Union Street but the numbers are very low (less than 2 per movement). This shows that the existing truck load limit is well implemented and is effective in the Tempe area.

The existing No Right Turn restriction from Princes Highway to Union Street, introduced as part of the previous LATM study (Section 2.10), has also proven effective, with no vehicles observed to be turning right into Union Street.

From the intersection counts, less than 50 vehicles per hour use Union Street. However, tube count surveys will provide a better understanding on the utilisation of Union Street.

#### 4.2.2.1 Comparison with pre-COVID data

A comparison of the intersection count data with previous traffic assessments and surveys in the area is shown in Table 4.3.



**Table 4.3: Comparison of traffic volumes with pre-COVID surveys (Union Street / Smith Street / Princes Highway)**

| Traffic Assessment / Data  | Survey Date(s)                      | Smith Street       |                    | Union Street       |
|----------------------------|-------------------------------------|--------------------|--------------------|--------------------|
|                            |                                     | Southbound volumes | Northbound volumes | Northbound volumes |
| Thursday PM                |                                     |                    |                    |                    |
| TTPA Bunnings TIA          | 2017 or before (exact date unknown) | 47                 | 133                | 37                 |
| GTA peer review of the TIA | 6 December 2018                     | 46                 | 131                | 72                 |
| This LATM study            | 19 March 2020                       | 55                 | 102                | 49                 |
| Saturday midday            |                                     |                    |                    |                    |
| TTPA Bunnings TIA          | 2017 or before (exact date unknown) | 33                 | 50                 | 22                 |
| GTA peer review of the TIA | 8 December 2018                     | 58                 | 85                 | 81                 |
| This LATM study            | 21 March 2020                       | 34                 | 60                 | 38                 |

The intersection counts are consistent with counts undertaken by Transport and Traffic Planning Associates (TTPA) as part of the Traffic Impact Assessment (TIA) for the Bunnings Development (published October 2017) (see Section 6.2 for details of the development). However, they are lower than the counts undertaken by GTA Consultant for their peer review of the TIA (published January 2019), particularly for vehicles entering Union Street.

### 4.2.3 Tube Counts

24-hour tube counts were collected for seven days for all the study area roads. Information such as volumes, heavy vehicle composition, and speed data were recorded for both directions of the road.

From the data, the average daily traffic (ADT) volumes, the 85<sup>th</sup> percentile speeds, and daily heavy vehicle percentage and volumes were extracted for all directions of the locations, shown in Table 4.4. The directions stated were the directions on surveys. Relatively higher values are highlighted **orange**.

Maps showing the values of ADT, 85<sup>th</sup> percentile speeds, and heavy vehicle percentage and volumes are shown in **Appendix B**.

#### 4.2.3.1 Traffic Volumes

All local streets in the study area have a VPD of less than 1,500, the comfortable limit for a local residential traffic environment as according to *GTGD*. Moderately high volumes of more than 500 vpd can be observed on Smith Street, South Street and Holbeach Avenue. Union Street and Edwin Street have volumes of between 400 to 500 vehicles. This is expected for Union Street as it is one of the more direct routes between Princes Highway and Unwins Bridge Road

**Table 4.4: Tube Count Data Summary**

| Street           | Location                                  | Direction | ADT Volumes | 85 <sup>th</sup> Percentile Speed (km/h) | Heavy Vehicle Composition |         |
|------------------|---|-----------|-------------|--|---------------------------|---------|
|                  |   |           |             |  | %                         | Volumes |
| Barden Street    | Between Princes Highway & South Street    | EB        | 71          | 30.5                                     | 4.9%                      | 3       |
|                  |   | WB        | 74          | 32.8                                     | 8.2%                      | 6       |
| Fanning Street   | Between Princes Highway & South Street    | EB        | 108         | 35.5                                     | 6.7%                      | 7       |
|                  |   | WB        | 112         | 34.4                                     | 4.3%                      | 5       |
| Foreman Street   | Between Princes Highway and Brooklyn Lane | EB        | 261         | 34.1                                     | 5.7%                      | 15      |
| Hart Street      | Between Princes Highway & South Street    | EB        | 273         | 30.3                                     | 3.0%                      | 8       |
|                  |   | WB        | 63          | 30.4                                     | 9.5%                      | 6       |
| Holbeach Avenue  | Between Princes Highway & Roundabout      | NB        | 505         | 44.1                                     | 8.9%                      | 45      |
|                  |   | SB        | 551         | 40.9                                     | 4.9%                      | 27      |
| Smith Street     | Between Princes Highway & Wood Street     | EB        | 320         | 46.5                                     | 36.0%                     | 115     |
|                  |   | WB        | 604         | 38.8                                     | 25.0%                     | 151     |
| South Street     | Between Smith Street & Station Street     | NB        | 510         | 28.3                                     | 6.0%                      | 31      |
|                  |   | SB        | 182         | 30                                       | 25.0%                     | 46      |
| Stanley Street   | Between Edwin Street & Zuitton Lane       | EB        | 164         | 45.5                                     | 7.7%                      | 13      |
|                  |   | WB        | 120         | 41.9                                     | 7.8%                      | 9       |
| Station Street   | Between Princes Highway & Young Street    | EB        | 85          | 30.6                                     | 3.7%                      | 3       |
|                  |   | WB        | 20          | 31.7                                     | 7.0%                      | 1       |
| Union Street     | Between Princes Highway & Zuitton Lane    | WB        | 487         | 26.9                                     | 3.4%                      | 17      |
| Wentworth Street | Between Princes Highway & South Street    | EB        | 72          | 32.1                                     | 6.7%                      | 5       |
|                  |   | WB        | 151         | 36.1                                     | 6.7%                      | 10      |
| Zuitton Lane     | Between Union Street & Stanley Street     | NB        | 123         | 22                                       | 5.6%                      | 7       |
|                  |   | SB        | 82          | 19.9                                     | 2.8%                      | 2       |
| Edwin Street     | Between Stanley Street & Tramway Street   | EB        | 290         | 31.1                                     | 6.9%                      | 20      |
|                  |   | WB        | 439         | 38.1                                     | 1.8%                      | 8       |
| Tramway Street   | Between Unwins Bridge Road & Edwin Street | NB        | 253         | 19                                       | 2.8%                      | 7       |
|                  |   | SB        | 318         | 23.6                                     | 1.9%                      | 6       |

**4.2.3.2 85<sup>th</sup> Percentile Speeds**

All local streets in the study area have an 85<sup>th</sup> percentile speed of less than the posted speed limit of 50 km/h. Most recorded 85<sup>th</sup> percentile speeds are less than 40 km/h, with Holbeach Avenue, Stanley Street and Smith Street having speeds between 40 and 50 km/h. It is important to note that on these roads, LATM devices aimed at reducing speeds and narrowing road widths are not present.

#### 4.2.3.3 Heavy Vehicle Composition

Many of the streets in the study area with the 3-tonne truck load limit have heavy vehicle volumes of 10 or less. However, roads such as Stanley Street, Union Street, Foreman Street, Wentworth Street and Edwin Street have volumes of around 10 to 20 heavy vehicles per day.

Roads without the truck load limit have relatively higher heavy vehicle volumes per day, such as Holbeach Avenue, South Street and Smith Street. In particular, Smith Street has heavy vehicle volumes of more than 100 per day in each direction, justified by the commercial and industrial land use along Smith Street and Wood Street.

In terms of heavy vehicle percentages, most of the roads have a heavy vehicle percentage of more than 5%. In particular, Smith Street and South Street have relatively higher heavy vehicle percentages.

#### 4.2.4 Parking Occupancy & Duration

Parking occupancy and duration surveys were undertaken on a Thursday and a Saturday in March 2020. The surveys were conducted in hourly periods between 7:00 AM to 7:00 PM. Roads surveyed are highlighted in Figure 4.3.

The surveys recorded a total of 291 spaces on the roads surveyed. 57% of these spaces were occupied on the Thursday while 54% of the spaces were occupied on the Saturday.

The parking occupancies by time of day and parking durations for the Thursday and Saturday are summarised in Table 4.5 to Table 4.8.

A map showing the average parking occupancy rates is provided in **Appendix B**.

**Table 4.5: Thursday Parking Occupancy Rate by Hourly Period**

| Road           | Side       | Section                        | Restriction  | Parking Capacity | 0700-0800 | 0800-0900 | 0900-1000 | 1000-1100 | 1100-1200 | 1200-1300 | 1300-1400 | 1400-1500 | 1500-1600 | 1600-1700 | 1700-1800         | 1800-1900 | Average           |
|----------------|------------|--------------------------------|--------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------------|-----------|-------------------|
| Fanning Street | West       | Entire Section                 | Unrestricted | 34               | 59%       | 47%       | 44%       | 47%       | 47%       | 41%       | 50%       | 44%       | 47%       | 59%       | 62%               | 59%       | 50%               |
|                | East       | Entire Section                 | Unrestricted | 29               | 76%       | 72%       | 76%       | 69%       | 69%       | 76%       | 72%       | 69%       | 76%       | 72%       | 76%               | 90%       | 74%               |
| Barden Street  | West       | Entire Section                 | Unrestricted | 30               | 50%       | 50%       | 53%       | 60%       | 50%       | 40%       | 43%       | 50%       | 53%       | 60%       | 63%               | 47%       | 52%               |
|                | East       | Entire Section                 | Unrestricted | 33               | 52%       | 42%       | 45%       | 48%       | 45%       | 45%       | 45%       | 58%       | 58%       | 45%       | 48%               | 52%       | 49%               |
| South Street   | North      | Between Fanning St & Barden St | Unrestricted | 9                | 44%       | 22%       | 33%       | 33%       | 33%       | 33%       | 56%       | 33%       | 44%       | 44%       | 44%               | 33%       | 38%               |
|                |            | Between Barden St & Smith St   | Unrestricted | 10               | 40%       | 40%       | 40%       | 40%       | 40%       | 40%       | 40%       | 40%       | 50%       | 50%       | 50%               | 70%       | 45%               |
|                | South      | Entire Section                 | Unrestricted | 16               | 0%        | 0%        | 0%        | 6%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%                | 0%        | 1%                |
| Smith Street   | West       | Between Princes Hwy & South St | Unrestricted | 31               | 61%       | 65%       | 74%       | 81%       | 77%       | 77%       | 84%       | 77%       | 87%       | 81%       | 77%               | 61%       | 75%               |
|                |            | Between South St & cul-de-sac  | No Parking   | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%                | 0%        | 0%                |
|                | Cul-de-sac | -                              | No Parking   | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 100%      | 0%        | 100%      | 300% <sup>2</sup> | 0%        | 100% <sub>2</sub> |

| Road         | Side | Section                              | Restriction  | Parking Capacity | 0700-0800 | 0800-0900 | 0900-1000 | 1000-1100 | 1100-1200 | 1200-1300 | 1300-1400 | 1400-1500 | 1500-1600 | 1600-1700 | 1700-1800 | 1800-1900 | Average           |
|--------------|------|--------------------------------------|--------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------------|
|              | East | Between cul-de-sac & Wood St         | Unrestricted | 3                | 33%       | 100%      | 100%      | 100%      | 100%      | 100%      | 100%      | 100%      | 100%      | 100%      | 100%      | 0%        | 86%               |
|              |      | Between Wood St & Princes Hwy        | Unrestricted | 27               | 59%       | 59%       | 63%       | 63%       | 63%       | 63%       | 70%       | 67%       | 63%       | 67%       | 63%       | 56%       | 63%               |
| Union Street | East | Between Princes Hwy & Brooklyn Ln    | No Parking   | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%                |
|              |      | Between Brooklyn Ln & School Ln      | Unrestricted | 7                | 86%       | 43%       | 71%       | 71%       | 57%       | 71%       | 57%       | 71%       | 57%       | 71%       | 71%       | 71%       | 67%               |
|              |      |                                      | PWD          | 1                | 100%      | 100%      | 100%      | 100%      | 100%      | 100%      | 0%        | 0%        | 0%        | 0%        | 0%        | 100%      | 58%               |
|              |      |                                      | Unrestricted | 15               | 80%       | 80%       | 67%       | 67%       | 73%       | 67%       | 87%       | 80%       | 67%       | 80%       | 80%       | 80%       | 76%               |
|              |      |                                      | No Stopping  | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%                |
|              |      | Between School Ln & Unwins Bridge Rd | No Stopping  | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%                |
|              |      |                                      | Unrestricted | 8                | 0%        | 25%       | 25%       | 25%       | 25%       | 25%       | 25%       | 25%       | 25%       | 25%       | 12%       | 12%       | 21%               |
|              | West | Between Unwins Bridge Rd & Edwin St  | No Stopping  | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%                |
|              |      |                                      | No Parking   | 0                | 0%        | 0%        | 100%      | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 100% <sub>2</sub> |



| Road | Side | Section                          | Restriction     | Parking Capacity | 0700-0800 | 0800-0900 | 0900-1000 | 1000-1100 | 1100-1200 | 1200-1300 | 1300-1400 | 1400-1500 | 1500-1600 | 1600-1700 | 1700-1800 | 1800-1900 | Average |                   |
|------|------|----------------------------------|-----------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|-------------------|
|      |      |                                  | Unrestricted    | 7                | 86%       | 86%       | 86%       | 86%       | 86%       | 86%       | 86%       | 100%      | 100%      | 86%       | 71%       | 100%      | 88%     |                   |
|      |      |                                  | No Stopping     | 0                | 0%        | 0%        | 0%        | 0%        | 100%      | 100%      | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      | 100% <sub>2</sub> |
|      |      | Between Edwin St & Zuitton Ln    | No Stopping     | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      | 0%                |
|      |      |                                  | Unrestricted    | 27               | 78%       | 63%       | 52%       | 56%       | 59%       | 56%       | 56%       | 59%       | 59%       | 59%       | 67%       | 56%       | 60%     |                   |
|      |      | Between Zuitton Ln & Princes Hwy | No Stopping     | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      | 0%                |
|      |      |                                  | 1P <sup>1</sup> | 4                | 75%       | 75%       | 75%       | 75%       | 75%       | 75%       | 75%       | 25%       | 50%       | 50%       | 75%       | 50%       | 25%     | 60%               |
|      |      |                                  | No Stopping     | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      | 0%                |
|      |      | Total                            |                 |                  |           | 291       | 57%       | 53%       | 55%       | 57%       | 55%       | 54%       | 56%       | 57%       | 58%       | 60%       | 61%     | 56%               |

Notes:

1. 1P restriction during 8:30 AM - 6:00 PM Mon-Fri

2. A percentage of 100% for a No Stopping or No Parking restriction means there is a vehicle that is illegally stopping or parked. A percentage of 300% means there are three (3) vehicles that are illegally stopping or parked

**Table 4.6: Saturday Parking Occupancy Rate by Hourly Period**

| Road           | Side       | Section                        | Restriction  | Parking Capacity | 0700-0800 | 0800-0900 | 0900-1000 | 1000-1100 | 1100-1200 | 1200-1300 | 1300-1400 | 1400-1500 | 1500-1600 | 1600-1700 | 1700-1800 | 1800-1900 | Average           |
|----------------|------------|--------------------------------|--------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------------------|
| Fanning Street | West       | Entire Section                 | Unrestricted | 34               | 50%       | 50%       | 41%       | 44%       | 41%       | 53%       | 62%       | 56%       | 59%       | 56%       | 50%       | 59%       | 52%               |
|                | East       | Entire Section                 | Unrestricted | 29               | 90%       | 93%       | 97%       | 93%       | 93%       | 90%       | 100%      | 83%       | 72%       | 69%       | 86%       | 90%       | 88%               |
| Barden Street  | West       | Entire Section                 | Unrestricted | 30               | 60%       | 53%       | 57%       | 50%       | 47%       | 57%       | 53%       | 53%       | 50%       | 47%       | 50%       | 40%       | 51%               |
|                | East       | Entire Section                 | Unrestricted | 33               | 61%       | 55%       | 42%       | 48%       | 45%       | 55%       | 55%       | 55%       | 55%       | 48%       | 55%       | 61%       | 53%               |
| South Street   | North      | Between Fanning St & Barden St | Unrestricted | 9                | 33%       | 22%       | 22%       | 33%       | 33%       | 33%       | 67%       | 67%       | 78%       | 67%       | 67%       | 67%       | 49%               |
|                |            | Between Barden St & Smith St   | Unrestricted | 10               | 50%       | 60%       | 50%       | 40%       | 50%       | 40%       | 40%       | 40%       | 40%       | 30%       | 40%       | 30%       | 43%               |
|                | South      | Entire Section                 | Unrestricted | 16               | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 6%        | 6%        | 1%                |
| Smith Street   | West       | Between Princes Hwy & South St | Unrestricted | 31               | 71%       | 61%       | 65%       | 55%       | 61%       | 68%       | 71%       | 71%       | 71%       | 65%       | 68%       | 65%       | 66%               |
|                |            | Between South St & cul-de-sac  | No Parking   | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%                |
|                | Cul-de-sac | -                              | No Parking   | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 100%      | 100%      | 0%        | 0%        | 100% <sub>2</sub> |

| Road         | Side | Section                              | Restriction  | Parking Capacity | 0700-0800 | 0800-0900 | 0900-1000 | 1000-1100 | 1100-1200 | 1200-1300 | 1300-1400 | 1400-1500 | 1500-1600 | 1600-1700 | 1700-1800 | 1800-1900 | Average |
|--------------|------|--------------------------------------|--------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|
|              | East | Between cul-de-sac & Wood St         | Unrestricted | 3                | 0%        | 0%        | 0%        | 33%       | 0%        | 0%        | 0%        | 0%        | 33%       | 33%       | 33%       | 33%       | 14%     |
|              |      | Between Wood St & Princes Hwy        | Unrestricted | 27               | 48%       | 48%       | 48%       | 44%       | 48%       | 41%       | 52%       | 52%       | 56%       | 59%       | 52%       | 56%       | 50%     |
| Union Street | East | Between Princes Hwy & Brooklyn Ln    | No Parking   | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      |
|              |      | Between Brooklyn Ln & School Ln      | Unrestricted | 7                | 71%       | 57%       | 71%       | 71%       | 43%       | 43%       | 71%       | 71%       | 71%       | 71%       | 71%       | 71%       | 65%     |
|              |      |                                      | PWD          | 1                | 100%      | 100%      | 100%      | 100%      | 100%      | 0%        | 0%        | 0%        | 0%        | 100%      | 100%      | 100%      | 67%     |
|              |      |                                      | Unrestricted | 15               | 80%       | 80%       | 73%       | 80%       | 73%       | 53%       | 60%       | 80%       | 80%       | 80%       | 93%       | 73%       | 76%     |
|              |      |                                      | No Stopping  | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      |
|              |      | Between School Ln & Unwins Bridge Rd | No Stopping  | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      |
|              |      |                                      | Unrestricted | 8                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 12%       | 1%      |
|              | West | Between Unwins Bridge Rd & Edwin St  | No Stopping  | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      |
|              |      |                                      | No Parking   | 0                | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%        | 0%      |

| Road | Side | Section                          | Restriction     | Parking Capacity | 0700-0800  | 0800-0900  | 0900-1000  | 1000-1100  | 1100-1200  | 1200-1300  | 1300-1400  | 1400-1500  | 1500-1600  | 1600-1700  | 1700-1800  | 1800-1900  | Average    |
|------|------|----------------------------------|-----------------|------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|      |      |                                  | Unrestricted    | 7                | 71%        | 71%        | 71%        | 71%        | 57%        | 43%        | 43%        | 71%        | 86%        | 86%        | 71%        | 0%         | 62%        |
|      |      |                                  | No Stopping     | 0                | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         |
|      |      | Between Edwin St & Zuitton Ln    | No Stopping     | 0                | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         |
|      |      |                                  | Unrestricted    | 27               | 67%        | 67%        | 56%        | 52%        | 70%        | 59%        | 48%        | 44%        | 52%        | 48%        | 56%        | 59%        | 56%        |
|      |      | Between Zuitton Ln & Princes Hwy | No Stopping     | 0                | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         |
|      |      |                                  | 1P <sup>1</sup> | 4                | 75%        | 75%        | 75%        | 50%        | 50%        | 75%        | 50%        | 50%        | 25%        | 25%        | 75%        | 75%        | 58%        |
|      |      |                                  | No Stopping     | 0                | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         | 0%         |
|      |      | <b>Total</b>                     |                 |                  | <b>291</b> | <b>58%</b> | <b>55%</b> | <b>53%</b> | <b>51%</b> | <b>52%</b> | <b>52%</b> | <b>56%</b> | <b>55%</b> | <b>56%</b> | <b>53%</b> | <b>57%</b> | <b>54%</b> |

Notes:

1. 1P restriction during 8:30 AM-12:30 PM Sat

2. A percentage of 100% for a No Stopping or No Parking restriction means there are cars that are illegally stopping or parked.

**Table 4.7: Thursday Parking Duration Proportions**

| Road           | Side       | Section                        | Restriction  | Total Vehicles | Parking Duration |         |         |         |         |         |         |         |         |          |          |          |
|----------------|------------|--------------------------------|--------------|----------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
|                |            |                                |              |                | 1 hour           | 2 hours | 3 hours | 4 hours | 5 hours | 6 hours | 7 hours | 8 hours | 9 hours | 10 hours | 11 hours | 12 hours |
| Fanning Street | West       | Entire Section                 | Unrestricted | 47             | 26%              | 15%     | 19%     | 6%      | 4%      | 2%      | 11%     | 0%      | 2%      | 2%       | 2%       | 11%      |
|                | East       | Entire Section                 | Unrestricted | 51             | 25%              | 14%     | 12%     | 4%      | 6%      | 4%      | 8%      | 2%      | 2%      | 10%      | 0%       | 14%      |
| Barden Street  | West       | Entire Section                 | Unrestricted | 43             | 23%              | 28%     | 9%      | 7%      | 7%      | 5%      | 0%      | 0%      | 2%      | 2%       | 5%       | 12%      |
|                | East       | Entire Section                 | Unrestricted | 40             | 30%              | 15%     | 5%      | 10%     | 10%     | 0%      | 3%      | 3%      | 5%      | 0%       | 5%       | 15%      |
| South Street   | North      | Between Fanning St & Barden St | Unrestricted | 9              | 44%              | 11%     | 0%      | 11%     | 0%      | 0%      | 11%     | 0%      | 0%      | 0%       | 0%       | 22%      |
|                |            | Between Barden St & Smith St   | Unrestricted | 8              | 38%              | 0%      | 0%      | 13%     | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 13%      | 38%      |
|                | South      | Entire Section                 | Unrestricted | 1              | 100%             | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
| Smith Street   | West       | Between Princes Hwy & South St | Unrestricted | 42             | 19%              | 12%     | 5%      | 5%      | 2%      | 5%      | 5%      | 5%      | 7%      | 5%       | 5%       | 26%      |
|                |            | Between South St & cul-de-sac  | No Parking   | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|                | Cul-de-sac | -                              | No Parking   | 4              | 75%              | 25%     | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
|                | East       | Between cul-de-sac & Wood St   | Unrestricted | 3              | 0%               | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 67%      | 33%      | 0%       |
|                |            | Between Wood St & Princes Hwy  | Unrestricted | 29             | 17%              | 14%     | 3%      | 3%      | 0%      | 7%      | 3%      | 3%      | 10%     | 3%       | 0%       | 34%      |



| Road         | Side | Section                              | Restriction  | Total Vehicles | Parking Duration |         |         |         |         |         |         |         |         |          |          |          |
|--------------|------|--------------------------------------|--------------|----------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
|              |      |                                      |              |                | 1 hour           | 2 hours | 3 hours | 4 hours | 5 hours | 6 hours | 7 hours | 8 hours | 9 hours | 10 hours | 11 hours | 12 hours |
| Union Street | East | Between Princes Hwy & Brooklyn Ln    | No Parking   | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      | Between Brooklyn Ln & School Ln      | Unrestricted | 14             | 43%              | 7%      | 14%     | 7%      | 0%      | 0%      | 0%      | 7%      | 14%     | 0%       | 0%       | 7%       |
|              |      |                                      | PWD          | 2              | 50%              | 0%      | 0%      | 0%      | 0%      | 50%     | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
|              |      |                                      | Unrestricted | 30             | 20%              | 30%     | 13%     | 3%      | 3%      | 7%      | 0%      | 0%      | 3%      | 3%       | 0%       | 17%      |
|              |      |                                      | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      | Between School Ln & Unwins Bridge Rd | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                      | Unrestricted | 2              | 0%               | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 50%     | 0%       | 50%      | 0%       |
|              | West | Between Unwins Bridge Rd & Edwin St  | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                      | No Parking   | 1              | 100%             | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
|              |      |                                      | Unrestricted | 12             | 42%              | 0%      | 0%      | 0%      | 0%      | 17%     | 0%      | 0%      | 8%      | 0%       | 0%       | 33%      |
|              |      |                                      | No Stopping  | 1              | 0%               | 100%    | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
|              |      | Between Edwin St & Zuitton Ln        | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                      | Unrestricted | 38             | 34%              | 16%     | 5%      | 0%      | 5%      | 3%      | 8%      | 3%      | 0%      | 3%       | 0%       | 24%      |

| Road         | Side | Section                          | Restriction     | Total Vehicles | Parking Duration |         |         |         |         |         |         |         |         |          |          |          |
|--------------|------|----------------------------------|-----------------|----------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
|              |      |                                  |                 |                | 1 hour           | 2 hours | 3 hours | 4 hours | 5 hours | 6 hours | 7 hours | 8 hours | 9 hours | 10 hours | 11 hours | 12 hours |
| Union Street |      | Between Zuitton Ln & Princes Hwy | No Stopping     | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                  | 1P <sup>1</sup> | 9              | 44%              | 11%     | 11%     | 11%     | 11%     | 0%      | 0%      | 0%      | 0%      | 0%       | 11%      | 0%       |
|              |      |                                  | No Stopping     | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
| Total        |      |                                  |                 | 386            | 28%              | 16%     | 9%      | 5%      | 4%      | 4%      | 4%      | 2%      | 4%      | 4%       | 3%       | 18%      |

Notes:

1. 1P restriction during 8:30 AM - 6:00 PM Mon-Fri

**Table 4.8: Saturday Parking Duration Proportions**

| Road           | Side       | Section                        | Restriction  | Total Vehicles | Parking Duration |         |         |         |         |         |         |         |         |          |          |          |
|----------------|------------|--------------------------------|--------------|----------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
|                |            |                                |              |                | 1 hour           | 2 hours | 3 hours | 4 hours | 5 hours | 6 hours | 7 hours | 8 hours | 9 hours | 10 hours | 11 hours | 12 hours |
| Fanning Street | West       | Entire Section                 | Unrestricted | 52             | 37%              | 13%     | 15%     | 4%      | 6%      | 4%      | 0%      | 2%      | 4%      | 2%       | 2%       | 12%      |
|                | East       | Entire Section                 | Unrestricted | 60             | 25%              | 17%     | 10%     | 3%      | 7%      | 7%      | 2%      | 3%      | 7%      | 2%       | 0%       | 18%      |
| Barden Street  | West       | Entire Section                 | Unrestricted | 40             | 23%              | 13%     | 13%     | 8%      | 13%     | 10%     | 5%      | 3%      | 3%      | 0%       | 3%       | 10%      |
|                | East       | Entire Section                 | Unrestricted | 45             | 29%              | 16%     | 7%      | 11%     | 9%      | 4%      | 4%      | 0%      | 0%      | 0%       | 2%       | 18%      |
| South Street   | North      | Between Fanning St & Barden St | Unrestricted | 9              | 22%              | 11%     | 0%      | 11%     | 0%      | 22%     | 0%      | 0%      | 11%     | 0%       | 0%       | 22%      |
|                |            | Between Barden St & Smith St   | Unrestricted | 10             | 30%              | 10%     | 20%     | 0%      | 0%      | 0%      | 0%      | 20%     | 0%      | 0%       | 0%       | 20%      |
|                | South      | Entire Section                 | Unrestricted | 1              | 0%               | 100%    | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
| Smith Street   | West       | Between Princes Hwy & South St | Unrestricted | 39             | 18%              | 13%     | 10%     | 5%      | 5%      | 3%      | 8%      | 5%      | 0%      | 0%       | 3%       | 31%      |
|                |            | Between South St & cul-de-sac  | No Parking   | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|                | Cul-de-sac | -                              | No Parking   | 2              | 100%             | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
|                | East       | Between cul-de-sac & Wood St   | Unrestricted | 2              | 50%              | 0%      | 0%      | 50%     | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
|                |            | Between Wood St & Princes Hwy  | Unrestricted | 32             | 22%              | 6%      | 13%     | 13%     | 16%     | 6%      | 3%      | 3%      | 0%      | 0%       | 0%       | 19%      |

| Road         | Side | Section                              | Restriction  | Total Vehicles | Parking Duration |         |         |         |         |         |         |         |         |          |          |          |
|--------------|------|--------------------------------------|--------------|----------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
|              |      |                                      |              |                | 1 hour           | 2 hours | 3 hours | 4 hours | 5 hours | 6 hours | 7 hours | 8 hours | 9 hours | 10 hours | 11 hours | 12 hours |
| Union Street | East | Between Princes Hwy & Brooklyn Ln    | No Parking   | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      | Between Brooklyn Ln & School Ln      | Unrestricted | 9              | 11%              | 0%      | 0%      | 22%     | 22%     | 22%     | 0%      | 0%      | 0%      | 0%       | 0%       | 22%      |
|              |      |                                      | PWD          | 2              | 0%               | 0%      | 50%     | 0%      | 50%     | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
|              |      |                                      | Unrestricted | 29             | 24%              | 10%     | 10%     | 14%     | 17%     | 3%      | 0%      | 0%      | 3%      | 3%       | 0%       | 14%      |
|              |      |                                      | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      | Between School Ln & Unwins Bridge Rd | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                      | Unrestricted | 1              | 100%             | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%      | 0%       | 0%       | 0%       |
|              | West | Between Unwins Bridge Rd & Edwin St  | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                      | No Parking   | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                      | Unrestricted | 8              | 0%               | 13%     | 0%      | 38%     | 13%     | 0%      | 0%      | 0%      | 0%      | 0%       | 38%      | 0%       |
|              |      |                                      | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      | Between Edwin St & Zuitton Ln        | No Stopping  | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                      | Unrestricted | 46             | 35%              | 22%     | 4%      | 9%      | 4%      | 7%      | 2%      | 2%      | 0%      | 2%       | 0%       | 13%      |

| Road         | Side | Section                          | Restriction     | Total Vehicles | Parking Duration |         |         |         |         |         |         |         |         |          |          |          |
|--------------|------|----------------------------------|-----------------|----------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
|              |      |                                  |                 |                | 1 hour           | 2 hours | 3 hours | 4 hours | 5 hours | 6 hours | 7 hours | 8 hours | 9 hours | 10 hours | 11 hours | 12 hours |
| Union Street |      | Between Zuitton Ln & Princes Hwy | No Stopping     | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
|              |      |                                  | 1P <sup>1</sup> | 6              | 17%              | 33%     | 17%     | 0%      | 0%      | 0%      | 0%      | 17%     | 0%      | 0%       | 0%       | 17%      |
|              |      |                                  | No Stopping     | 0              | -                | -       | -       | -       | -       | -       | -       | -       | -       | -        | -        | -        |
| Total        |      |                                  |                 | 393            | 26%              | 14%     | 10%     | 8%      | 9%      | 6%      | 3%      | 3%      | 2%      | 1%       | 2%       | 16%      |

Notes:

1. 1P restriction during 8:30 AM-12:30 PM Sat



#### 4.2.4.1 Parking Data Summary

The parking occupancy data shows that

- Out of the 291 spaces, about 50 to 60% of the spaces are occupied at any one time on both days.
- There are little differences in parking occupancy between Thursday and Saturday, except for Smith Street.
- For Smith Street, the occupancy rate is higher on the Thursday and lower on Saturday.
  - The occupancy rates for the section of Smith Street southeast of South Street (up to the cul-de-sac) are significantly different between Thursday and Saturday. This is because of the low number of spaces resulting in high fluctuations of occupancy rates.
- For Fanning Street the occupancy rate on the eastern side is higher than the western side on both days, with occupancy rates of 74% and 88% on Thursday and Saturday respectively.
- On the Thursday, there are occasional vehicles parking or stopped at each section with No Stopping or No Parking restrictions. These restrictions are along Smith Street and Union Street.
- The southern side of South Street is rarely occupied, which is consistent with site observations and Street View. This is due to the narrow width of South Street which is only wide enough for a parking lane and a trafficable lane.
- All other roads have parked vehicles on both sides of the road, if allowed
- Parking occupancy is relatively higher on Union Street near the school on Thursdays, with the western and eastern sides having occupancy rates of 88% and 76% respectively.
- The parking duration data shows that:
- Almost 400 vehicles parked during the surveyed time period.
- On both Thursday and Saturday:
  - about 27% of all users park less than an hour
  - about 15% park less than 2 hours
  - about 17% of users park for at least 12 hours, i.e. potentially residents

The parking occupancy and duration data will be considered when determining locations and suitability of LATM devices. This data also sets a base line for the parking demand in the study area. This can be used for a comparative study to identify changes in parking demand after any new developments have been built.

An assessment of the Smith Street on-street parking availability considering changes to Smith Street as a result of the proposed Bunnings development is detailed in Section 6.2.

# 5. SITE INSPECTIONS

## 5.1 Site Audits

A site inspection and audit within the study area was undertaken, on Wednesday 4 March 2020, to gain an understanding of the current conditions of the streets within the study area (including parking behaviour), and identify existing LATM devices and traffic control infrastructure. Details on traffic and parking signage were also recorded.

The site audit covered the following traffic items and are detailed in the sections below:

- LATM Devices
- Traffic Signs
- Parking Signs
- Bicycle Facilities
- Pedestrian Facilities
- Waste Management/Collection Issues

The signage audit included the following items:

- Type of Sign (and relevant codes) or device
- Direction of sign control
- Restrictions and times of operation
- Condition
- Location (GPS co-ordinates)
- Applicable direction of traffic

Bicycle and Pedestrian Facilities

- Cycle related signage / road markings and their location
- Wayfinding signage and their location
- Kerb ramps and crossings

Waste Management

- Evidence of issues with road geometry or surfaces that can affect waste collection

A database of the audit findings was developed including photographs of signs and infrastructure, located in **Appendix C**.

### 5.1.1 LATM Audit

An audit of existing LATM devices within the study area was conducted, covering the following aspects:

- LATM type
- Location (including road name)
- Line marking and physical condition

A total of 16 LATM devices were identified within the study area, presented in Table 5.1 and Figure 5.1.

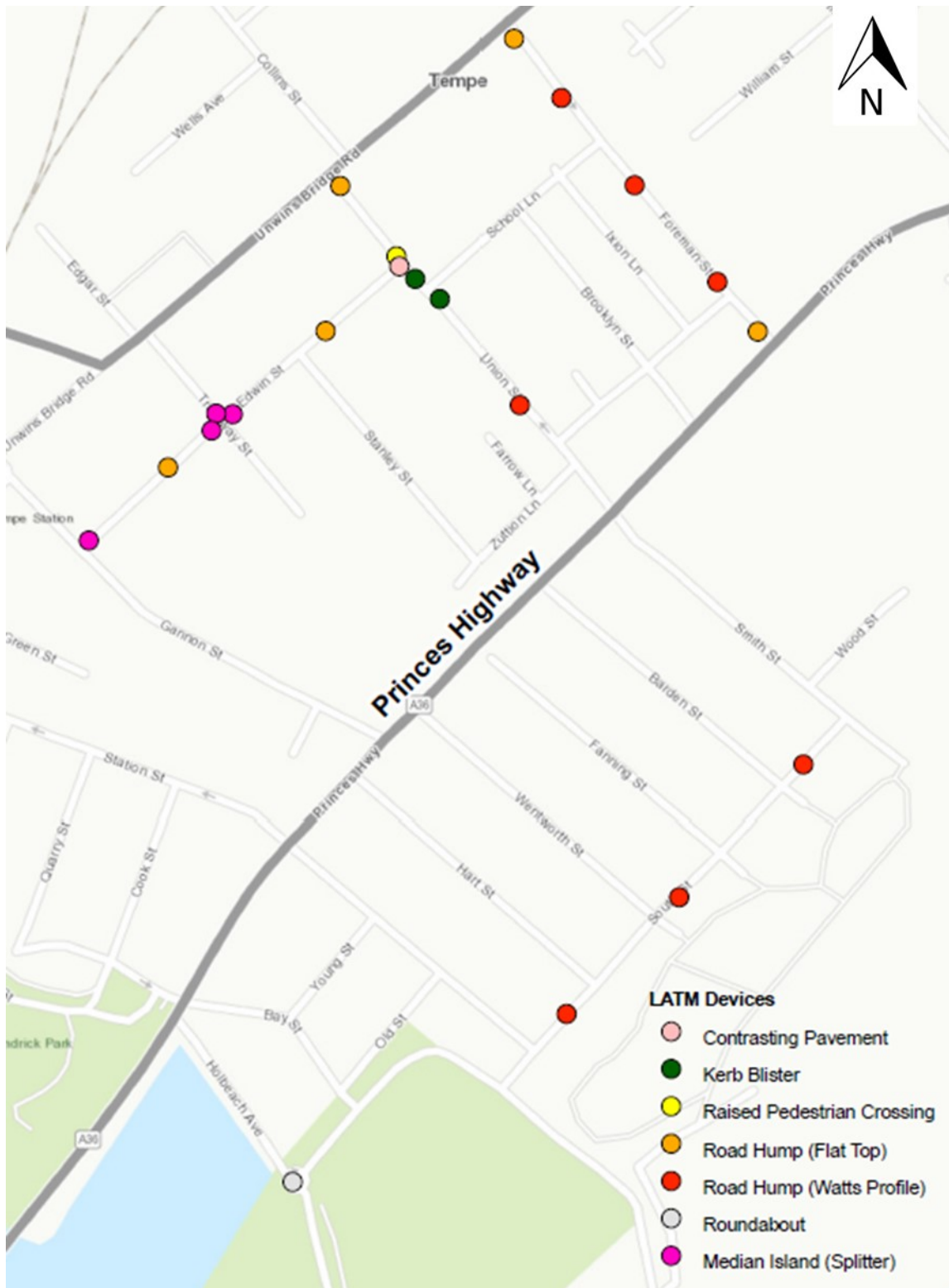
**Table 5.1: Existing LATM Devices & Controls**

| Road            | Traffic Calming or Treatment | Treatment Type  |
|-----------------|------------------------------|---|
| Union Street    | Yes                          | <ul style="list-style-type: none"> <li>▪ Road Hump (Watts Profile)</li> <li>▪ Road Hump (Flat Top) – Raised Thresholds</li> <li>▪ Kerb Blisters</li> <li>▪ Contrasting Pavement</li> <li>▪ Raised Pedestrian Crossing (Wombat Crossing)</li> <li>▪ One-way restriction</li> </ul> |
| Foreman Street  | Yes                          | <ul style="list-style-type: none"> <li>▪ Road Hump (Watts Profile)</li> <li>▪ Road Hump (Flat Top) - Raised Thresholds</li> <li>▪ Kerb Blisters</li> <li>▪ One-way restriction</li> </ul>   |
| Edwin Street    | Yes                          | <ul style="list-style-type: none"> <li>▪ Road Hump (Flat Top)</li> <li>▪ Contrasting Pavement</li> <li>▪ Median Island (Splitter Rumble Strips)</li> </ul>  |
| Tramway Street  | Yes                          | <ul style="list-style-type: none"> <li>▪ Median Island (Splitter Rumble Strips)</li> </ul>  |
| South Street    | Yes                          | <ul style="list-style-type: none"> <li>▪ Road Hump (Watts Profile)</li> </ul>   |
| Holbeach Avenue | Yes                          | <ul style="list-style-type: none"> <li>▪ Roundabout (with Pedestrian Refuge Islands)</li> </ul>   |

A number of these devices are in addition to those proposed as part of the previous *St Peters/Tempe LATM Study*. This includes:

- Raised thresholds, kerb blisters, raised pedestrian crossing and contrasting pavement on Union Street
- An additional Watts Profile hump on South Street
- Roundabout at Holbeach Avenue.

Signage associated with the LATM devices are covered under the Traffic Sign Audit in Section 5.1.2.



Adapted from ESRI Maps

**Figure 5.1: Existing LATM Devices**

### 5.1.2 Traffic Sign Audit

The traffic sign audit covered all traffic signs along each roadway, including regulatory, warning and wayfinding signage. Signage associated with LATM devices (such as directional hazard markers or speed hump warning sign) were included in the traffic signage audit. The audit covered:

- Sign type & associated RMS code
- Road and location (including road name and co-ordinates)
- Applicable direction of traffic
- Sign condition
- Visibility obstruction (if any)

A total of 153 traffic signs were recorded within the study area. A database of traffic signs identified in the audit is provided in **Appendix C**. A summary list of the types of traffic signs recorded are shown in Table 5.2.

Majority of the signs were found to be in a good condition with unobstructed visibility. Some signs were found to be vandalised with stickers or graffiti, or faded, however, were still mostly legible. A number of signs were also found to be dislocated or facing the wrong way. Some signs were also obstructed by trees, or covered by another sign immediately above or below the obstructed sign.

A large proportion of the traffic signs are speed hump and speed hump ahead signs (with relevant tag plates), one-way, and the 3-tonne truck load limit signs. The speed hump related signage are mostly along South Street, Union Street and Foreman Street, while the 3-tonne truck load limit signage are located on the entry to roads with the load limit restriction (see Section 2.9).

**Table 5.2: Traffic Signs Audit**

| Traffic Sign Recorded      | Sign Code | Locations   |
|----------------------------|-----------|---|
| No Through Road            | G9-18     | Holbeach Avenue, Smith Street, Wood Street, Tramway Street                    |
| Stop                       | R1-1      | Holbeach Avenue, School Lane, Edwin Street                                    |
| Roundabout Give Way        | R1-13     | Holbeach Avenue   |
| Give Way                   | R1-2      | Holbeach Avenue, Station Street, Union Street, Foreman Street, Tramway Street |
| Traffic Signal Stop        | R1-4      | Holbeach Avenue, Smith Street   |
| All Traffic Left Only      | R2-14_L   | Station Street, Fanning Street  |
| All Traffic Right Only     | R2-14_R   | School Lane   |
| One Way Left               | R2-2_L    | Princes Highway, Zuitton Lane, Unwin's Bridge Road, Edwin Street              |
| One Way Right              | R2-2_R    | School Lane, Princes Highway, Brooklyn Lane, Unwins Bridge Road               |
| Two Way                    | R2-223    | Holbeach Avenue   |
| Keep Left                  | R2-3      | Holbeach Avenue   |
| No Entry                   | R2-4N     | Foreman Street  |
| No Right Turn              | R2-6_R    | Unwins Bridge Road, Gannon Street   |
| Pedestrian Crossing        | R3-1      | Union Street  |
| Speed Limit Sign (25 km/h) | R4-1      | Holbeach Avenue   |

| <b>Traffic Sign Recorded</b>                           | <b>Sign Code</b>           | <b>Locations</b>   |
|--|----------------------------|--|
| School Zone Sign (including illuminated)               | R4-230 & R4-230-1          | School Lane, Foreman Street, Union Street, Edwin Street  |
| End School Zone  | R4-231                     | Foreman Street, Edwin Street   |
| Local Traffic Area (50 km/h)                           | R4-240 (50 km/h)           | Fanning Street, Barden Street, Smith Street  |
| End Local Traffic Area (50 km/h)                       | R4-241                     | Fanning Street, Barden Street, Smith Street  |
| Trucks Prohibited 3-tonne & over                       | R6-222, R6-10-2 and R9-221 | Old Street, Bay Street, Union Street, Fanning Street, Barden Street, Station Street, Hart Street, Edwin Street |
| "6AM-10AM 3PM-7PM Mon-Fri" Tag Plate                   | R9-1-2                     | Unwins Bridge Road   |
| "When Signals Black Out or Flashing" Tag Plate         | R9-201                     | Smith Street   |
| Hazard Warning Marker                                  | T5-5                       | Union Street, Foreman Street, Holbeach Avenue  |
| Roundabout Warning                                     | W2-7                       | Holbeach Avenue  |
| Speed Hump Ahead                                       | W3-4                       | South Street, Union Street, Edwin Street, Foreman Street   |
| Speed Hump   | W5-10                      | South Street, Union Street, Edwin Street, Foreman Street   |
| Pedestrian Warning                                     | W6-1                       | Holbeach Avenue, Union Street  |
| Pedestrian Crossing Ahead / Left                       | W6-2 & W6-2-1              | Union Street, Edwin Street   |
| Children Crossing                                      | W6-3                       | Union Street   |
| "School" Tag Plate                                     | W8-14                      | Union Street   |
| Speed Tag Plates for Speed Hump signs (various speeds) | W8-2                       | South Street, Union Street, Edwin Street, Foreman Street   |
| "Refuge Island" Tag Plate                              | W8-211                     | Holbeach Avenue  |

### 5.1.3 Parking Sign Audit

The parking sign audit captured any signage associated with kerbside and parking controls, including 'No Stopping' and 'No Parking' areas. The audit covered (where applicable):

- Location (road name and co-ordinates)
- Sign type & associated RMS sign code
- Direction of arrow
- Time restrictions and operation days/times
- Applicable traffic direction
- Sign Condition
- Any visibility obstructions

As most of the study area has unrestricted on-street parking, there are very few parking signs with timed or conditional restrictions. The rest of the signs, particularly, those close to intersections, are No Stopping and No Parking signs. A total of 89 parking signs were recorded.



Majority of signs are legible, with some signs heavily faded and illegible (including wording and arrow).

Parking zones associated with the parking signs was previously presented in Figure 2.8. A map of parking signs recorded is provided in **Appendix C**.

#### **5.1.4 Bicycle Facilities Audit**

The bicycle facilities audit covered both physical and visual treatments provided for cyclists, such as ramps or crossings and cycle route pavement markings and signage. The audit included:

- Any bicycle-related route-finding signage
- Any shared paths and cycleways
- Any shared bicycle/pedestrian signalised crossing
- Location of bicycle facility (including road name)

Most bicycle facilities are located along the bicycle routes shown in Section 2.7.1, which include Holbeach Avenue, South Street and Smith Street. This includes shared paths and associated signage and bicycle route signage. Signalised shared pedestrian / bicycle crossings are also located at the intersections of Princes Highway / Holbeach Avenue and Princes Highway / Smith Street.

A bicycle on-ramp is also present near the Holbeach Avenue approach to Princes Highway. This allows cyclists along the roadway of Holbeach Avenue to join the shared path along Holbeach Avenue and Princes Highway.

A map of bicycle facilities is provided in **Appendix C**.

#### **5.1.5 Pedestrian Facilities Audit**

The pedestrian facilities audit identified features providing accessible pedestrian connectivity within the study area. This included:

- Any kerb ramps
- Any pedestrian refuges
- Any signalised pedestrian crossing or shared bicycle/pedestrian crossings
- Any pedestrian (zebra) crossings

The study area is well-connected by footpaths, with the exception of laneways such as Farrow Lane and Zuitton Lane and were therefore not included as part of the pedestrian facilities audit.

Kerb ramps are present at crossing points at most intersections in the study area.. In most circumstances, the kerb ramps occur in pairs; one on each side of the road. Where pairs of kerb ramps are not present, this creates a break in footpath connectivity, presenting accessibility issues for low mobility pedestrians, such as wheelchair users.

These issues should be further explored and addressed as part of a different study such as a Pedestrian Accessibility Mobility Plan.

#### **5.1.6 Waste Management Audit**

The waste management audit focussed on identifying evidence of issues or potential issues affecting waste collection. This may include items such as insufficient geometry, damage to kerbs/corners or other evidence of manoeuvring issues.

Very few issues were found that may affect residential waste collection in the study area.

A kerb runover was noted at the corner of Farrow Lane and Zuitton Lane, shown in Figure 5.2. These roadways feature narrow road widths which would be expected to be restrictive for waste collection vehicles.



**Figure 5.2: Kerb Runover at Farrow Lane**

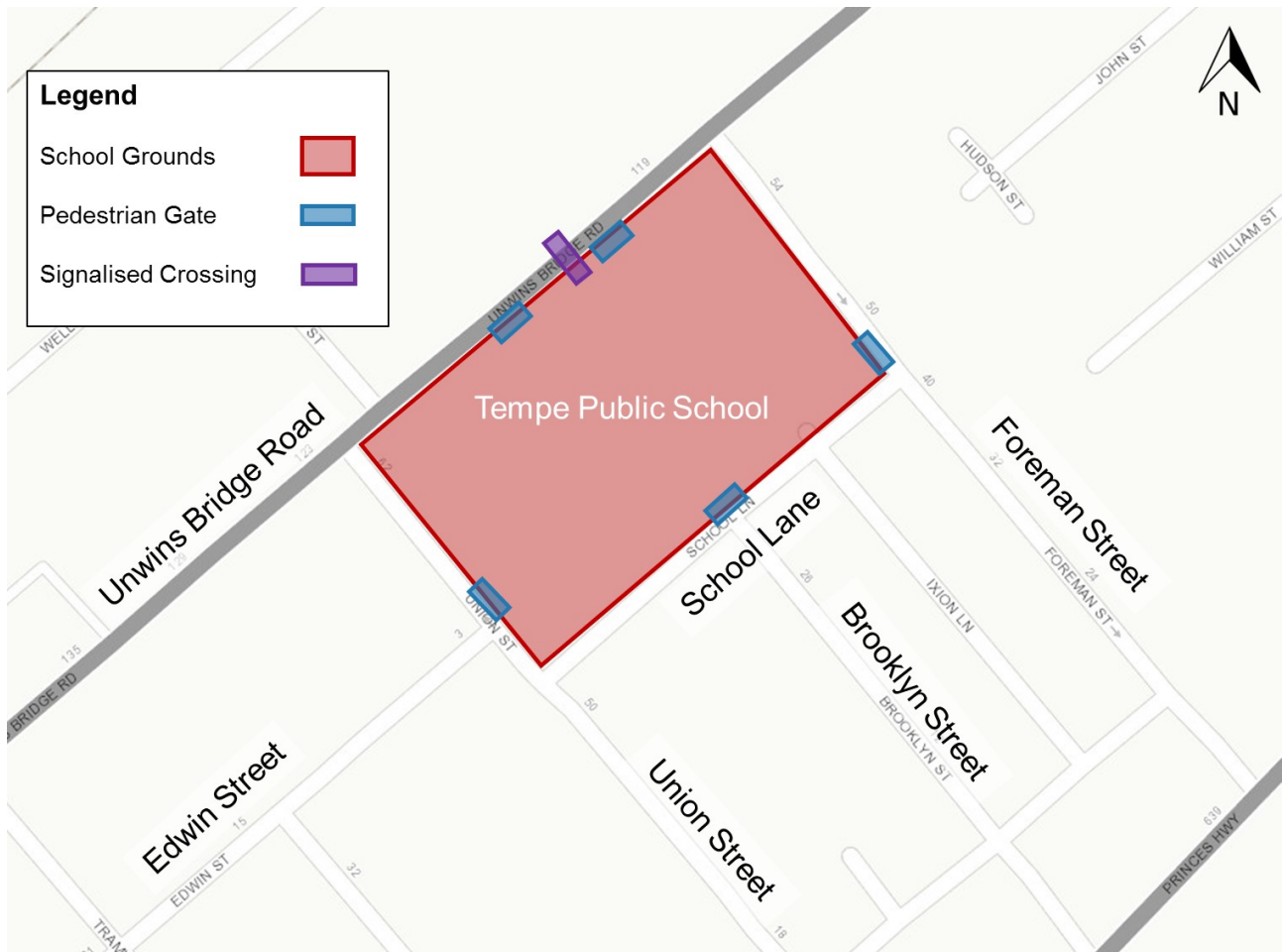
## **5.2 Tempe Public School Observations**

### **5.2.1 Overview**

A site visit was also undertaken on Tuesday 15 and Wednesday 16 September 2020, to observe traffic patterns and behaviours related to Tempe Public School. The site observations focussed on student pickup and drop off operations, parking and pedestrian routes. School hours were observed between 09:00 AM and 3:00 PM.

#### **5.2.1.1 Access Points**

The school has a number of pedestrian access gates along its perimeter, with the school's main building entrance located along Unwins Bridge Road west of the signalised crossing, shown in Figure 5.3.



Adapted from ESRI Maps

**Figure 5.3: School Access Locations**

#### 5.2.1.2 AM School Peak Observations

The following was observed during the AM peak period:

- School traffic peak extends between 8:30am and 9:00am with little traffic prior to 8:20am.
- Pedestrian access gates on Union Street, School Lane and Foreman Street open from approximately 8:30am
- Parents were observed to
- Drop off students near access gates without leaving their vehicle, stationary for up to 30 seconds
- Park on Edwin Street and walk up to the gate on Union Street
- Vehicles stopped to give way to one another along Edwin Street, causing some congestion
- Queues on Union Street at Unwins Bridge Road occasionally extended to Edwin Street
- Pedestrians approach school primarily along Union Street, Edwin Street and Unwins Bridge Road
- Traffic along School Lane was primarily westbound as vehicles circulate around the school

#### 5.2.1.3 PM School Peak Observations

The following was observed during the PM peak period:

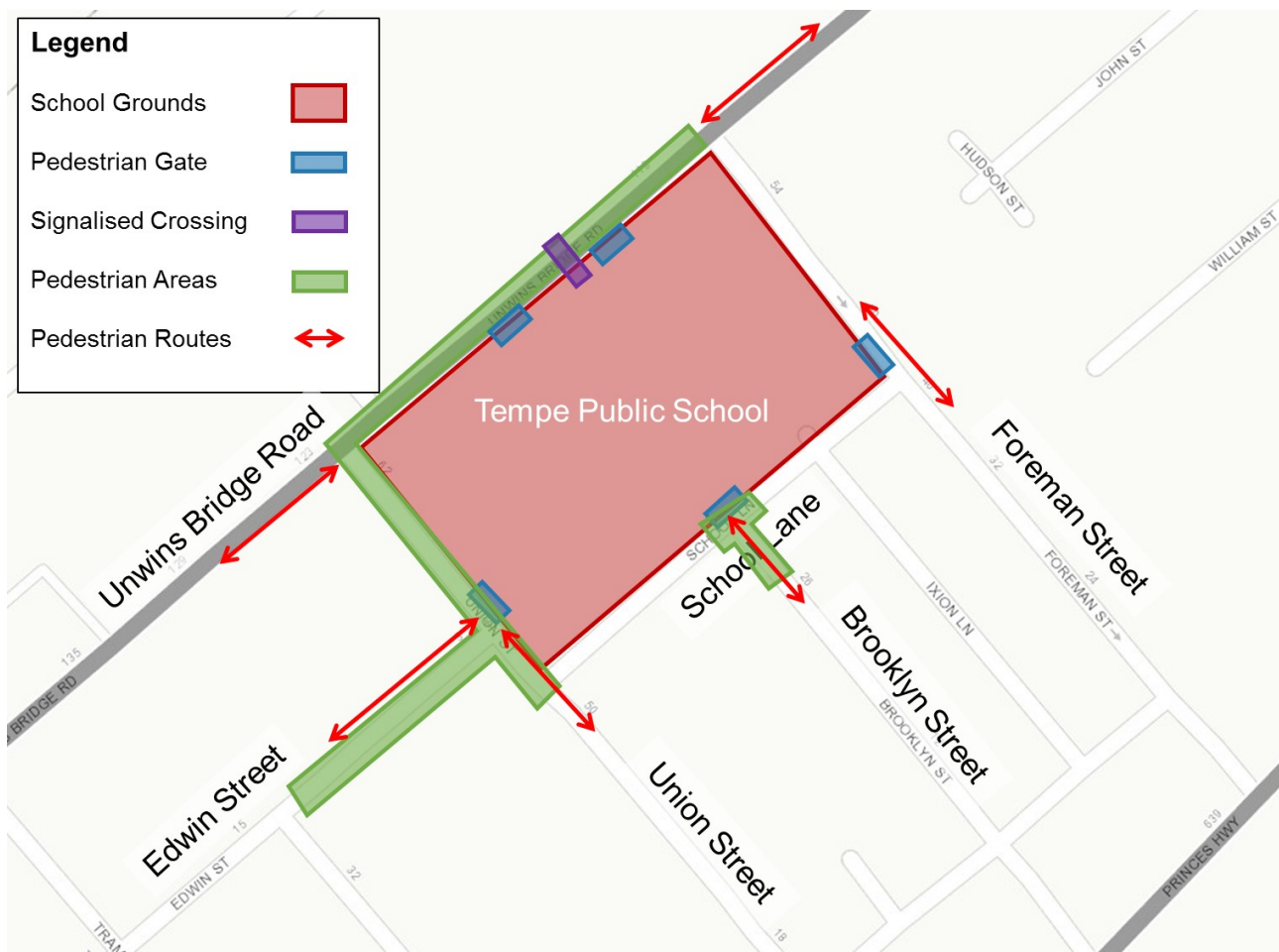
- School traffic peak extends between 2:30pm and 3:15pm



- Most parents arrived via Foreman Street, Edwin Street and Brooklyn Street
- Parents parked and waited in their vehicles along Union Street, Brooklyn Street, School Lane and Edwin Street
- vehicles were observed to circulate westbound from Foreman Street via School Lane, Union Street and Edwin Street, before exiting the area
- Blockages due to vehicles travelling in opposite directions along Edwin Street, giving way to one another
- Pedestrian movements primarily along Edwin Street, Union Street, Foreman Street and Unwin's Bridge Road.
- Large groups of students along Unwins Bridge Road towards Tempe and Sydenham Station directions.

#### 5.2.1.4 Pedestrian Areas

The areas shown in Figure 5.4 featured large volumes of pedestrians as parents picked up and dropped off students, or travelled between parked vehicles and the school. These areas are primarily focussed around access gates, including Union Street and Edwin Street.



Adapted from ESRI Maps

**Figure 5.4: Pedestrian Areas**

## 6. FUTURE CONDITIONS

### 6.1 Future Residential Development

There are not any known high impact residential developments, such as medium or high-density developments, currently pending within Tempe and the study area.

Based on population forecasts provided by Forecast ID (using Census data from 2006 to 2016), Tempe is expected to experience a negative population growth until 2031. As such, it is expected that there will be very little traffic growth in traffic volumes in Tempe for the next 10 years. This excludes traffic along major through roads and connectors such as Princes Highway or Unwins Bridge Road.

### 6.2 Future Bunnings Development

The proposed Bunnings Development is to be located at the south-east corner of Princes Highway and Smith Street, with vehicular access to be provided via Smith Street and Princes Highway. A Traffic Impact Assessment (TIA) was undertaken by Transport and Traffic Planning Associates (TTPA) in October 2017, indicating the following proposed road changes (also shown in Figure 6.1):

- A new left turn slip lane from Princes Highway to Smith Street
- Removal of parking on the eastern side of Smith Street and a reduction to one departure lane on Smith Street
- Widening of Smith Street approach to Princes Highway to three lanes
- Customer and delivery access ("Smith Street access") to Bunnings from Smith Street at existing driveway location
- Access to Bunnings from Princes Highway to be located north-east of the Smith Street intersection
- A new unsignalised right turn bay from Princes Highway eastbound to Bunnings Warehouse Princes Highway access
- Only left turns permitted from the Bunnings Princes Highway access
- Relocation of the southwest-bound bus stop on Princes Highway, currently located on the approach to Smith Street.





**Table 6.1: Parking Occupancy on Smith Street**

| Side            | Section                                | Parking Capacity | Occupied Spaces (Average) | Vacant Spaces |
|-----------------|--|------------------|---------------------------|---------------|
| <b>Thursday</b> |  |                  |                           |               |
| West            | Between Princes Highway & South Street | 31               | 23                        | 8             |
| East            | Between cul-de-sac & Wood Street       | 3                | 3                         | 0             |
|                 | Between Wood Street & Princes Highway  | 27               | 17                        | 10            |
| Total           |  | 61               | 43                        | 18            |
| <b>Saturday</b> |  |                  |                           |               |
| West            | Between Princes Highway & South Street | 31               | 20                        | 11            |
| East            | Between cul-de-sac & Wood Street       | 3                | 0                         | 3             |
|                 | Between Wood Street & Princes Highway  | 27               | 14                        | 13            |
| Total           |  | 61               | 34                        | 27            |

Any proposed treatments resulting in the removal of further parking spaces on Smith Street (mainly the western side) may further reduce the number of vacant spaces along Smith Street.

## 6.2.2 Traffic Generation

It is expected that there will be an increase in traffic along Smith Street due to traffic generated by the proposed Bunnings Development. The increase in volumes along Smith Street will be limited to the section of Smith Street between Princes Highway and the proposed Bunnings access. Generated trips by the Bunnings development are not expected to use Smith Street south of the Bunnings access and subsequently South Street.

A further assessment of impacts on surrounding local streets from the generated traffic is discussed in Section 7.

Traffic generation had previously been determined by the Traffic Impact Assessment (TIA) developed by TTPA at the DA stage of the Bunnings Proposal and within GTA Consultant's peer review of the TIA. In the draft version of this LATM report, the traffic volumes calculated by GTA were used for analysis. However, following community consultation between November 2020 and January 2021, traffic generation was recalculated using more conservative traffic generation rates and are outlined in Section 13.4.2.

### 6.2.2.1 Previous Traffic Generation

A summary of key assumptions by TTPA and GTA is provided in Table 6.2.

On review of the previously calculated traffic volumes, it was determined that the volumes presented by GTA Consultants provide a better representation of expected traffic volumes based on:

- Higher weekend traffic generation rate – based on existing survey data and trend
- Exclusion of existing on site traffic – Existing site was (and remains) non-operational
- 50:50 split of in/out trips. – customers generally spend less than an hour at Bunnings Warehouse

As such, the total in/out volumes calculated by GTA consultants are outlined in Table 6.3, and was used in the draft version of this LATM report.

**Table 6.2: Previous Traffic Generation – Key Assumptions**

| Item  | TTPA Consultants   | GTA Consultants  |
|---|--|--|
| Traffic Generation Rates (veh/100m <sup>2</sup> GFA)          | <ul style="list-style-type: none"> <li>1.56 (PM peak)</li> <li>4.5 (weekend peak)</li> </ul>   | <ul style="list-style-type: none"> <li>1.56 (PM peak)</li> <li>4.7 (weekend peak)</li> </ul> |
| Existing Traffic Reduction                                    | 90 vph (PM Peak)   | Nil  |
| Passing Trade Traffic Reduction                               | <ul style="list-style-type: none"> <li>27% (PM peak)</li> <li>28% (weekend peak)</li> </ul>  | <ul style="list-style-type: none"> <li>28% (PM peak)</li> <li>28% (weekend peak)</li> </ul>  |
| In / Out Split  | 40% In / 60% Out   | 50% In / 50% Out   |
| Distribution at Princes Highway / Smith Street / Union Street | <ul style="list-style-type: none"> <li>45% East (Princes Highway)</li> <li>45 % West (Princes Highway)</li> <li>10% North (Local Streets)</li> </ul> |  |

**Table 6.3: Traffic Generation Volumes**

| Peak     | Total Trips (veh / hour) | Directional Split |     | Volumes (veh / hour) |     |
|----------|--------------------------|-------------------|-----|----------------------|-----|
|          |                          | In                | Out | In                   | Out |
| PM       | 226                      | 50%               | 50% | 113                  | 113 |
| Saturday | 670                      |                   |     | 335                  | 335 |

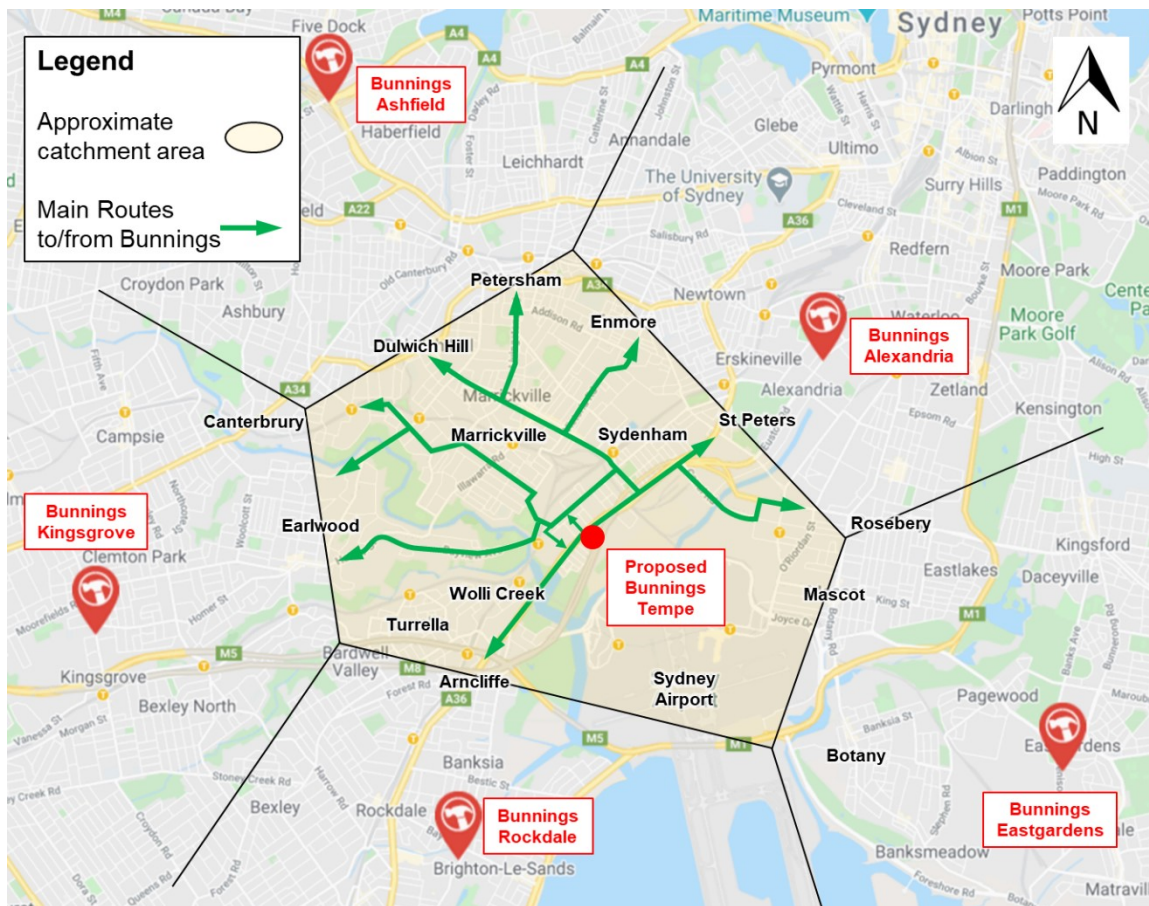
### 6.2.2.2 Adjusted Traffic Distribution

The previously adopted 45 / 45 / 10 split of traffic (based on previous studies conducted at the IKEA site, located to the east) was determined as an under representation to the potential split of traffic accessing and leaving the proposed Bunnings Warehouse site.

Using the locations of adjacent Bunnings Warehouse stores, a potential catchment area was estimated, shown in Figure 6.2. This area covers suburbs extending from Canterbury to the west, Roseberry to the east, Petersham to the north and Arncliffe to the south. Key roads leading to and from the proposed Tempe Bunnings Warehouse are also shown (details on routes are provided in Section 7).

Based on the location and density of suburbs to the north of the proposed Bunnings Site, a substantial amount of traffic is expected to travel to and from these areas. As such, it would be more realistic to assign a greater proportion of this traffic heading north using local streets, particularly as these streets provide a more direct route to the rail bridge on Richardson Crescent (at Tempe) or Gleeson Avenue (at Sydenham) via Unwins Bridge Road.

Volumes as a result of adjusted / greater distribution of Bunnings traffic (up to 30%) using local streets north of Princes Highway are provided in Table 6.4. A large majority of traffic will still be expected to use Princes Highway to access routes to the north of the area.



Adapted from Google Maps

**Figure 6.2: Approximate Catchment Area of Proposed Bunnings Warehouse**

**Table 6.4: Adjusted Traffic Distribution (Using Local Streets)**

| Peak     | Total Trips<br>(veh / hour) | Vehicle Volumes |     |     |     |
|----------|-----------------------------|-----------------|-----|-----|-----|
|          |                             | 10%             | 20% | 25% | 30% |
| PM       | 113                         | 11              | 23  | 28  | 34  |
| Saturday | 335                         | 34              | 67  | 84  | 101 |

### 6.2.3 Other Changes

It is understood that the existing bus stop along Princes Highway outside of the development site may be impacted by the development. The provision of replacement bus stops is outside the scope of this study.

## 6.3 Future Road Network

### 6.3.1 WestConnex

The new M8 tunnel, opened in July 2020, runs underneath the study area as part of the WestConnex project. There will be no connections or changes to study area roads. The St. Peters interchange, located approximately 2km northeast of Tempe, connects the M8 with roads towards the eastern suburbs such as Mascot and Kingsford, and the City's inner south such as Alexandria and Waterloo.

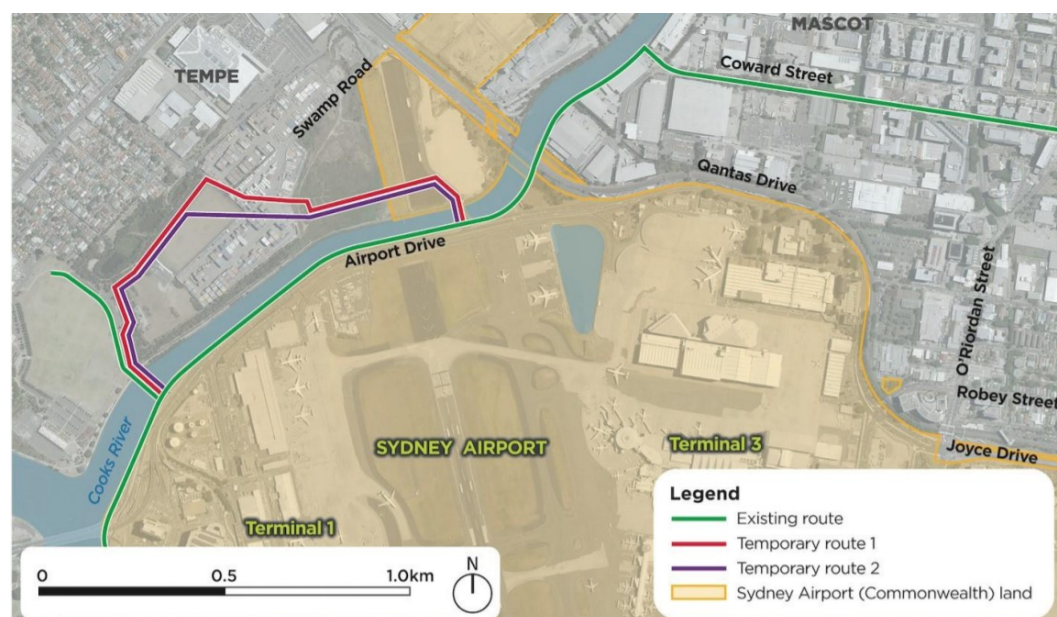
Currently, traffic from the M5 exit at Arncliffe runs via Princes Highway, through Tempe, then via Canal Road or Sydney Park Road to get to the inner south and eastern suburbs respectively. The opening of the new M8 and St Peters interchange may provide an alternative route from the existing M5 to these suburbs, bypassing the Tempe area and is expected to reduce traffic along Princes Highway through Tempe. However, it is not expected to influence traffic along the side roads such as Union Street, Holbeach Avenue and Smith Street.

The M8, though open, is counted as future road network as it opened after the traffic surveys were undertaken.

### 6.3.2 Sydney Gateway

Sydney Gateway is a future motorway connection between the St Peters interchange and Sydney Kingsford Smith Airport, scheduled to be completed by 2023. The proposed alignment is located adjacent to between Tempe Golf Range and the Alexandria Canal, and does not pass through the study area. However, a construction site is proposed to be located within Tempe Lands on the sites of the Tempe Golf Range and Tempe Dog Park. It is expected for up to 100 light vehicles to access the site via Holbeach Avenue, to be undertaken between 2021 and 2023. Construction vehicle trucks will not be allowed to use Holbeach Avenue to access the Tempe Lands construction site.

Additionally, the current Alexandria Canal shared path will be closed and relocated as part of the project, a temporary active transport link is proposed to run adjacent to Tempe Recreation Reserve and Tempe Lands, shown in Figure 6.3, serving as a temporary detour of the closed shared path. As such, a greater number of cyclists and pedestrians expected towards the south of the study area.



Source: Sydney Gateway Environmental Impact Assessment

**Figure 6.3: Sydney Gateway - Temporary Active Transport Link**



## 7. BUNNINGS IMPACTS TO LOCAL TRAFFIC

The increased traffic generated from Bunnings will have a flow on impact onto surrounding local residential roads in the study area. This can lead to an increase of traffic issues such as excessive volumes and speeds on the local roads, which is not desirable. Any LATM devices proposed will aim to mitigate these impacts.

### 7.1 Routes to and from Bunnings

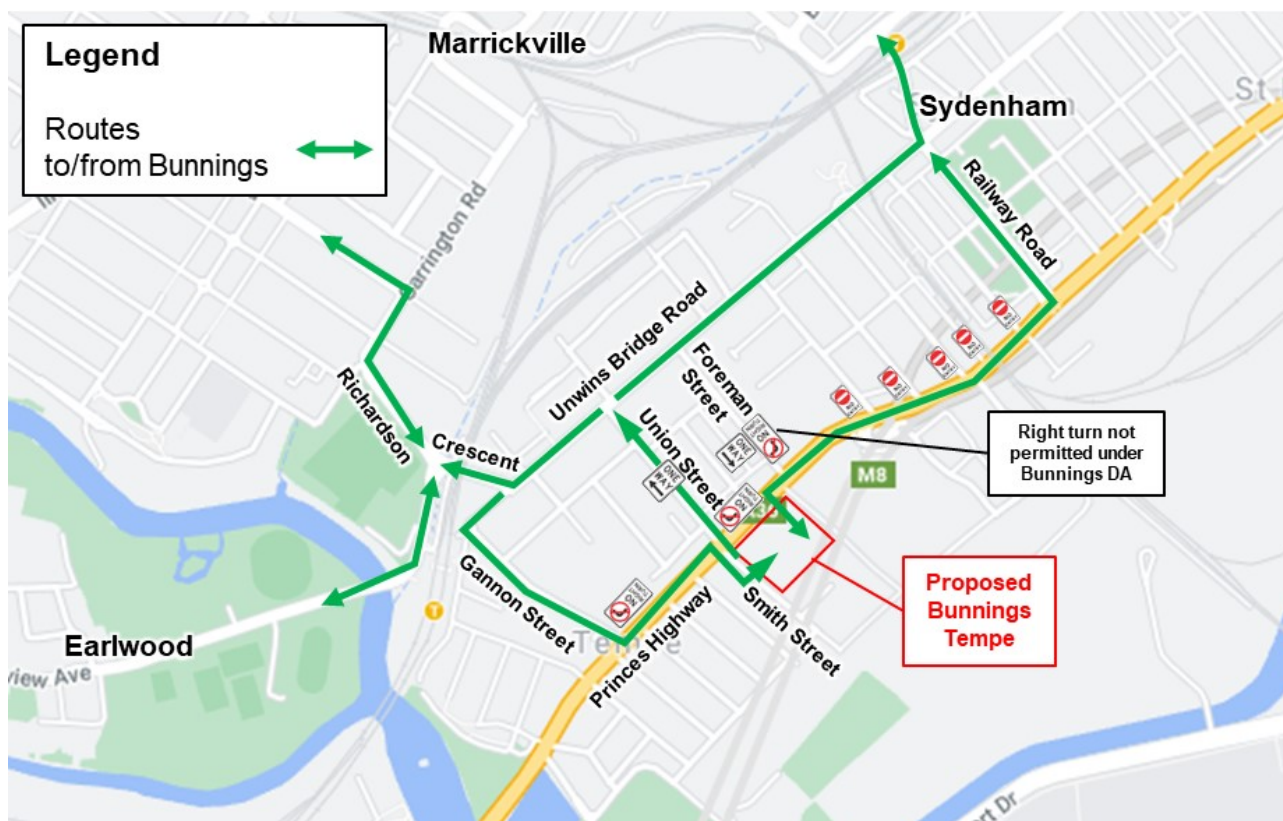
As shown in Figure 6.2, the expected catchment area of the proposed Tempe Bunnings Warehouse covers a broad area of Sydney's Inner West. Key routes and roads identified to access these areas include those outlined in Table 7.1:

**Table 7.1: Summary of Routes**

| Direction | Roads   |
|-----------|---|
| North     | Princes Highway, Railway Street, Sydenham Road, Marrickville Road, Unwins Bridge Road, Richardson Crescent, Warren Road |
| East      | Princes Highway, Gardeners Road   |
| West      | Princes Highway, Unwins Bridge Road, Richardson Crescent, Bayview Avenue, Wardell Road                                  |
| South     | Princes Highway   |

As a result of local rail crossings, there is potential for Bunnings customers to utilise local streets north of the Princes Highway, which provide a more direct route from Princes Highway to the rail bridge on Richardson Crescent (at Tempe) or Gleeson Avenue (at Sydenham) via Unwins Bridge Road.

Due to existing traffic management measures already in place, the most likely local roads used include Gannon Street and Union Street, with Union Street being the most direct northbound route available from Smith Street. The right turn from Foreman Street to Princes Highway will not be permitted due to the extension of the central median as part of the Bunnings DA, and therefore cannot be used as a route into Bunnings. These expected access routes between Unwins Bridge Road and Princes Highway are shown in Figure 7.1.



Adapted from GoogleMaps

**Figure 7.1: Expected Access Routes between Unwins Bridge Road and Princes Highway**

## 7.2 Impacts to Union Street

As a result, it can be expected that Union Street experiences an increase in traffic during peak periods. This is less than favourable due to the narrow geometry, the residential environment of the street and location of Tempe Public School to the north.

The increase in traffic as a result of the proposed Bunnings Warehouse is previously outlined in Table 6.4. A comparison of potential traffic volumes on Union Street is provided in Table 7.2.

**Table 7.2: Comparison of Potential Traffic Volumes on Union Street**

| Peak                 | Traffic Volumes (veh / hour) | Total Traffic on Union Street |      |      |      | Acceptable Environmental Limit |
|----------------------|------------------------------|-------------------------------|------|------|------|--------------------------------|
|                      |                              | 10%*                          | 20%* | 25%* | 30%* | Local Road                     |
| March 2020 Counts    |                              |                               |      |      |      | < 200 vph                      |
| PM                   | 51                           | 62                            | 74   | 79   | 85   |                                |
| Saturday             | 41                           | 75                            | 108  | 125  | 142  |                                |
| December 2018 Counts |                              |                               |      |      |      |                                |
| PM                   | 72                           | 83                            | 95   | 100  | 106  |                                |
| Saturday             | 81                           | 115                           | 148  | 165  | 182  |                                |

\* by proportion split of Bunnings Warehouse traffic, see Table 6.4



While an assessment of up to 30% of the expected traffic generated by Bunnings Warehouse more than doubles the existing traffic volumes along Union Street (in comparison to both 2018 and 2020 volumes), the increase in traffic can be accommodated by Union Street and does not exceed the acceptable environmental limit (200 vehicles per hour) previously outlined in Table 4.1 (*RTA Guide to Traffic Generating Developments 2002*).

### 7.3 Impacts to School Operations

Based on Bunnings Warehouse visitation pattern information (made available by *Google*), the highest visitation typically occurs:

- Weekday – between 10am and 4pm
- Weekends – between 9am and 6pm

With this in mind, traffic generated by the proposed Bunnings is more likely to have an impact on school operations during the PM School peak (typically between 2:30pm and 3:30pm). This may include:

- Increased vehicle volumes along Union Street
- Increased congestion and queueing at the intersection with Unwins Bridge Road
- Potential 'rat-running' using Edwin Street and Tramway Street
- Increased congestion with vehicles parked along Union Street and Edwin Street

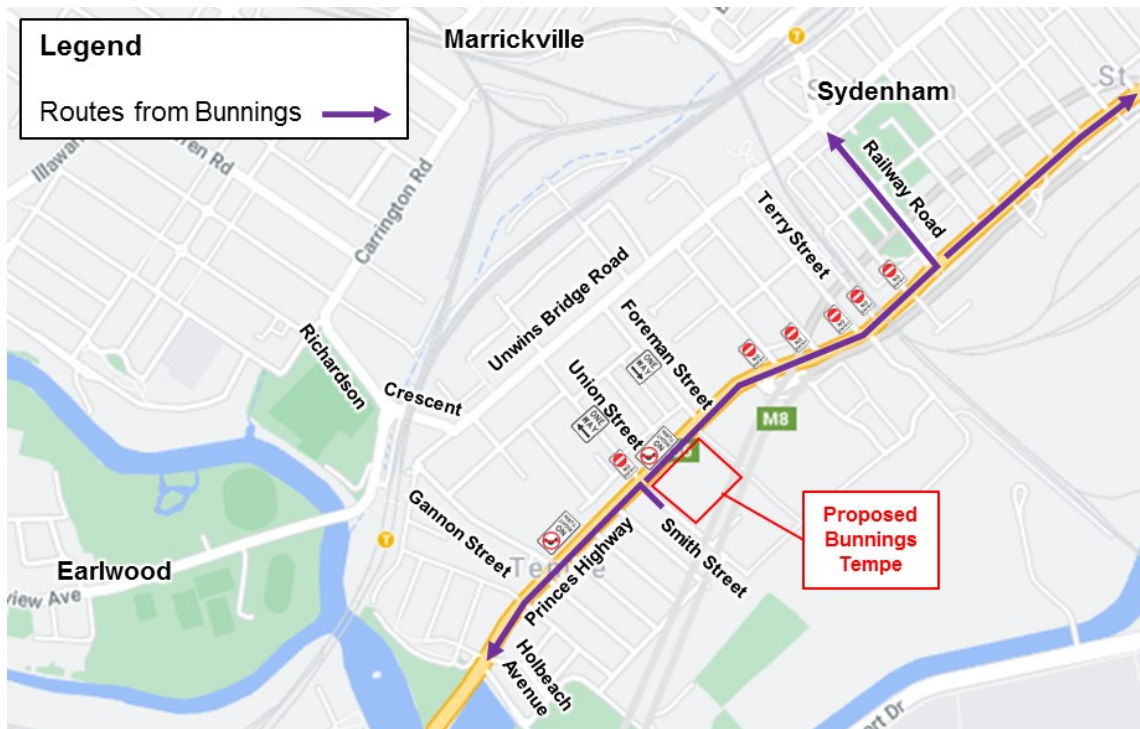
Traffic associated with Bunnings trade customers will typically occur before peak traffic periods and is not expected to impact the AM school peak.

### 7.4 Closure of Union Street

#### 7.4.1 Traffic re-direction

To prevent non-local traffic from using Union Street, the concept of a road closure has been considered at Princes Highway. We understand that this is supported by the local community members in Union Street. This closure aims to re-direct Bunnings related traffic emerging from Smith Street, to utilise the Princes Highway and other higher order roads to access Unwins Bridge Road and beyond, as shown in Figure 7.4 . This would result in the following routes:

- Right turn from Smith Street onto Princes Highway, then left turn onto Railway Road or Campbell Road
- Left turn from Smith Street onto Princes Highway, U-turn using the Holbeach Avenue roundabout, then right turn onto Princes Highway, then left turn onto Gannon Street



Adapted from GoogleMaps

**Figure 7.2: Routes with Union Street Closure**

#### 7.4.2 Impact to other Local Streets

Due to the no right turn currently in place for westbound traffic on Princes Highway at Gannon Street, drivers may utilise alternative routes along local streets south of Princes Highway to turn around and access Gannon Street via a left turn, as shown in Figure 7.3.

These streets may experience a greater volume of vehicles turning from Princes Highway, which is not favourable due to the limited available carriageway and residential environment of the street. Most vehicles would be expected to use Holbeach Avenue to perform the u-turn manoeuvre.



Adapted from GoogleMaps

**Figure 7.3: Access to Gannon Street using Local Streets**

### 7.4.3 Impact on Access for Residents

Due to the no right turn currently in place for westbound traffic on Princes Highway at Union Street, access to Union Street is currently gained by:

- Left turn from Princes Highway
- Through from Smith Street

The closure of Union Street would restrict access to the left turn from Princes Highway only (under a partial closure), or remove access altogether (with a full closure).

The alternative route for local residents on Union Street would then include the left turn from Princes Highway to Brooklyn Street, then left at Brooklyn lane or School Lane to access Union Street, as shown in Figure 7.4. It would be expected most residents would utilise Brooklyn Lane as it provides best access to properties along Union Street.

While Brooklyn Street is a wider street and capable of accommodating the increase in local traffic, Brooklyn Lane is a narrow bi-directional laneway (also shown Figure 7.4) which would not accommodate such traffic. Particularly during the AM peak where local residents are likely to access Princes Highway via Brooklyn Lane as well as school traffic.

Further, despite being undesirable, vehicles leaving Bunnings via Smith Street may also attempt to take this route, which will exacerbate traffic issues arising from using narrow lane ways as a main access route.



Adapted from GoogleMaps

**Figure 7.4: Local Routes with Union Street Closure**

In consideration of the potential outcomes due to a closure of Union Street at Princes Highway, in the draft version of the report, a closure was not recommended and other treatments to deter vehicles from using Union Street was preferred. However, a ban of through traffic from Smith Street to Union Street is now proposed following feedback from community engagement (See Section 13.4.4).

## 8. RISK PRIORITY ASSESSMENT

### 8.1 Methodology

Each study area road was assessed against criteria to determine its risk for future crashes based on the data collected. Criteria included:

- Crash history
- 24-hour vehicle volumes (existing)
- 85<sup>th</sup> percentile vehicle speeds
- Heavy vehicle volumes (existing)
- Road width
- Availability of existing LATM devices
- Proximity to schools
- Existing land use
- Future traffic volumes, taking into consideration traffic generated from Bunnings

Points were allocated to each road or road section based on the level of risk. The higher the points, the higher the risk for future crashes, and hence the higher the need for LATM devices.

#### Crash history (max 4)

- 4 points for crash casualty rates of more than the typical urban casualty rate of 0.446, as listed in Table 3.6.

The points are applied to Edwin Street, Holbeach Avenue and Smith Street.

#### 24-hour vehicle volumes (max 4)

- 2 points (per direction) for ADT of more than 400, as listed in Table 4.4.

The points are applied to Edwin Street, Holbeach Avenue, Smith Street, South Street and Union Street.

#### 85<sup>th</sup> percentile vehicle Speeds (max 4)

- 2 points (per direction) for 85<sup>th</sup> percentile speeds of more than 40 km/h, as listed in Table 4.4.

The points are applied to Holbeach Avenue, Smith Street and Stanley Street.

#### Heavy vehicle volumes (max 4)

- For roads without a truck load limit
  - 1 point (per direction) for daily heavy vehicle volumes of more than 50, as listed in Table 4.4; and
  - 1 point (per direction) for daily heavy vehicle percentages of more than 10%, as listed in Table 4.4.

The points are applied to Smith Street and South Street.

- For roads with the 3-tonne truck load limit
  - 1 point (per direction) for daily heavy vehicle volumes of more than 10, as listed in Table 4.4; and
  - 1 point (per direction) or daily heavy vehicle percentages of more than 5%, as listed in Table 4.4.

The points are applied to all roads with the load limit except Tramway Street.

#### Road width (max 4)



- 4 points where the available trafficable road width is more than two car widths – high potential/incentive to speed up and collide with pedestrians, adjacent parked vehicles or vehicles travelling in opposite direction

The points are applied to Holbeach Avenue and Smith Street only, which have wider roads than the other roads in the study area.

- 2 points where the available trafficable road width is equal or less than two car widths – low potential/incentive to speed up and collide with pedestrians, adjacent parked vehicles or vehicles travelling in opposite direction

The points are applied to all other roads accessed.

#### **Existing LATM devices**

- -1 (negative one) point for each set of LATM devices located on that road.
  - Multiple LATM devices at the same location are counted as one set (e.g. A flat top road hump with kerb blisters and contrasting pavement)
  - The three median rumble strips at the intersection of Edwin Street and Tramway Street are counted as one set on Edwin Street and one set on Tramway Street
  - Roundabouts are excluded, but any pedestrian refuge islands or median islands are included.

#### **Proximity to schools (max 4)**

- 4 points if the roads are within 100 metres from a school and/or have school zones, and frequently have children walking around.

The points are applied to Union Street, Foreman Street and Edwin Street, which are in close proximity to Tempe Public School.

#### **Existing land use (max 4)**

- 4 points for local traffic and residential streets. While this does not directly contribute to crash risk, safety is more paramount in a local traffic areas, and residential roads should be given some priority for implementation of LATM schemes.

The points are applied to all roads except Holbeach Avenue and Zuitton Lane, which are not predominantly residential.

#### **Future traffic volumes (max 4)**

- 4 points where additional Bunnings Warehouse generated traffic may flow onto, based on the evaluation in Section 7, assuming no changes in turning restrictions or accesses; or
- 4 points for local streets forecasted to have daily volumes are to exceeding 1,500

The points are applied to Smith Street, Union Street, Edwin Street and Tramway Street, which are potential routes for Bunnings traffic. No streets are forecasted to have more than 1,500 daily volumes.



## 8.2 Assessment

Based on the above scoring criteria, Table 8.1.presents the accumulated scores of each roadway.

**Table 8.1: Risk Score by Road**

| Road   | Criteria |        |       |               |       |               |         |                   |                |             |
|--|----------|--------|-------|---------------|-------|---------------|---------|-------------------|----------------|-------------|
|  | Crash    | Volume | Speed | Heavy Vehicle | Width | Existing LATM | Schools | Existing Land Use | Future Traffic | Total score |
| Barden Street                                      | -        | -      | -     | 1             | 2     | -             | -       | 4                 | -              | 7           |
| Edwin Street                                       | 4        | 2      | -     | 2             | 2     | -5            | 4       | 4                 | 4              | 17          |
| Fanning Street                                     | -        | -      | -     | 1             | 2     | -             | -       | 4                 | -              | 7           |
| Foreman Street                                     | -        | -      | -     | 2             | 2     | -5            | 4       | 4                 | -              | 7           |
| Hart Street  | -        | -      | -     | 1             | 2     | -             | -       | 4                 | -              | 7           |
| Holbeach Avenue<br>(Princes Highway to roundabout) | 4        | 4      | 4     | -             | 4     | -1            | -       | -                 | -              | 15          |
| Holbeach Avenue<br>(roundabout to South Street)    | -        | -      | -     | -             | 4     | -             | -       | -                 | -              | 4           |
| Smith Street                                       | 4        | 2      | 2     | 4             | 4     | -             | -       | -                 | 4              | 20          |
| South Street                                       | -        | 2      | -     | 1             | 2     | -3            | -       | 4                 |                | 6           |
| Stanley Street                                     | -        | -      | 4     | 3             | 2     | -             | -       | 4                 | -              | 13          |
| Station Street                                     | -        | -      | -     | 1             | 2     | -             | -       | 4                 | -              | 7           |
| Union Street                                       | -        | 2      | -     | 1             | 2     | -5            | 4       | 4                 | 4              | 12          |
| Tramway Street                                     | -        | -      | -     | -             | 2     | -1            | -       | 4                 | 4              | 9           |
| Wentworth Street                                   | -        | -      | -     | 3             | 2     | -             | -       | 4                 | -              | 9           |
| Zuilton Lane                                       | -        | -      | -     | 1             | 2     | -             | -       | -                 | 4              | 3-7         |

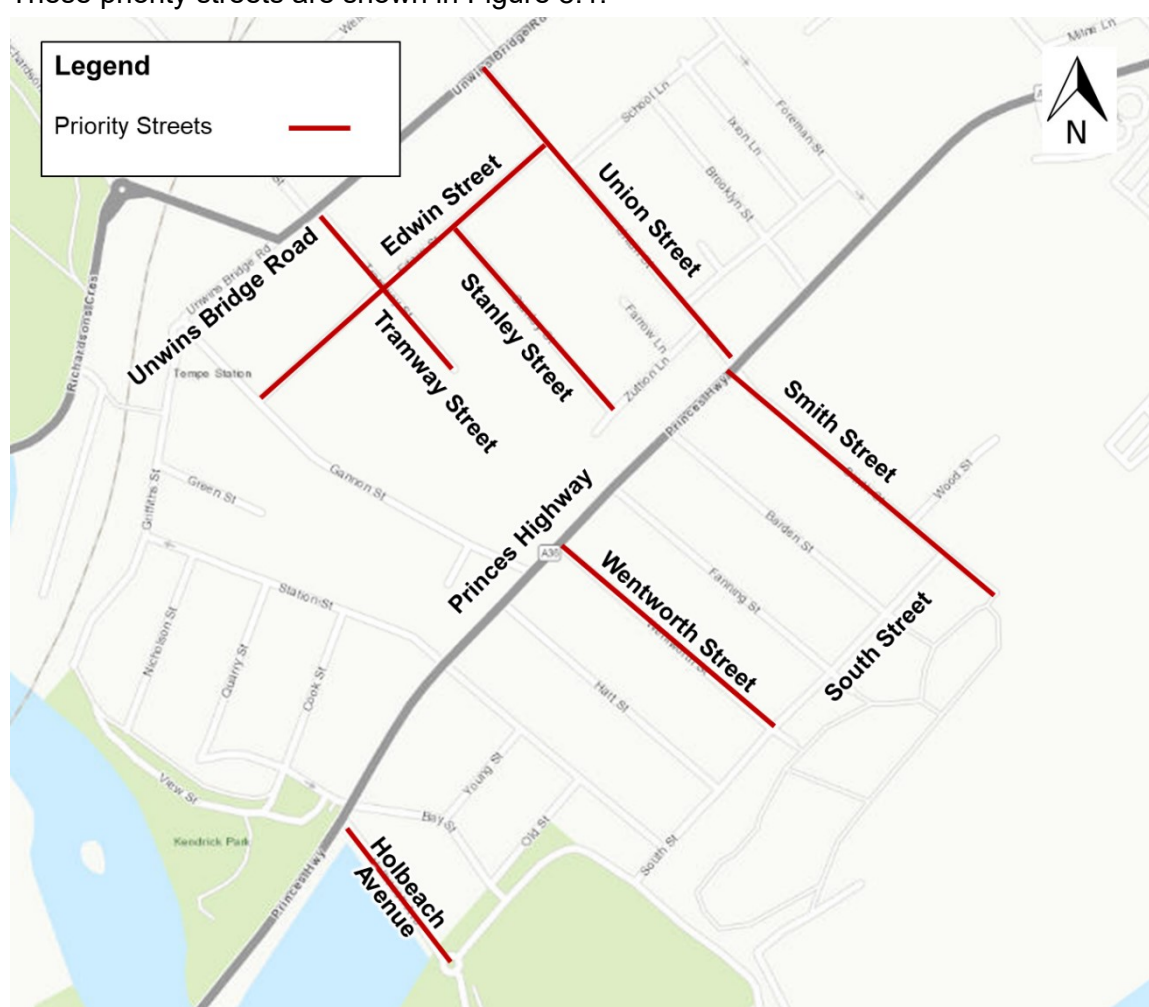
Based on the above assessment, Smith Street exhibits the highest score, followed by Edwin Street and Holbeach Avenue (between Princes Highway and the roundabout), then Stanley Street and Union Street. Wentworth Street and Tramway Street also achieved relatively high scores for local residential roads.

Other local streets, including Barden, Fanning, Hart and Station Streets, have an accumulated score of 7 points. Given the lack of crash history, low vehicle speeds and heavy vehicle composition, these roads do not require any LATM treatments. However, other treatments may be proposed to further deter non-local traffic from using these roads.

## 8.3 Summary

From the risk priority assessment, LATM devices are recommended to be implemented on, in the order of priority:

- Smith Street – to deal with traffic volume, speed and heavy vehicle issues
- Edwin Street – to deal with traffic volume, heavy vehicle issues and potential future traffic from Bunnings
- Holbeach Avenue (between Princes Highway and the roundabout) – to deal with crash risks, traffic volume and speed issues
- Stanley Street – to deal with speed issues
- Union Street – to deal with traffic volume issues and potential future traffic from Bunnings
- Wentworth Street – to deal with heavy vehicle issues
- Tramway Street – to deal with potential future traffic from Bunnings
- These priority streets are shown in Figure 8.1.



**Figure 8.1: Priority Streets for Treatment**

## 9. PRELIMINARY ROAD TREATMENTS

### 9.1 Traffic Calming and Local Area Traffic Management

Road treatments, including Local Area Traffic Management (LATM) Schemes and traffic calming measures can be implemented to change traffic conditions and speed environments, such that driver behaviour and perception of the road environment would be more appropriate along local residential streets and activity areas.

The primary objectives in introducing LATM schemes as part of this study is to address the following:

- Vehicle speeds
- Vehicle volumes
- Heavy vehicle volumes
- Reducing potential for traffic using local roads (with the exception of Smith Street) to access Princes Highway
- Improving amenity along Smith Street

### 9.2 Existing Road Treatments

As detailed in Section 2.11, the numerous LATM devices already in use within the study area include:

- Road humps (Watts profile & flat top), including raised thresholds
- Kerb blisters
- Contrasting pavement
- Raised pedestrian (wombat) crossing
- Roundabouts
- Pedestrian refuge islands

The majority of LATM devices are located along Union Street and Foreman Street in the vicinity of Tempe Public School.

### 9.3 Preliminary Road Treatment Options

To address the issues identified, a wide range of traffic calming devices can be implemented. LATM devices presented in *Austroads Guide to Traffic Management Part 8 – Local Area Traffic Management* were used as a basis for developing a list of suitable devices that could be used.

To create safer local road environments, the key targets for any proposed treatment options include:

- Reducing vehicle speeds
- Minimising traffic levels, including non-resident traffic in local streets
- Deterring heavy vehicles
- Reducing crash risk
- Improving local amenity, including walking and cycling options.

The following traffic calming treatments may potentially be implemented across the study area:

- Entry thresholds
- Flat top road humps

- Raised Pedestrian Crossings
- Speed cushions
- Slow points
- Road narrowing / Kerb blisters
- Pedestrian refuge / Median / Splitter islands
- Line marking (edge line and/or centreline)
- Shared zones.

Descriptions of each of these treatments are provided in Table 9.1.

**Table 9.1: Road Treatment Types**

| Name   | Type              | Description   |
|--|-------------------|---|
| Entry Threshold                              | Physical / Visual | <ul style="list-style-type: none"> <li>▪ Provides a physical and visual gateway to a local street</li> <li>▪ May control vehicle speeds in both directions</li> <li>▪ Design can be varied to accommodate different traffic types and road geometries (such as bicycles)</li> <li>▪ Include raised platforms, medians and kerb blisters</li> <li>▪ Opportunity to introduce landscaping elements to enhance streetscape</li> <li>▪ Commonly used throughout study area</li> <li>▪ May impact large vehicle movements near intersections</li> </ul>  |
| Flat Top Road Hump                           | Physical          | <ul style="list-style-type: none"> <li>▪ Wide raised platform type 'speed hump'</li> <li>▪ Controls vehicle speeds by vertical deflection and may reduce traffic volumes</li> <li>▪ More visually appealing than typical speed humps (such as Watts Profile)</li> <li>▪ Typically 75-150mm high, 2-6m long</li> <li>▪ Fullwidth designs control speeds in both directions</li> <li>▪ Design can be varied to adapt to different road geometries and traffic, including medians and kerb blisters</li> <li>▪ Can be misconstrued as a pedestrian crossing without roadside barriers (fence, landscaping or other)</li> <li>▪ Typically low cost</li> </ul> |
| Raised Pedestrian Crossing (Wombat Crossing) | Physical          | <ul style="list-style-type: none"> <li>▪ Flat Top Road Hump combined with marked Pedestrian Crossing</li> <li>▪ Controls vehicle speeds and provides pedestrian crossing location</li> <li>▪ Improves pedestrian safety by raising walkway (for better visibility) and calming traffic vehicles</li> <li>▪ Allows for pedestrian priority</li> </ul>  |
| Speed Cushions                               | Physical          | <ul style="list-style-type: none"> <li>▪ Small plastic or rubber 'cushion' in centre of travel lane (or series across travel lanes)</li> <li>▪ Controls vehicle speeds by vertical deflection</li> <li>▪ Smaller and narrower than speed humps or flat top road humps</li> <li>▪ Slows light vehicles with little impact to heavy vehicles (such as buses)</li> <li>▪ Can be combined with a median and kerb blisters for further control</li> <li>▪ Low cost and quick installation</li> </ul>   |

| Name  | Type       | Description   |
|---|------------|---|
| Slow Points                                   | Physical   | <ul style="list-style-type: none"> <li>Controls vehicles by horizontal deflection</li> <li>Uses series of kerb extensions or blisters on alternating sides of road to create an angled travel lane</li> <li>Opportunity to introduce landscaping elements to enhance streetscape</li> <li>Requires considerable length of road to install and potentially high cost</li> <li>Must consider local driveway access</li> <li>May impact kerbside parking</li> </ul>  |
| Road Narrowing                                | Physical   | <ul style="list-style-type: none"> <li>Kerb extensions or blisters to reduce available road width at a single point</li> <li>Use of kerb blisters may allow for kerbside drainage</li> <li>Often used in conjunction with other treatments (such as entry thresholds and road humps)</li> <li>Opportunity to introduce landscaping elements to enhance streetscape</li> </ul>   |
| Pedestrian Refuge / Median / Splitter Islands | Physical   | <ul style="list-style-type: none"> <li>Raised or flush island positioned at the intersection or the centreline of a street</li> <li>Narrows lanes</li> <li>Provide pedestrians with a refuge</li> <li>Used in areas where there is a need to reduce entry speed of vehicles to a residential street</li> <li>May not be used on narrow two-lane streets, and where there is insufficient sight distance</li> <li>Must consider local driveway access</li> <li>May impact kerbside parking</li> </ul>    |
| Line Marking                                  | Visual     | <ul style="list-style-type: none"> <li>May be used where physical treatments are not appropriate</li> <li>Can provide a visual narrowing of the roadway such that drivers perceive a narrower travel lane and reduce speed</li> <li>Assists in delineating road components such as cycle lanes and kerbside parking</li> <li>Available roadway width through bends is visually narrowed when combined with centreline marking</li> <li>May not be effective along considerably wide roadways</li> </ul> |
| Contrasting Pavement                          | Visual     | <ul style="list-style-type: none"> <li>Highlight the change in road conditions to drivers</li> <li>Colour and texture can be designed to fit with local area context</li> <li>Typically located at start of traffic areas (such as High Pedestrian Activity Areas)</li> <li>Textured pattern (such as Embossed Hex) can also provide a tactile and audible warning to drivers</li> <li>Typically low cost</li> </ul>  |
| Shared Zone                                   | Regulatory | <ul style="list-style-type: none"> <li>Located along a road section</li> <li>Vehicles must give way to all pedestrians</li> <li>Suitable for a high-pedestrian area</li> <li>10 km/h speed limit</li> <li>Parking can be retained but bays must be marked</li> </ul>  |



It is understood that the Bunnings development may also bring about traffic impacts onto streets just outside of the study area such as Edwin Street and Tramway Street. These impacts have been considered, however, no treatments are proposed on these streets

## 9.4 Standard LATM Treatments

Based on existing LATM devices found and the types presented by Austroads, a number of potential standard treatment options are proposed for installation across the study area, presented in Table 9.2.

These devices are identified as being appropriate for the context of the study area and address the issues identified on local roads.

**Table 9.2: Proposed Standard LATM Treatments**

| Infrastructure       | Description                                  |
|----------------------|--|
| Flat-top Road Hump   | Standard flat top road hump                  |
| Speed Cushion        | Standard speed cushion(s)                    |
| Road Narrowing       | Kerb blisters (landscaping)                  |
| Median Treatments    | Median Island (standard or low-profile)      |
| Line marking         | Edge and centre line marking                 |
| Contrasting Pavement | Standard at-grade contrasting pavement       |
| Shared Zone          | 10 km/h shared zone with marked parking bays |

Examples of some of these treatments are provided in Figure 9.1 below.



*Left to Right: Flat top road hump, road narrowing (kerb blisters with landscaping)*

**Figure 9.1: Examples of Treatments**

There are other treatments that may be implemented or installed additionally, complementing the proposed LATM treatments. Treatments identified as suitable for the study area include:

- Bicycle facilities, including bicycle ramps, shared paths and bicycle markings
- Signage, to complement the LATM treatments
- Footpath widening

## 9.5 Treatment Criteria

As there is a large range of available LATM devices available, the selection and location of these devices is important to address the specific issues along each street. A range of factors and considerations are to be given in the selection process to determine suitable and appropriate LATM treatments. As such, a treatment selection criteria was developed to inform the selection and location of proposed LATM devices.

### 9.5.1 Austroads LATM Selection Toolkit

The selection of an appropriate LATM is greatly dependent on the overall objective for the particular roadway, the local context of the road environment and the needs of local road users.

*Austroads Guide to Traffic Management Part 8 – Local Area Traffic Management* provides a toolkit and selection rubric, which outlines the relative use of different LATM devices based on previous research and practice within Australia and New Zealand. The Austroads Toolkit which provides a description and use of LATM devices is provided in Table 9.3.

**Table 9.3: Austroads LATM Toolkit**

| Measure  |                                   | Reduce speeds | Reduce traffic volume | Reduce crash risk | Increase pedestrian safety | Increase bicycle safety |
|--|-----------------------------------|---------------|-----------------------|-------------------|----------------------------|-------------------------|
| Vertical deflection devices<br>(Section 7.2)             | Road humps                        | ✓             | ✓                     | ✓                 | –                          | –                       |
|  | Road cushions                     | ✓             | ✓                     | ✓                 | –                          | ✓                       |
|  | Flat-top road humps               | ✓             | ✓                     | ✓                 | –                          | ✓                       |
|  | Wombat crossings                  | ✓             | ✓                     | ✓                 | ✓                          | ✓                       |
|  | Raised pavements                  | ✓             | ✓                     | ✓                 | –                          | ✓                       |
| Horizontal deflection devices<br>(Section 7.3)           | Lane narrowings/kerb extensions   | ✓             | –                     | –                 | ✓                          | –                       |
|  | Slow points                       | ✓             | ✓                     | –                 | –                          | –                       |
|  | Centre blister islands            | ✓             | ✓                     | –                 | ✓                          | –                       |
|  | Driveway links                    | ✓             | ✓                     | –                 | ✓                          | ✓                       |
|  | Mid-block median treatments       | ✓             | –                     | ✓                 | ✓                          | ✓                       |
|  | Roundabouts                       | ✓             | ✓                     | ✓                 | –                          | –                       |
| Diversion devices<br>(Section 7.4)                       | Full road closure                 | –             | ✓                     | ✓                 | ✓                          | ✓                       |
|  | Half road closure                 | –             | ✓                     | ✓                 | ✓                          | ✓                       |
|  | Diagonal road closure             | –             | ✓                     | ✓                 | ✓                          | ✓                       |
|  | Modified T-intersection           | ✓             | ✓                     | ✓                 | ✓                          | ✓                       |
|  | Left-in/left-out islands          | –             | ✓                     | ✓                 | ✓                          | –                       |
| Signs, linemarking and other treatments<br>(Section 7.5) | Speed limit signs                 | ✓             | –                     | ✓                 | ✓                          | ✓                       |
|  | Prohibited traffic movement signs | –             | ✓                     | ✓                 | –                          | ✓                       |
|  | One-way (street) signs            | –             | ✓                     | ✓                 | ✓                          | –                       |
|  | Give-way signs                    | ✓             | ✓                     | ✓                 | ✓                          | ✓                       |
|  | Stop signs                        | ✓             | ✓                     | ✓                 | ✓                          | ✓                       |
|  | Shared zones                      | ✓             | ✓                     | –                 | ✓                          | ✓                       |
|  | School zones                      | ✓             | –                     | ✓                 | ✓                          | ✓                       |
|  | Threshold treatments              | ✓             | ✓                     | ✓                 | –                          | ✓                       |
|  | Tactile surface treatments        | ✓             | –                     | –                 | –                          | –                       |
|  | Bicycle facilities                | –             | –                     | ✓                 | –                          | ✓                       |
|  | Bus facilities                    | –             | ✓                     | –                 | –                          | –                       |

### 9.5.2 Treatment Criteria

The information presented within the Austroads LATM selection toolkit and consideration of other road environment elements was used to develop a specific treatment selection criteria and is presented in Table 9.4.

The criteria include considerations of the following:

- Speed and traffic volume reduction
- Crash risk reduction
- Relative traffic volumes
- Deterrence against non-local traffic
- Pedestrians, bicycles and buses
- Kerbside parking
- Road and traffic noise generation
- Roadway width requirements.

**Table 9.4: Proposed Treatment Selection Criteria**

| Type                   | Details                                      | Reduce Speed     | Reduce Traffic Volumes | Reduce Crash Risk | Suitable for High Traffic Volumes | Deter Non-Local Traffic | Accommodate Pedestrians | Bicycle Friendly | Bus Route friendly | Parking friendly  | Noise Considerations | Wide Road required | Other remarks                                    |
|------------------------|--|------------------|------------------------|-------------------|-----------------------------------|-------------------------|-------------------------|------------------|--------------------|-------------------|----------------------|--------------------|--|
| <b>LATM Treatments</b> |  |                  |                        |                   |                                   |                         |                         |                  |                    |                   |                      |                    |  |
| Road hump              | Flat top road hump                           | Yes              | Yes                    | Yes               | Yes                               | Yes                     | No                      | Yes <sup>3</sup> | Yes <sup>4</sup>   | Yes               | Yes                  | No                 | Preferred for lower traffic volumes              |
| Speed Cushion          | Speed Cushion                                | Yes              | Yes                    | Yes               | Yes                               | Yes                     | No                      | Yes              | Yes                | Yes <sup>10</sup> | Yes                  | No <sup>7</sup>    | Preferred for lower traffic volumes              |
| Road narrowing         | Kerb blisters (landscaping)                  | Yes              | No                     | No                | Yes                               | Yes                     | No                      | No               | No <sup>5</sup>    | No                | No                   | Yes                | Not to be used on bus routes on a one-way street |
| Median Treatment       | Median Island (standard or low-profile)      | Yes              | No                     | Yes               | Yes                               | Yes                     | No                      | No <sup>5</sup>  | Yes <sup>6</sup>   | No                | No                   | Yes                | Must conform to Transport for NSW standards      |
| Line-Marking           | Edge, centre and lane line marking           | Yes <sup>1</sup> | No                     | Yes <sup>2</sup>  | Yes                               | Yes                     | -                       | -                | Yes                | Yes               | No                   | Yes <sup>8</sup>   | Parking lane width may vary, minimum 2.1m        |
| Contrasting Pavement   | Standard Contrasting Pavement                | Yes              | No                     | No                | Yes                               | Yes                     | -                       | -                | Yes                | Yes               | Yes <sup>9</sup>     | No                 | Visual and tactile treatment only                |
| Shared zone            | 10 km/h shared zone with marked parking bays | Yes              | No                     | Yes               | No                                | Yes                     | Yes                     | Yes              | No                 | Yes               | No                   | No <sup>10</sup>   | Not to be used on heavy vehicle or bus routes    |

| Type                    | Details  | Reduce Speed | Reduce Traffic Volumes | Reduce Crash Risk | Suitable for High Traffic Volumes | Deter Non-Local Traffic | Accommodate Pedestrians | Bicycle Friendly | Bus Route friendly | Parking friendly | Noise Considerations | Wide Road required | Other remarks |
|-------------------------|--|--------------|------------------------|-------------------|-----------------------------------|-------------------------|-------------------------|------------------|--------------------|------------------|----------------------|--------------------|---------------|
| <b>Other Treatments</b> |  |              |                        |                   |                                   |                         |                         |                  |                    |                  |                      |                    |               |
| Bicycle Facilities      | Bicycle ramps, shared paths and bicycle markings | -            | -                      | -                 | -                                 | -                       | No                      | Yes              | -                  | -                | No                   | No                 |               |
| Signage                 | Signage to complement LATM treatments            | varies       |                        |                   |                                   |                         | -                       | -                | -                  | -                | No                   | No                 |               |
| Footpath widening       | Widened footpath                                 | -            | -                      | -                 | -                                 | -                       | Yes                     | Yes              | -                  | No               | No                   | Yes                |               |

**Notes:**

1. If travel lane is sufficiently narrowed
2. May effectively reduce kerbside crashes
3. Ramps can be designed to be bicycle friendly
4. Flat top road humps can be designed to bus friendly specifications (ref. STA guidelines)
5. Bus routes require 3.2m to 3.5m wide travel lane, which will not be an effective road narrowing for regular traffic
6. If 3.5m travel lane is maintained
7. More effective on narrow roads. Installation on bus routes require 3.5m travel lane
8. Generally applied to wide road
9. Noise to be considered if using textured surface treatment (such as embossed pattern or similar)
10. A minimum trafficable width of 2.8m is required to meet shared zone warrants



## 9.6 Proposed Treatment and Locations

Based on the selection criteria, a number of proposed treatment options were developed for the priority roads identified in Section 8.3. Additional proposed treatments for other roads in the study area were also developed. The proposed treatments are outlined in Table 9.5.

**Table 9.5: Proposed Treatment and Locations**

| Road         | Option                   | Type                                  | Location                                       | Features   |
|--------------|--------------------------|---------------------------------------|--|--|
| Smith Street | 1                        | Road Narrowing & Contrasting Pavement | Immediately south of proposed Bunnings access, | <ul style="list-style-type: none"> <li>▪ Landscaped kerb blisters with low height shrubs</li> <li>▪ At-grade contrasting pavement treatment (embossed text pattern)</li> </ul>   |
|              | 2                        | Mountable Concrete Median Treatment   |  | <ul style="list-style-type: none"> <li>▪ Mountable low-profile concrete median with contrasting pavement</li> </ul>  |
|              | Addition to both options | Right Turn Only Signage               | Opposite and facing Bunnings access            | <ul style="list-style-type: none"> <li>▪ R2-14_R (Right Turn Only) sign</li> </ul>   |
|              |                          | Line Marking                          | Between Princes Highway and Bunnings Access    | <ul style="list-style-type: none"> <li>▪ Edge and centre line markings to provide a visual narrowing of the roadway</li> <li>▪ Road environment would appear distinctively different to the southern section of Smith Street</li> <li>▪ Delineation of adjusted lane arrangement near Princes Highway</li> </ul>   |
|              |                          | Bicycle Facilities                    | Between Princes Highway and Bunnings Access    | <ul style="list-style-type: none"> <li>▪ Extend shared path for a short distance from Princes Highway along both sides of Smith Street</li> <li>▪ Inclusion of an angled bicycle ramp for southbound cyclists to transition between the shared path and Smith Street</li> <li>▪ Signage and marking to indicate transitions between shared path and on-road cycling</li> </ul> |

| Road             | Option | Type                                  | Location   | Features   |
|------------------|--------|---------------------------------------|--|--|
|                  |        | Widened Footpath                      | Western side of road, between No. 48 and South Street  | <p>Option a (Option 1a or Option 2a):</p> <ul style="list-style-type: none"> <li>Widen western footpath</li> <li>Retain existing kerbside parking on the western side of Smith Street</li> <li>Shift centreline to suit road width</li> </ul> <p>Option b (Option 1b or Option 2b):</p> <ul style="list-style-type: none"> <li>Widen western footpath with adjacent landscaped verge</li> <li>Removal of existing kerbside parking on the western side of Smith Street</li> <li>Some paved parking bays within the landscaped area to offset loss of parking</li> <li>Turning pocket to allow vehicles to turn right out of No.1 Smith Street</li> </ul> |
| Holbeach Avenue  | 1      | Speed Cushions                        | Between driveways of 14 and 18 Holbeach Avenue   | <ul style="list-style-type: none"> <li>Set of four speed cushions of 100mm height, across roadway</li> </ul>   |
|                  | 2      | Speed Cushions & Road Narrowing       |  | <ul style="list-style-type: none"> <li>Set of two speed cushions of 100mm height in travel lanes</li> <li>Landscaped kerb blisters with low height shrubs</li> </ul>   |
| Stanley Street   | 1      | Flat Top Road Hump                    | <p>Near streetlight outside 14 Stanley Street</p> <p>Near streetlight outside 37 Stanley Street</p>  | <ul style="list-style-type: none"> <li>Concrete flat top road hump of 100mm height, across road width</li> <li>Contrasting surface treatment ('terracotta' colour surface of similar)</li> <li>Landscaped barriers (kerbside)</li> </ul>   |
|                  | 2      | Road Narrowing                        |  | <ul style="list-style-type: none"> <li>Landscaped kerb blisters with low height shrubs</li> </ul>  |
| Wentworth Street | 1      | Road Narrowing & Contrasting Pavement | <p>At entry from Princes Highway (specifically south of Tempe Tyre Centre vehicular access)</p> <p>At entry from South Street (specifically north of the drainage pit)</p> | <ul style="list-style-type: none"> <li>Landscaped kerb blisters with low height shrubs</li> <li>At-grade contrasting pavement treatment (embossed text pattern)</li> </ul>   |
|                  | 2      | Flat Top Road Hump                    |  | <ul style="list-style-type: none"> <li>Concrete flat top road hump of 100mm height, across road width</li> <li>Contrasting surface treatment ('terracotta' colour surface of similar)</li> <li>Bollard and chain barriers (kerbside)</li> </ul>  |

| Road                                      | Option                   | Type  | Location   | Features   |
|---|--------------------------|---|--|--|
|   | Addition to both options | 3 Tonne Truck Limit Signage                 | Outside 846 Princes Highway<br>Outside 45 Wentworth Street | <ul style="list-style-type: none"> <li>R6-10-2 and R9-231 (Truck Load Limit) signs</li> <li>W8-245N_L (Left Arrow) Signage, only on Princes Highway</li> </ul>   |
| Union Street                              | 1                        | Flat Top Road Hump                          | Outside 2D Union Street<br>Outside 46 Union Street         | <ul style="list-style-type: none"> <li>Concrete flat top road hump of 100mm height, across road width</li> <li>Contrasting surface treatment ('terracotta' colour surface of similar)</li> <li>Bollard and chain barriers (kerbside)</li> </ul>  |
|   | 2                        | Shared Zone <sup>1</sup>                    | Between Princes Highway and School Lane                    | <ul style="list-style-type: none"> <li>"10" Speed Markers</li> <li>Marked parking bays, with some overlapping with footpath</li> <li>R4-4 (Shared Zone), R2-10 (Give Way to Pedestrians) and R5-65 (Park in Bays Only) signs at the start of shared zone and entry points at Zuitton Lane and Brooklyn Lane</li> <li>R4-5 (End Shared Zone) signs at the end of shared zone and exit points at Zuitton Lane and Brooklyn Lane</li> </ul> |
|   | Addition to both options | Contrasting Pavement Threshold              | At entry from Princes Highway                              | <ul style="list-style-type: none"> <li>At-grade contrasting pavement treatment (embossed text pattern)</li> </ul>  |
| Edwin Street                              | 1                        | Flat Top Road Hump                          | Outside No. 14 Union Street                                | <ul style="list-style-type: none"> <li>Concrete flat top road hump of 100mm height, across road width</li> <li>Contrasting surface treatment ('terracotta' colour surface of similar)</li> <li>Landscaped barriers (kerbside)</li> </ul>   |
| Tramway Street                            | 1                        | Contrasting Pavement Threshold              | At entries (Unwins Bridge Road and Edwin Street)           | <ul style="list-style-type: none"> <li>At-grade contrasting pavement treatment (embossed text pattern)</li> </ul>  |
| Barden, Fanning, Hart and Station Streets | -                        | Contrasting Pavement Threshold <sup>2</sup> | At entry from Princes Highway                              | <ul style="list-style-type: none"> <li>At-grade contrasting pavement treatment (embossed text pattern)</li> </ul>  |

1. Assessment against the shared zone criteria is detailed in Section 10.6.3. Shared zones are subject to Transport for NSW review and approval

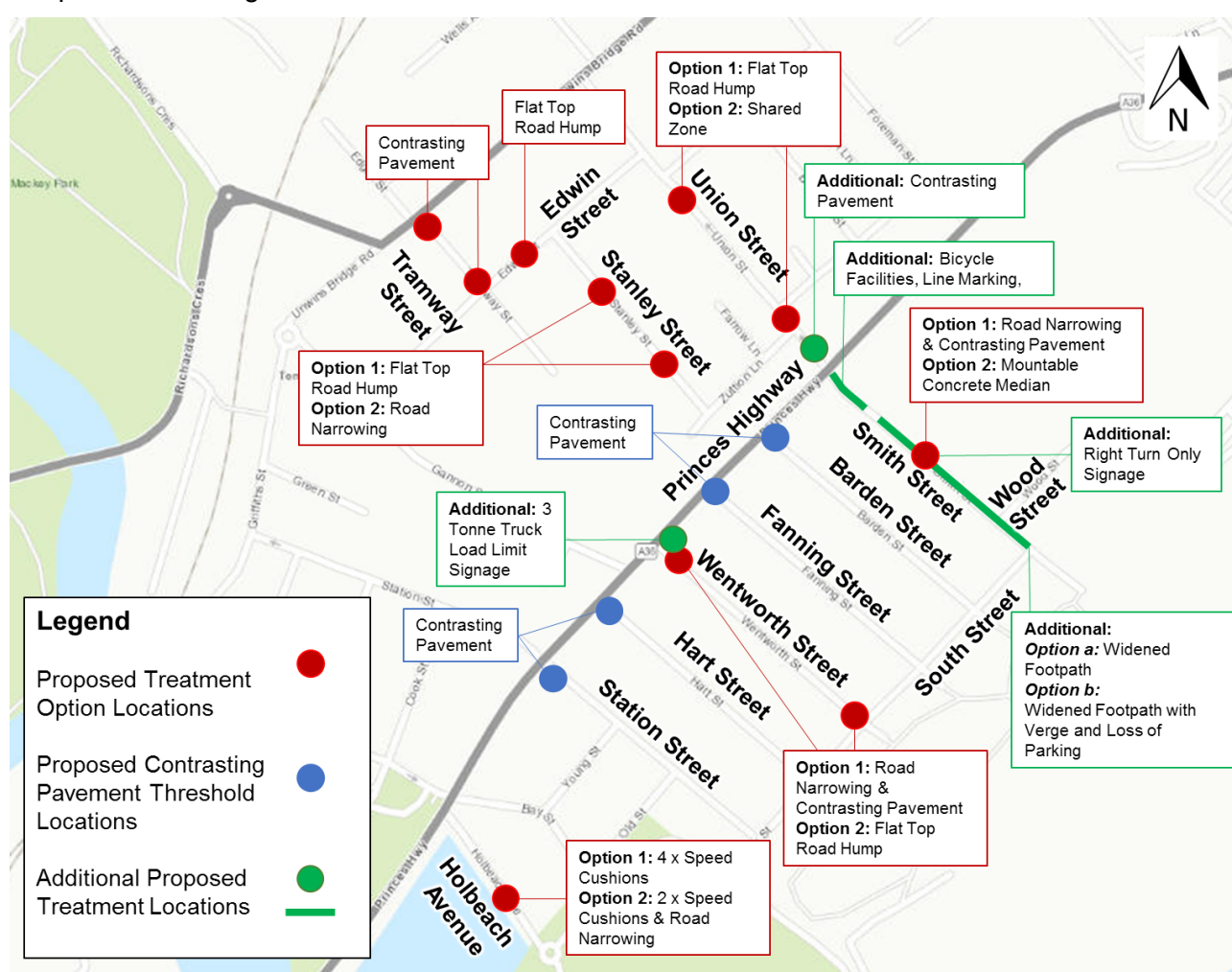
2. Subject to a 40km/h Local Traffic Area proposal and/or Transport for NSW review and approval

The following considerations were given when locating each of the above treatments:

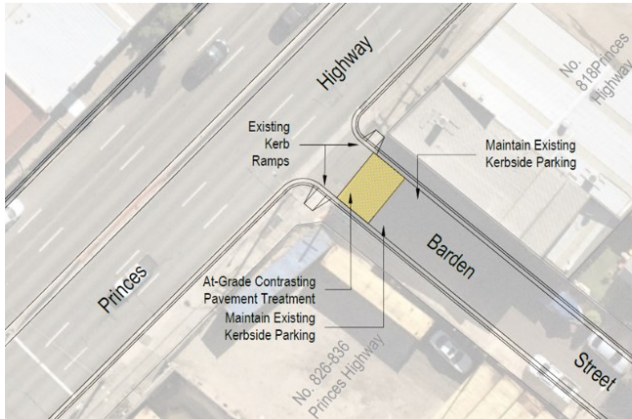
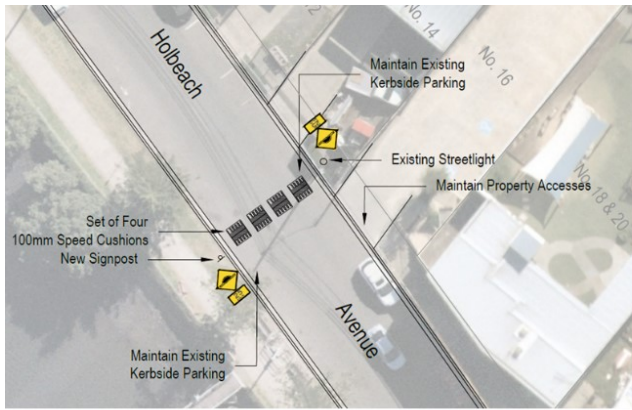
- Spacing: a maximum spacing between 80m and 120m was adopted (following *Austrroads LATM Guidelines*)
- Presence of existing street lighting and light posts
- Kerb ramps
- Property accesses and driveways
- Road gradients
- Driver sight distances and visibility.

Assessment of the different treatments are further detailed in Section 10.

The locations of the proposed treatments options, contrasting pavement thresholds and additional Smith Street treatments are shown in Figure 9.2. Sample concepts of the proposed treatment types are presented in Figure 9.3.



**Figure 9.2: Proposed Treatment Locations and Options**



Clockwise from top: Speed Cushions, Road Narrowing (kerb Blisters), Flat Top Road Hump, Kerb Blisters and Contrasting Pavement

**Figure 9.3: Sample Concepts of Proposed Treatments**



# 10. PROPOSED TREATMENT JUSTIFICATION

## 10.1 Overview

This section describes each treatment option in detail by street and discusses its merits and potential impacts to the road environment such as property access and kerbside parking. The merits and impacts are summarised at the end of this section in Table 10.3 and Table 10.4 respectively.

Any LATM measures proposed may have an impact on the travel time of emergency service vehicles through the area. However, in consideration of the existing road environment along these local streets, any additional proposed LATM measures are not expected to have a significant impact to emergency service vehicle access. Additionally, the treatments proposed are not located along public or school bus routes, therefore, there are no anticipated impacts to buses.

## 10.2 Smith Street

### 10.2.1 Issues

As discussed in previous sections, the issues present on Smith Street are:

- Smith Street has relatively high average daily traffic (ADT) volumes, up to 600 vehicles per day in each direction, compared to other local roads in the study area.
- Smith Street has relatively high 85<sup>th</sup> percentile speeds of up to 46 km/h per direction compared to other local roads.
- Due to industrial land use located along Smith Street and its adjoining Wood Street, heavy vehicles are common along Smith Street. From the tube count data, on average, between 100 and 150 heavy vehicles travel along Smith Street daily in each direction, and make up 25 to 36% of the total daily traffic.
- Based on crash history, three (3) crashes occurred along Smith Street between January 2014 and December 2018, with two (2) crashes resulting in injuries.
- The proposed Bunnings development will be mainly accessed via Smith Street. There are concerns that the development will generate both light and heavy vehicle traffic, not just on Smith Street, but on other local roads such as Barden Street, South Street and Holbeach Avenue.
- Speed cushions were installed along Smith Street, as part of a previous LATM study, were removed in 2012 and 2017 respectively. This was due to resident complaints about the noise produced by trucks driving over the speed cushions. As such, vertical deflection devices such as speed humps were not considered as treatment options on Smith Street.

### 10.2.2 Location of Treatment Options

Treatment options for Smith Street will be located between the Bunnings access and access to No.1 Smith Street. The placement of treatment options mid-block on Smith Street breaks up the long straight section of the roadway, preventing drivers from gathering speed along the length of the road.

### 10.2.3 Option 1: Road Narrowing & Contrasting Pavement

This option involves landscaped kerb blisters on each side of the road, and an at-grade embossed text pattern as contrasting pavement between the kerb blisters. Additional measures to Smith Street regardless of Options 1 or 2 are described separately in Section 10.2.5.

### 10.2.3.1 Merits

Road narrowing will provide a narrow travel width, similar to existing treatments on neighbouring streets like Barden or Fanning Streets, which have an 85<sup>th</sup> percentile speed of less than 40 km/h. Therefore, providing road narrowing will strongly encourage traffic to slow down. Lower speeds will in turn increase travel time and may deter non-local traffic from utilising Smith Street.

Landscaping on the kerb blisters will also improve the aesthetics of the roadway and enhance sense of place. It may also provide clearer changes in road geometry for vehicles approaching the treatment.

The contrasting pavement will highlight the entry to a local traffic area by providing a physical and visual gateway treatment to the south section of Smith Street. The differentiation of road environment may be able to deter vehicles from turning left from the proposed Bunnings access onto Smith Street southbound. Combined with road narrowing, the reduced geometry may also be less favourable to heavy vehicles.

Road narrowing will result in a loss of parking along Smith Street. However, the removal of parking will improve sightlines for vehicles exiting the driveways from Bunnings and No.1 Smith Street. It also improves manoeuvrability of these turns as there is a reduced likelihood of parked vehicles obstructing the access points.

### 10.2.3.2 Impacts to Parking

The Bunnings development will result in the proposed removal of up to 13 spaces of on-street parking along Smith Street. These spaces are compensated with 13 spaces within Bunnings warehouse, which are open to access during Bunnings trading hours only. This removes the flexibility of parking at any time of the day for any duration. Given that most residents are expected to park overnight or outside business hours, as a worst-case scenario, these spaces will not be considered as part of the assessment.

From the parking surveys conducted on 19<sup>th</sup> and 21<sup>st</sup> March 2020, on a Thursday and Saturday respectively, it was deduced that on average, Smith Street has 18 vacant spaces on Thursday and 27 vacant spaces on Saturday. With the loss of 13 parking spaces due to the Bunnings development, this will result in an estimated 5 and 14 vacant spaces remaining on Thursday and Saturday respectively.

Road narrowing will result in a loss of up to two (2) parking spaces on the western side and one (1) space on the eastern side, a total of three (3) spaces. The remaining availability of on-street parking on Smith Street will therefore be able to cope with the further removal of spaces due to road narrowing.

### 10.2.3.3 Other Impacts

The kerb blisters will be built between the Bunnings access and the access to No.1 Smith Street. There are no property accesses on the western side at the proposed location. As such, there will be no impacts of the treatments on the accesses along Smith Street.

The at-grade contrasting pavement also means that there will be no additional noise generated as compared to vertical deflection devices such as speed cushions. An at-grade pavement also provides minimal or no impacts to cyclists riding along Smith Street.

The treatment option may have an impact on the travel time of emergency service vehicles through the area. However, in consideration of the existing road environment along these local streets, any additional proposed LATM measures are not expected to have a significant impact to emergency service vehicle access.

#### 10.2.4 Option 2: Mountable Concrete Median

This option is a mountable low-profile concrete median. The pavement on the top of the median will also be contrasted against the road surface. Additional measures to Smith Street regardless of Options 1 or 2 are described separately in Section 10.2.5.

##### 10.2.4.1 Merits

The change in road geometry highlights local traffic area by providing a physical and visual gateway treatment to the south section of Smith Street. The reduction in geometry also aid in the differentiation of road environment and may deter vehicles turning left from proposed Bunnings access onto Smith Street southbound.

The treatment is a horizontal deflection device and will be able to slow traffic by diverting vehicles around the island, particularly heavy vehicles due to their larger turn radius.

The median island will result in a loss of parking along Smith Street (see next section). Similar to option 1, the removal of parking may improve sightlines of vehicles turning out from the accesses onto Smith Street. It also improves manoeuvrability of these turns as there is a reduced likelihood of parked vehicles obstructing the access points of 1 Smith Street.

The median island is low-profile and mountable to allow vehicles to turn right out of 1 Smith Street onto Smith Street northbound and mount over the median.

##### 10.2.4.2 Impacts to Parking

As mentioned in Option 1, Smith Street will have an estimated 5 and 14 vacant spaces remaining on Thursday and Saturday respectively, after spaces are removed for the Bunnings development.

The median island will result in a loss of seven (7) parking spaces on the western side and one (1) space on the eastern side, a total of eight (8) spaces. With the removal of these eight spaces, this will result in a **shortage of three (3) spaces** on a Thursday, and residential parking will be displaced onto adjacent streets such as Barden Street or South Street. Parking availability on Saturday will still be able to cope with the additional removal of spaces due to the median island.

On Thursday, Barden Street has a parking occupancy rate of around 50% out of 63 spaces, and South Street between Smith and Fanning Streets has a parking occupancy rate of around 40% out of 19 spaces. This means out of a total of 82 spaces, 39 are occupied and 42 are vacant, and therefore, Barden and South Streets will be able to cope with the additional parking demand of the three displaced vehicles.

It is also important to note that this is based on the worst-case scenario where most residents are expected to park overnight or outside Bunnings trading hours. It is possible that some residents may park within Bunnings overnight.

##### 10.2.4.3 Other Impacts

As the median island is built in the centre of the roadway, it will not require changes to accesses along Smith Street. Traffic exiting 1 Smith Street will still be able to turn right onto Smith Street northbound by mounting over the concrete median.

The island will also slow down cyclists riding along Smith Street as they need to divert around the island. However, the impact is minimal and the device is still 'bicycle-friendly'.

The treatment option may have an impact on the travel time of emergency service vehicles through the area. However, in consideration of the existing road environment along these local streets, any

additional proposed LATM measures are not expected to have a significant impact to emergency service vehicle access.

### 10.2.5 Additional Measures to Options 1 & 2

In addition to the location specific treatment as part of Option 1 and 2, other measures are proposed along Smith Street between Princes Highway and South Street. Some of these measures will also aid in increased connectivity for cyclists along pedestrians and Smith Street.

#### 10.2.5.1 Right Turn Only Sign

The “Right turn only” sign located opposite and facing Bunnings will enforce turn restrictions, preventing traffic exiting Bunnings from turning left onto Smith Street and using local streets.

#### 10.2.5.2 Line Marking

Edge and centre line markings will be provided along Smith Street (partially under Option 1, full length under Option 2), in addition to proposed line marking as part of Bunnings development arrangement. It will also provide differentiation between the northern and southern sections of Smith Street. Recommended delineation alignments to tie in with the proposed treatments have also been provided in the concept drawings in **Appendix B**.

#### 10.2.5.3 Bicycle Infrastructure

To provide off and on road bicycle transitions and connect the route on Smith Street to Princes Highway, the existing shared paths along Princes Highway will be extended on Smith Street, with kerb ramps and delineation. This aims to aid bicycles to transition to mixed traffic (bicycle and vehicles) along Smith Street away from the Princes Highway intersection. This will involve realignment and widening of the existing footpaths to allow one-way bicycle travel at minimum.

An angled bicycle ramp for southbound cyclists will be located on the eastern shared path, along with wayfinding and pavement markings to guide cyclists onto the road. Northbound cyclists will utilise the existing driveway of 48 Smith Street to access the extended shared path. Signage and marking will be used to guide cyclists to transition onto the shared path to travel along the existing Princes Highway shared paths.

On-road bicycle markings spaced evenly along Smith Street reaffirm that Smith Street is a mixed-traffic cycling route.

#### 10.2.5.4 Widened Footpath

##### Option a

The non-shared path section of the western footpath will be widened to 2.5m width to provide improved pedestrian facility. This option is known as **Option 1a or 2a** in the concept plans. Kerbside parking will be retained and delineated by edge line marking. The delineation will also provide a road narrowing along Smith Street and assist in slowing down vehicles.

##### Option b

Alternatively, the kerbside parking may be replaced with a landscaped verge of 1.6m width to provide a form of screening between the widened footpath and the roadway. This option is known as **Option 1b or 2b** in the concept plans. The reduced roadway width will also assist in slowing down vehicles. However, this will result in the loss of 31 kerbside parking spaces on the western side of the road. Six (6) spaces will be retained for parking, resulting in a net loss of 25 spaces on the western side of the road, i.e. a total of 26 spaces on both sides.

As mentioned previously, Smith Street will have an estimated 5 and 14 vacant spaces remaining on Thursday and Saturday respectively, after spaces are removed for the Bunnings development. The removal of 26 spaces will result in the overflow of 21 and 12 spaces onto adjacent streets on Thursday and Saturday respectively. Barden and South Streets, with a total of 42 vacant spaces, will be able to absorb the overflow of parking from Smith Street.

A summary of the loss in parking on Smith Street for the different options is shown in Table 10.1.

**Table 10.1: Loss of Smith Street Parking Spaces between Different Options**

| Option    | Western side | Eastern side | Total spaces lost from Design | Spaces removed for Bunnings | Total spaces removed | Existing vacant spaces | Vacant spaces remaining <sup>1</sup> |
|-----------|--------------|--------------|-------------------------------|-----------------------------|----------------------|------------------------|--------------------------------------|
| Thursday  |              |              |                               |                             |                      |                        |                                      |
| Option 1a | 3            | 1            | 4                             | 13                          | 17                   | 18                     | 1                                    |
| Option 2a | 8            | 1            | 9                             | 13                          | 22                   | 18                     | -4                                   |
| Option 1b | 25           | 1            | 26                            | 13                          | 39                   | 18                     | -21                                  |
| Option 2b | 25           | 1            | 26                            | 13                          | 39                   | 18                     | -21                                  |
| Saturday  |              |              |                               |                             |                      |                        |                                      |
| Option 1a | 3            | 1            | 4                             | 13                          | 17                   | 27                     | 10                                   |
| Option 2a | 8            | 1            | 9                             | 13                          | 22                   | 27                     | 5                                    |
| Option 1b | 25           | 1            | 26                            | 13                          | 39                   | 27                     | -12                                  |
| Option 2b | 25           | 1            | 26                            | 13                          | 39                   | 27                     | -12                                  |

1. Negative vacant spaces indicates parking demand exceeds capacity, resulting in parking overflow

## 10.3 Holbeach Avenue

### 10.3.1 Issues

As discussed in previous sections, the issues present on Holbeach Avenue are:

- Holbeach Avenue has relatively high average daily traffic (ADT) volumes, up to 550 vehicles per day in each direction, compared to other local roads in the study area.
- Holbeach Avenue has relatively high 85<sup>th</sup> percentile speeds of up to 44 km/h per direction compared to other local roads.
- Based on crash history, five (5) crashes occurred along Holbeach Avenue between January 2014 and December 2018, all resulting in injuries.

### 10.3.2 Location of Treatment Options

Treatment options for Smith Street will be located between the accesses of 14 and 16 Holbeach Avenue. Placing treatment options mid-block on Holbeach Avenue breaks up the long straight section of the roadway, preventing drivers from speeding up along the road.

The existing streetlight outside 14 Holbeach Avenue will also provide visibility of the device at night.



### **10.3.3 Option 1: Speed Cushions**

This option involves a set of four (4) speed cushions of 100mm height across the roadway, along with associated signage.

#### **10.3.3.1 Merits**

It is generally uncomfortable for drivers of vehicles to travel over vertical deflections at high speeds. By providing speed cushions as vertical deflections, vehicles will slow down in order to safely travel over the speed cushions. Lower speeds will in turn increase travel time and may deter non-local traffic from utilising Holbeach Avenue as an alternative route.

#### **10.3.3.2 Impacts to Parking**

As speed cushions do not require changes in roadway geometry, there will also be no impacts to kerbside parking or driveway accesses. Vehicles can still park over the road hump.

#### **10.3.3.3 Other Impacts**

The low profile of speed cushions allows for buses and service vehicles to travel to the Tempe recreation area. Bicycles can also safely get over speed cushions after slowing down.

Noise generated from travelling over speed cushions is not an issue as the land use along Holbeach Avenue is non-residential in nature.

### **10.3.4 Option 2: Speed Cushions and Road Narrowing**

This option is similar to option 1 in providing speed cushions. However, only a set of two (2) speed cushions of 100mm height will be provided across the roadway, with landscaped kerb blisters on each side of the road to provide narrowing of the roadway.

#### **10.3.4.1 Merits**

Similar to Option 1 for Smith Street, road narrowing will provide a narrow travel width and will likely be able to force traffic to slow down. Landscaping on the kerb blisters may also improve the aesthetics of the roadway and enhance sense of place. It may also provide clearer changes in road geometry for vehicles approaching the treatment.

Road narrowing will result in a loss of parking along Holbeach Avenue (see next section). However, the removal of parking may improve sightlines of vehicles turning out from the accesses onto Holbeach Avenue. It also improves manoeuvrability of these turns as there is a reduced likelihood of parked vehicles obstructing the access points of 14 and 16 Holbeach Avenue.

#### **10.3.4.2 Impacts to Parking**

Road narrowing will result in a loss of up to one (1) parking space on each side of the road, a total of two (2) spaces. While there are no parking surveys available for Holbeach Avenue, observations during site visit show that there are ample vacant on-street parking spaces along Holbeach Avenue during the daytime. It is very likely that the parking availability of Holbeach Avenue is able to cope with the loss of a mere two spaces.

#### **10.3.4.3 Other Impacts**

Impacts of speed cushions on traffic have been outlined in Option 1 and will not differ in Option 2.

The kerb blisters will be built between 14 and 16 Holbeach Avenue. There are no property accesses on the western side at the same location. As such, there will be no impacts of the treatments on the accesses along Holbeach Street.

The treatment option (road narrowing) may have an impact on the travel time of emergency service vehicles through the area. However, in consideration of the existing road environment along these local streets, any additional proposed LATM measures are not expected to have a significant impact to emergency service vehicle access.

## **10.4 Stanley Street**

### **10.4.1 Issues**

As discussed in previous sections, the issues present on Stanley Street are:

- Stanley Street has relatively high 85<sup>th</sup> percentile speeds of up to 45 km/h per direction compared to other local roads, although these speeds are below the speed limit of 50 km/h.
- Stanley Street also has up to 13 heavy vehicles per direction daily, despite the 3 tonne truck load limit imposed.

### **10.4.2 Location of Treatment Options**

Treatment options for Stanley Street will be located at two locations: outside 14 and 37 Stanley Street. The treatments to be installed at both locations will be the same.

Placing treatment options on two mid-block locations along Stanley Street breaks up the long straight section of the roadway, preventing drivers from speeding up along the road. The spacing between both locations are also consistent with spacing recommendations

Existing streetlights outside 13-15 Stanley Street and 37 Stanley Street will also provide visibility of the devices at night.

### **10.4.3 Option 1: Flat Top Road Hump**

This option involves a 100mm high concrete flat top road hump across the roadway at each location. The hump will have a contrasting surface treatment, usually a 'terracotta' colour surface.

#### **10.4.3.1 Merits**

Similar to speed cushions, by providing flat top road humps as vertical deflections, vehicles will slow down in order to safely travel over the humps. Lower speeds will in turn increase travel time and may deter non-local traffic from utilising Stanley Street.

Flat top road humps are consistent with other LATM devices in the area, particularly along Edwin Street.

#### **10.4.3.2 Impacts to Parking**

As flat top road humps do not require changes in roadway geometry, there will also be no impacts to kerbside parking or driveway accesses. Vehicles can still park over the road hump.

#### **10.4.3.3 Other Impacts**

As Stanley Street is not a heavy vehicle or bus route, there will be no noise generated as a result of trucks or buses travelling over the road hump. Bicycles will still be able to safely get over speed cushions.

#### **10.4.4 Option 2: Road Narrowing**

This option involves landscaped kerb blisters on each side of the road at each location.

##### **10.4.4.1 Merits**

Similar to road narrowing options proposed in other roads, road narrowing will provide a narrow travel width and will likely be able to force traffic to slow down. Lower speeds will in turn increase travel time and may deter non-local traffic from utilising Stanley Street.

Landscaping on the kerb blisters may also improve the aesthetics of the roadway and blend into the local landscape. It may also provide clearer changes in road geometry for vehicles approaching the treatment.

Road narrowing will result in a loss of parking along Stanley Street (see next section). However, the removal of parking may improve sightlines of vehicles turning out from the accesses onto Stanley Street. It also improves manoeuvrability of these turns as there is a reduced likelihood of parked vehicles obstructing nearby access points.

Kerb blisters are consistent with other LATM devices in the area, particularly along Union Street.

##### **10.4.4.2 Impacts to Parking**

Road narrowing will result in a loss of up to one (1) parking space on each side of the road at each of the two (2) locations, a total of four (4) spaces. While there are no parking surveys available for Stanley Street, observations made during a site visit show that there are ample vacant on-street parking spaces along Stanley Street during the daytime. It is very likely that the parking availability of Stanley Street is able to cope with the loss of four spaces.

##### **10.4.4.3 Other Impacts**

The kerb blisters will be built in between driveways of properties along Stanley Street. As such, there will be no impacts on the property access.

Road narrowing in general may slightly increase travel time of emergency service vehicles through the area due to reduced speed. However, considering the existing road environment along these local streets, any additional proposed LATM measures are not expected to have a significant impact on emergency service vehicle access.

### **10.5 Wentworth Street**

#### **10.5.1 Issues**

As discussed in previous sections, the issues present on Wentworth Street are:

- Wentworth Street has up to 10 heavy vehicles per direction daily, despite the 3-tonne truck load limit imposed.
- A signage audit noted missing truck load limit signage when approaching Wentworth Street from Princes Highway.

#### **10.5.2 Location of Treatment Options**

Treatment options for Wentworth Street will be located at two locations: north of South Street (outside 5 Wentworth Street) and south of Princes Highway (outside 846-854 Princes Highway, south of the Tempe Tyre Centre access). The treatments to be installed at both locations will be the same.

### **10.5.3 Option 1: Road Narrowing & Contrasting Threshold**

This option involves landscaped kerb blisters on each side of the road at each location, and an at-grade embossed text pattern as contrasting pavement between the kerb blisters.

#### **10.5.3.1 Merits**

Similar to Option 1 for Smith Street, providing road narrowing will encourage traffic to slow down. Lower speeds will in turn increase travel time and may deter non-local traffic from utilising Stanley Street.

Landscaping on the kerb blisters may also improve the aesthetics of the roadway and enhance sense of place. It may also provide clearer changes in road geometry for vehicles approaching the treatment.

The contrasting pavement will highlight the local traffic area by providing a physical and visual gateway treatment to Wentworth Street. The differentiation of road environment may discourage vehicles from turning into Wentworth Street, particularly from South Street. Combined with road narrowing, the reduce geometry may also be less favourable to heavy vehicles and deter them from turning into Wentworth Street.

Road narrowing will result in a loss of parking along Wentworth Street. However, the removal of parking may improve sightlines for vehicles exiting driveways onto Wentworth Street. It also improves manoeuvrability of these turns as there is a reduced likelihood of obstruction from parked vehicles .

#### **10.5.3.2 Impacts to Parking**

Road narrowing will result in a loss of up to one (1) parking space on each side of the road at the location south of Princes Highway. There is no nominal loss of parking spaces at the location north of South Street as it is within 10 metres from a T-intersection, meaning it has an existing non-signposted No Stopping restriction. Therefore, a total of two (2) spaces will be lost.

While there are no parking surveys available for Wentworth Street, observations during site visit show that there are ample vacant on-street parking spaces along Wentworth Street during the daytime. It is very likely that the parking availability of Wentworth Street is able to cope with the loss of two spaces.

#### **10.5.3.3 Other Impacts**

At the location south of Princes Highway, the kerb blisters will be built between the property access of 846 Princes Highway and Tempe Tyre Centre access. At the location north of South Street, there are no property accesses adjacent to the device location. As such, there will be no impacts on the accesses along Wentworth Street.

Road narrowing in general may slightly increase travel time of emergency service vehicles through the area due to reduced speed. However, considering the existing road environment along these local streets, any additional proposed LATM measures are not expected to have a significant impact on emergency service vehicle access.

### **10.5.4 Option 2: Flat Top Road Hump**

This option involves a 100mm high concrete flat top road hump across the roadway at each location. The road hump will have a contrasting surface treatment, usually a 'terracotta' colour surface.

#### **10.5.4.1 Merits**

By providing flat top road humps as vertical deflections, vehicles will slow down in order to safely travel over the humps. Lower speeds will in turn increase travel time and may deter non-local traffic from utilising Wentworth Street.

#### **10.5.4.2 Impacts to Parking**

As flat top road humps do not require changes in roadway geometry, there will also be no impacts to kerbside parking or driveway accesses. Vehicles can still park over the road hump.

#### **10.5.4.3 Other Impacts**

As Wentworth Street is not a heavy vehicle or bus route, there will be no noise generated as a result of trucks or buses travelling over the road hump. Bicycles will still be able to safely get over the road humps.

### **10.5.5 Additional Measures to Options 1 & 2**

In addition to Option 1 or 2, truck restriction (3t limit) is proposed at the northern end of Wentworth Street. The signage along Princes Highway will provide an early indication and warning of the truck restriction along Wentworth Street, while the signage along Wentworth Street south of the Tempe Tyre Centre access will enforce the truck load limit and reinforce the local road environment. The signage aims to reduce heavy vehicles accessing Wentworth Street from Princes Highway, with the exception of delivery vehicles accessing Tempe Tyre Centre.

## **10.6 Union Street**

### **10.6.1 Issues**

As discussed in previous sections, the issues present on Union Street are:

- Union Street has relatively high average daily traffic (ADT) volumes of almost 500 vehicles per day, compared to other local roads in the study area.
- Due to its proximity to a school, there is high pedestrian activity especially before and after school hours

Additionally, Union Street will be impacted by traffic generated from Bunnings, and will likely heighten any of the existing traffic issues.

Other options such as a closure of Union Street at Princes Highway have been considered, however, such a closure will result in a number of unfavourable routes and outcomes.

### **10.6.2 Option 1: Flat Top Road Hump**

This option involves a 100mm high concrete flat top road hump across the roadway at each location. The road hump will have a contrasting surface treatment, usually a 'terracotta' colour surface.

The flat top road humps will be located outside 2 Union Street and outside 46 Union Street.

#### **10.6.2.1 Merits**

By providing flat top road humps as vertical deflections, vehicles will slow down in order to safely travel over the humps. Lower speeds will in turn increase travel time and may deter non-local traffic from utilising Union Street, in particular utility type vehicles.



### 10.6.2.2 Impacts to Parking

As flat top road humps do not require changes in roadway geometry, there will also be no impacts to kerbside parking or driveway accesses. Vehicles can still park over the road hump.

### 10.6.2.3 Other Impacts

As Union Street is not a heavy vehicle or bus route, there will be no noise generated as a result of trucks or buses travelling over the road hump. Bicycles will still be able to safely travel over the road humps.

## 10.6.3 Option 2: Shared Zone

This option involves implementing a 10 km/h shared zone between Princes Highway and School Lane. Marked parking bays will be provided along the shared zone, with some overlapping with the footpath. The shared zone will require approval from Transport for NSW.

### 10.6.3.1 Shared Zone Warrants

Transport for NSW *Shared Zone Policy* (SS/12/01) provides a set of criteria for implementing shared zones. The proposal area was assessed against the criteria, shown in Table 10.2. Transport for NSW technical direction *Design and implementation of shared zones including provision for parking* (TTD2016/001) was also considered for the design of the shared zone.

### 10.6.3.2 Merits

A 10 km/h shared zone will force vehicles to slow down along Union Street. Additionally, vehicles must always give way to all pedestrians crossing Union Street. This will increase pedestrian safety, particularly to school children from Tempe Public School and Union Street residents. Lower speeds will also increase travel time and may deter non-local traffic from utilising Union Street.

Marked parking bays will be provided along the shared zone, with some overlapping with the footpath. This will formalise parking on the footpath, which is already present on Union Street.

### 10.6.3.3 Impacts to Parking

The marked parking bays will retain parking along Union Street. However, each bay must meet the dimensional requirements of *AS2890.5 On-street parking*, which state that most spaces must be 6.0-6.7 metre long. The parking bays will be slightly longer than the existing unmarked parking spaces, hence reducing the parking capacity of Union Street and a small reduction of parking spaces. Based on the parking surveys, the parking occupancy of Union Street is about 60-80%, which allows some room for the reduction of a few parking spaces without impacting on capacity. The PWD space on the eastern side of Union Street will be retained and marked.

### 10.6.3.4 Other Impacts

As the shared zone has no physical changes to the roadway, there will be no changes to waste collection services and routes. Parking bays will not be marked outside driveway accesses to maintain property accesses at all times.

## 10.6.4 Additional Measures to Options 1 & 2

An at-grade contrasting pavement is proposed at the start of Union Street to deter non-local traffic from travelling along Union Street.

**Table 10.2: Shared Zone Criteria Assessment**

| Features                               | Shared Zone Criteria   | Union Street between Princes Highway and School Lane  | Meets Criteria? |
|--|--|---|-----------------|
| Current traffic flows                  | $\leq 100$ vehicles per hour and $\leq 1000$ vehicles per day                                  | Less than 100 per hour based on intersection count surveys and tube counts<br>Average of 487 vehicles per day based on tube counts  | Yes             |
| Current speed limit                    | $\leq 50$ km/h   | 50 km/h   | Yes             |
| Length of proposed Shared Zone         | $\leq 400$ metres  | Around 215 metres   | Yes             |
| Current speed limit of adjoining roads | $\leq 50$ km/h   | Adjoining roads Smith Street, Zuitton Lane, Brooklyn Lane and School Lane are not signposted and are assumed to have the default 50 km/h speed limit.<br>Princes Highway is 60 km/h, however vehicles would already have to slow down when turning into Union Street. | Yes             |
| Current Carriageway width              | Minimum traffic width of 2.8 metres  | Assuming vehicles are allowed to park on footpaths, a traffic width of at least 2.8 metres is possible  | Yes             |
| Route Access                           | Must not be located along bus routes or heavy vehicle routes except delivery or garbage trucks | No bus routes<br>Not a heavy vehicle route due to the 3 tonne truck load limit  | Yes             |
| Streets with narrow or no footpaths    | Where pedestrians are forced to use the road   | Footpaths are already quite narrow and are further narrowed with parked vehicles on footpath  | Yes             |
| Kerbs                                  | Kerbs must be removed unless excepted by RMS / Transport for NSW                               | A Category 2 shared zone as shown in TTD2016/001 can be implemented, without the removal of kerbs.  | Yes             |
| All criteria met?                      |  |   | Yes             |

## 10.7 Edwin Street

### 10.7.1 Issues

As discussed in previous sections, the issues present on Edwin Street include:

- Relatively high average daily traffic (ADT) volumes of over 400 vehicles per day, compared to other local roads in the study area
- Due to its proximity to a school, there is a high level of pedestrian activity especially during AM and PM school peaks

In addition, there is potential for Bunnings generated traffic to use Edwin Street as an alternative route to access Unwins Bridge Road.

### 10.7.2 Option 1: Flat Top Road Hump

This option involves a 100mm high concrete flat top road hump across the roadway with a contrasting surface treatment, such as a 'terracotta' colour surface and light coloured ramps / wings.

The flat top road hump will be located outside No. 14 Edwin Street, and complement the existing road hump on east of Stanley Street.

#### **10.7.2.1 Merits**

While speed is not a concern along Edwin Street, by providing flat top road hump as vertical deflections, vehicles will slow down in order to safely travel over the humps. This provides two benefits:

- Lower speeds to increase pedestrian safety, particularly during school pick up and drop off locations
- Increased travel time and a less comfortable road environment in conjunction with the existing road hump and narrow carriageway should deter non-local traffic from using Edwin Street.

#### **10.7.2.2 Impacts to Parking**

No changes to kerbside alignments are proposed, the flat top road hump will have no impact on kerbside parking or driveway accesses. Vehicles can still park over the road hump. Landscaped barriers on the kerbside may hinder opening of car doors.

#### **10.7.2.3 Other Impacts**

As Edwin Street is not a heavy vehicle or bus route, there will be little noise generated as a result of trucks or buses travelling over the road hump. Bicycles will still be able to safely travel over the road humps.

### **10.8 Tramway Street**

#### **10.8.1 Issues**

Tramway Street does not currently experience excess traffic speed or volume issues, however has been identified as potential alternative route or rat run for non-local traffic, including Bunnings development traffic.

#### **10.8.2 Option 1: Contrasting Thresholds**

Due to the restricted carriageway and length of road and existing splitter island at Edwin Street, further physical treatment won't be necessary along Tramway Street. However, contrasting thresholds are proposed to be located at each end (Unwins Bridge Road and Edwin Street).

##### **10.8.2.1 Merits**

The contrasting thresholds provide a visual indicator of the change in road environment on entry to Tramway Street, particularly at Unwins Bridge Road. The threshold will act as a visual gateway to the local residential area and aim to deter non-local traffic.

##### **10.8.2.2 Impacts to Parking**

The contrasting threshold will have no impacts to existing kerbside parking.

## **10.9 Barden, Fanning, Hart and Station Streets**

At-grade contrasting threshold pavements are proposed along Barden, Fanning, Hart and Station Streets just south of Princes Highway.

While there are no existing issues with these four roads, LATM measures should still be put in place to further deter non-local traffic from travelling along these local roads, particularly from Princes Highway.

It is understood that a 40 km/h Local Traffic Area, including the study area south of Princes Highway, is intended to be implemented in the future. This reduction in speed limit will be subject to a speed review study, potentially including further proposed traffic calming treatments. These treatments and the 40km/h Local Traffic Area will be subject to review and approval by Transport for NSW.

### **10.9.1.1 Merits**

The contrasting pavement will highlight the local traffic area by providing a physical and visual gateway treatment to these local roads. The differentiation of road environment may be able to deter vehicles turning left from Princes Highway onto the local roads.

### **10.9.1.2 Impacts to Parking**

As the threshold pavements require no physical change to the roadway geometry, there will be no impacts to parking. As the proposed locations are within 10 metres from T-intersections, there are already existing No Stopping restrictions at the locations in accordance with the Australian Road Rules.

### **10.9.1.3 Other Impacts**

As the contrasting pavements do not involve any horizontal or vertical deflection of the roadway, there will be no impacts to property access, cyclists or emergency service vehicles.

## **10.10 Summary of Merits**

The merits of each proposed treatment are summarised in Table 10.3. Deterring non-local traffic was a key objective in all proposed treatments.

**Table 10.3: Merits of Proposed Treatments**

| Road         | Option                     | Type                                    | Rationale   |
|--------------|----------------------------|---|---|
| Smith Street | 1                          | Road Narrowing and Contrasting Pavement | <ul style="list-style-type: none"> <li>Historic non-preference for vertical deflection devices such as speed humps or cushions</li> <li>Kerb blisters slows traffic by providing a narrow travel width</li> <li>Can reduce travel width similar to neighbouring streets</li> <li>Highlights local traffic area by providing a physical and visual gateway treatment to the south section of Smith Street</li> <li>Differentiation of road environment may deter vehicles turning left from proposed Bunnings access Smith Street south</li> <li>Reduced geometry less favourable to heavy vehicles</li> <li>Breaks up long straight section of roadway</li> <li>Landscaped elements may enhance sense of place</li> <li>Removal of parking improves sightlines and manoeuvrability of traffic entering Smith Street</li> <li>No noise impacts to residences</li> <li>Bicycle friendly (with appropriate road markings)</li> </ul> |
|              | 2                          | Mountable Concrete Median Treatment     | <ul style="list-style-type: none"> <li>Historic non-preference for vertical deflection devices such as speed humps or cushions</li> <li>Highlights local traffic area by providing a physical and visual gateway treatment to the south section of Smith Street</li> <li>Differentiation of road environment may deter vehicles turning left from proposed Bunnings access Smith Street south</li> <li>Reduced geometry less favourable to heavy vehicles and slows traffic by diverting vehicles around the island</li> <li>Breaks up long straight section of roadway</li> <li>Removal of parking improves sightlines and manoeuvrability of traffic entering Smith Street</li> <li>No noise impacts to residences</li> <li>Bicycle friendly (with appropriate road markings)</li> <li>Low-profile allows right-turning trucks out of 1 Smith Street to mount over the median</li> </ul>  |
|              | Additional to both options | Right Turn Only Signage                 | <ul style="list-style-type: none"> <li>Right turn only" sign deters traffic exiting Bunnings from turning left onto Smith Street</li> </ul>   |



| Road            | Option                     | Type                                 | Rationale   |
|-----------------|----------------------------|--------------------------------------|---|
| Smith Street    | Additional to both options | Line Marking                         | <ul style="list-style-type: none"> <li>▪ Difference in line marking between the northern and southern sections of Smith Street provide differentiation of road environment between both sections</li> <li>▪ Differentiation of road environment may deter vehicles turning left from proposed Bunnings access Smith Street south</li> <li>▪ Recommended lane delineation alignments tie in with the proposed treatments</li> <li>▪ Provides clear travel lanes for vehicles and cyclists, with sufficient clearance from parked vehicles and opposing traffic</li> </ul>  |
|                 |                            | Bicycle Facilities                   | <ul style="list-style-type: none"> <li>▪ Shared paths allow cyclists to ride between on-road cycling along Smith Street and the Princes Highway shared path without dismounting</li> <li>▪ Bicycle ramps provide off and on-road bicycle transitions between the Smith Street roadway and the shared path</li> <li>▪ On-road bicycle markings spaced evenly along Smith Street reaffirm that Smith Street is a mixed-traffic cycling route</li> </ul>   |
|                 |                            | Widened Footpath                     | <ul style="list-style-type: none"> <li>▪ Provide improved pedestrian facility</li> <li>▪ Reduced roadway provides a road narrowing along Smith Street and assist in slowing down vehicles</li> </ul>  |
|                 |                            | Optional Landscaped Verge (Option b) | <ul style="list-style-type: none"> <li>▪ Provides form of screening from the roadway</li> </ul>   |
| Holbeach Avenue | 1                          | Speed Cushions (x4)                  | <ul style="list-style-type: none"> <li>▪ Slows vehicles down by providing vertical deflection which may be inconvenient to speeding vehicles</li> <li>▪ Lower speeds increase travel time and may deter non-local traffic</li> <li>▪ Allows for bus and service vehicle travel to Tempe recreation area</li> <li>▪ Does not impact kerbside parking</li> <li>▪ Minimises impact to driveway access</li> <li>▪ No noise impacts to residences (industrial area)</li> <li>▪ Located near street lighting for better visibility at night</li> <li>▪ Spacing between intersections consistent with recommendations</li> <li>▪ Bicycle friendly</li> </ul> |

| Road             | Option | Type                                  | Rationale   |
|------------------|--------|---------------------------------------|---|
| Holbeach Avenue  | 2      | Speed Cushions (x2) & Road Narrowing  | <ul style="list-style-type: none"> <li>Slows vehicles down by providing vertical deflection which may be inconvenient to speeding vehicles</li> <li>Lower speeds increase travel time and may deter non-local traffic</li> <li>Provides further traffic calming by narrowing the available roadway</li> <li>Landscaped kerb blisters may enhance the local streetscape</li> <li>Provides physical and visual gateway to area</li> <li>No noise impacts to residences (industrial area)</li> <li>Located near street lighting for better visibility at night</li> <li>Spacing between intersections consistent with recommendations</li> <li>Bicycle friendly</li> </ul> |
| Stanley Street   | 1      | Flat Top Road Hump                    | <ul style="list-style-type: none"> <li>Breaks up long straight section of roadway</li> <li>Slows vehicles down by providing vertical deflection which may be inconvenient to speeding vehicles</li> <li>Lower speeds increase travel time and may deter non-local traffic</li> <li>Consistent with other LATM devices in the area</li> <li>Located near street lighting for better visibility at night</li> <li>Treatment spacing consistent with spacing recommendations</li> <li>Does not impact kerbside parking</li> </ul>  |
|                  | 2      | Road Narrowing                        | <ul style="list-style-type: none"> <li>Slows vehicles down by providing horizontal deflection</li> <li>Lower speeds increase travel time and may deter non-local traffic</li> <li>Kerb blisters break up long straight section of roadway</li> <li>Provides a permanent narrowing of roadway</li> <li>Landscaped features are visually more appealing and will allow the device to blend into the local streetscape</li> <li>Located near street lighting for better visibility at night</li> <li>Treatment spacing consistent with spacing recommendations</li> <li>Consistent with other LATM devices in the area</li> </ul>  |
| Wentworth Street | 1      | Road Narrowing & Contrasting Pavement | <ul style="list-style-type: none"> <li>May deter heavy vehicle traffic and slow vehicles down by reducing roadway widths and increasing roadway friction</li> <li>Lower speeds increase travel time and may deter non-local traffic</li> <li>Highlights local traffic area by providing a visual gateway treatment to the local roads</li> <li>Differentiation of road environment may deter vehicles from turning into Wentworth Street</li> </ul>   |

| Road             | Option                     | Type                           | Rationale  |
|------------------|----------------------------|--------------------------------|--|
| Wentworth Street | 2                          | Flat Top Road Hump             | <ul style="list-style-type: none"> <li>Slows vehicles down by providing vertical deflection which may be inconvenient to speeding vehicles</li> <li>Lower speeds increase travel time and may deter non-local traffic</li> <li>Highlights local traffic area by providing a visual gateway treatment to the local roads</li> <li>Differentiation of road environment may deter vehicles turning into Wentworth Street</li> </ul>   |
|                  | Additional to both options | 3 Tonne Truck Limit Signage    | <ul style="list-style-type: none"> <li>Deter heavy vehicles from turning into Wentworth Street from Princes Highway, other than to access Tempe Tyre Centre</li> </ul>   |
| Union Street     | 1                          | Flat Top Road Hump             | <ul style="list-style-type: none"> <li>Breaks up long straight section of roadway</li> <li>Slows vehicles down by providing vertical deflection which may be inconvenient to speeding vehicles</li> <li>Lower speeds increase travel time and may deter non-local traffic</li> <li>Consistent with other LATM devices in the area</li> <li>Located near street lighting for better visibility at night</li> <li>Treatment spacing consistent with spacing recommendations</li> <li>Does not impact kerbside parking</li> </ul> |
|                  | 2                          | Shared Zone                    | <ul style="list-style-type: none"> <li>Slows vehicles down with a 10 km/h speed limit</li> <li>Lower speeds increase travel time and may deter non-local traffic</li> <li>The nature of shared zone also gives priority to pedestrians and increase pedestrian safety</li> <li>Marked parking bays on footpaths formalises parking on footpath</li> </ul>  |
|                  | Additional to both options | Contrasting Pavement Threshold | <ul style="list-style-type: none"> <li>Highlights local traffic area by providing a visual gateway treatment to the local roads</li> <li>Differentiation of road environment may deter vehicles from turning into Union Street from Princes Highway</li> </ul>   |
| Edwin Street     | 1                          | Flat Top Road Hump             | <ul style="list-style-type: none"> <li>Breaks up long straight section of roadway</li> <li>Slows vehicles down by providing vertical deflection</li> <li>Lower speeds improve pedestrian safety, increases travel time and may deter non-local traffic</li> <li>Consistent with existing road hump on Edwin Street</li> <li>Located near street lighting for better visibility at night</li> <li>Treatment spacing consistent with spacing recommendations</li> <li>Does not impact kerbside parking</li> </ul>                |
| Tramway Street   | 1                          | Contrasting Pavement Threshold | <ul style="list-style-type: none"> <li>Highlights local traffic area by providing a visual gateway treatment to the local roads</li> <li>Differentiation of road environment may deter vehicles from turning into Tramway Street from Unwins Bridge Road</li> </ul>  |

| Road                                      | Option | Type                           | Rationale  |
|---|--------|--------------------------------|--|
| Barden, Fanning, Hart and Station Streets | -      | Contrasting Pavement Threshold | <ul style="list-style-type: none"> <li>Highlights local traffic area by providing a visual gateway treatment to the local roads</li> <li>Differentiation of road environment may deter vehicles from turning into these local streets from Princes Highway</li> <li>Complements existing truck load limit signage</li> </ul> |

## 10.11 Summary of Impacts

The possible impacts on kerbside parking, property accesses and cyclists are summarised in Table 10.4.

**Table 10.4: Impacts of Proposed Treatments**

| Road         | Option                     | Type                                    | Impacts to Parking & Access   | Impacts to Cyclists  |
|--------------|----------------------------|---|---|--|
| Smith Street | 1                          | Road Narrowing and Contrasting Pavement | <ul style="list-style-type: none"> <li>Up to two (2) parking spaces removed on the western side and one (1) space on the eastern side<br/>Combined with the loss of 13 on-street parking as part of Bunnings development, a total of 16 on-street parking will be lost. Two (2) vacant spaces will still be available on Smith Street on an average Thursday.</li> <li>No impacts to 1 Smith Street access.</li> </ul>  | <ul style="list-style-type: none"> <li>Minimal impacts to cyclists on roadway</li> </ul>   |
|              | 2                          | Mountable Concrete Median Treatment     | <ul style="list-style-type: none"> <li>Up to seven (7) parking spaces removed on the western side and one (1) space on the eastern side. Combined with the loss of 13 on-street parking as part of Bunnings development, a total of 21 on-street parking will be lost. On average Thursday, there will be a <b>shortage of three (3) spaces</b> and will result in a flow-on effect of residential parking onto other streets such as Barden Street or South Street.</li> <li>Right-turning vehicles exiting 1 Smith Street access may and will be allowed to mount over the low-profile median.</li> </ul> | <ul style="list-style-type: none"> <li>Cyclists on roadway will have to slow down to divert around the median treatment</li> </ul> |
|              | Additional to both options | Right Turn Only Signage                 | <ul style="list-style-type: none"> <li>Vehicles exiting the Bunnings access must turn right</li> </ul>  | <ul style="list-style-type: none"> <li>No impact to cyclists</li> </ul>  |
|              |                            | Line Marking                            | <ul style="list-style-type: none"> <li>Minimal impacts</li> </ul>   | <ul style="list-style-type: none"> <li>Minimal negative impacts</li> </ul>   |

| Road             | Option | Type                                   | Impacts to Parking & Access  | Impacts to Cyclists   |
|------------------|--------|--|--|---|
|                  |        | Bicycle Facilities                     | <ul style="list-style-type: none"> <li>One (1) parking space loss</li> </ul>   | <ul style="list-style-type: none"> <li>Minimal negative impacts</li> </ul>  |
|                  |        | Widened Footpath                       | <ul style="list-style-type: none"> <li>Footpath must be designed to allow access driveways and the roadway</li> <li>Minimal impacts to parking, as kerbside parking will be retained</li> </ul>  | <ul style="list-style-type: none"> <li>No impact to cyclists</li> </ul>   |
|                  |        | Optional Landscaped Verge (Option b)   | <ul style="list-style-type: none"> <li>Removal of 25 parking spaces on the western side</li> </ul>   | <ul style="list-style-type: none"> <li>No impact to cyclists</li> </ul>   |
| Holbeach Avenue  | 1      | Speed Cushions (x4)                    | <ul style="list-style-type: none"> <li>No impacts to parking, as vehicles are still able to park over speed cushions</li> <li>No impacts to property accesses.</li> </ul>  | <ul style="list-style-type: none"> <li>Minimal impacts to cyclists as they are expected to utilise the shared path adjacent to roadway</li> </ul> |
|                  | 2      | Speed Cushions (x2) and Road Narrowing | <ul style="list-style-type: none"> <li>One (1) parking space removed on each side of the roadway, total two (2)</li> <li>No impacts to property accesses.</li> </ul>   | <ul style="list-style-type: none"> <li>Minimal impacts to cyclists as they are expected to utilise the shared path adjacent to roadway</li> </ul> |
| Stanley Street   | 1      | Flat Top Road Hump                     | <ul style="list-style-type: none"> <li>No impacts to parking, as vehicles are still able to park over flat top road humps</li> <li>No impacts to property accesses.</li> </ul>   | <ul style="list-style-type: none"> <li>Cyclists on roadway will have to slow down to safely get over the hump</li> </ul>                          |
|                  | 2      | Road Narrowing                         | <ul style="list-style-type: none"> <li>For each location: one (1) parking space removed on each side of the roadway, total two (2) per location</li> <li>No impact to property accesses.</li> </ul>  | <ul style="list-style-type: none"> <li>Minimal impacts to cyclists on roadway</li> </ul>  |
| Wentworth Street | 1      | Road Narrowing & Contrasting Pavement  | <ul style="list-style-type: none"> <li>For the location south of Princes Highway: one (1) parking space removed on each side of the roadway, total two (2) spaces</li> <li>No nominal loss of parking spaces for the location north of South Street, as it is located within 10 metres from a T-intersection, meaning it has an existing non-signposted No Stopping restriction</li> <li>Minimal impacts to property accesses, including vehicular access to Tempe Tyre Centre. May impact waste access to Tempe Tyre Centre.</li> </ul> | <ul style="list-style-type: none"> <li>Minimal impacts to cyclists on roadway</li> </ul>  |



| Road                                      | Option                     | Type                           | Impacts to Parking & Access   | Impacts to Cyclists  |
|---|----------------------------|--------------------------------|---|--|
|   | 2                          | Flat Top Road Hump             | <ul style="list-style-type: none"> <li>No impacts to parking, as vehicles are still able to park over flat top road humps</li> <li>No impacts to property accesses.</li> </ul>  | <ul style="list-style-type: none"> <li>Cyclists on roadway will have to slow down to safely get over the hump</li> </ul> |
|   | Additional to both options | 3 Tonne Truck Limit Signage    | <ul style="list-style-type: none"> <li>Any heavy vehicle accidentally turning into Wentworth Street will have to exit via Tempe Tyre Centre</li> </ul>  | <ul style="list-style-type: none"> <li>No impact to cyclists</li> </ul>  |
| Union Street                              | 1                          | Flat Top Road Hump             | <ul style="list-style-type: none"> <li>No impacts to parking, as vehicles are still able to park over flat top road humps</li> <li>No impacts to property accesses.</li> </ul>  | <ul style="list-style-type: none"> <li>Cyclists on roadway will have to slow down to safely get over the hump</li> </ul> |
|   | 2                          | Shared Zone                    | <ul style="list-style-type: none"> <li>The longer marked parking bays will result in a small number of parking spaces</li> <li>Parking bays will stay clear of property driveways to ensure no impact to property accesses</li> </ul> | <ul style="list-style-type: none"> <li>Cyclists will have to give way to pedestrians</li> </ul>                          |
|   | Additional to both options | Contrasting Pavement Threshold | <ul style="list-style-type: none"> <li>No impacts to parking and access.</li> </ul>   | <ul style="list-style-type: none"> <li>No impact to cyclists</li> </ul>  |
| Edwin Street                              | 1                          | Flat Top Road Hump             | <ul style="list-style-type: none"> <li>No impacts to parking and access.</li> </ul>   | <ul style="list-style-type: none"> <li>No impact to cyclists</li> </ul>  |
| Tramway Avenue                            | 1                          | Contrasting Threshold          | <ul style="list-style-type: none"> <li>No impacts to parking and access.</li> </ul>   | <ul style="list-style-type: none"> <li>No impact to cyclists</li> </ul>  |
| Barden, Fanning, Hart and Station Streets | -                          | Contrasting Pavement Threshold | <ul style="list-style-type: none"> <li>No impacts to parking and access.</li> </ul>   | <ul style="list-style-type: none"> <li>No impact to cyclists</li> </ul>  |

# 11. INFRASTRUCTURE ITEMISATION

## 11.1 Methodology

Most of the concept designs of LATM treatments were designed against on-site conditions such as road width and geometry, with reference to Australian Standards and Austroads design guidelines. However, the contrasting pavement thresholds presented are typical designs which may be adapted in each treatment location.

The following general costing methodology was adopted:

- Treatments were itemised and broken down into their composite elements, such as reinforced concrete platforms, line marking, signs, and landscaping
- Previous LATM studies, benchmark infrastructure costs and pedestrian facility planning reports recently undertaken in NSW were consulted to estimate a baseline treatment unit cost
- A unit cost per treatment type was developed based on the itemisation and base line unit costs
- The total estimated cost was developed based on the quantity and unit cost of each treatment.

The assumptions and exclusions made as a part of our cost estimations are outlined in the sections below.

## 11.2 Relevant Guidelines

### 11.2.1 Australian Standards

*AS1742 Manual of Uniform Traffic Control Devices* was the primary reference consulted for this study for specifications on traffic calming devices, and relevant signage and line marking. Both *AS1742 Part 10: Pedestrian Control and Protection* and *AS1742 Part 13: Local Area Traffic Management* were consulted for the specifications, with the former relating to refuge and median islands, and wombat crossings, and the latter relating to thresholds and other humps.

The Roads and Maritime Supplement to Australian Standard 1742 – Manual of Uniform Traffic Control Devices parts 1-15 (Version 2.4) (known simply as RMS supplement to AS1742) was consulted for any Roads and Maritime (RMS) modification or practices that differ from AS1742. The supplement cross references a number of RMS (and its predecessor Roads and Traffic Authority) technical directions, which are listed in Section 11.2.4.

### 11.2.2 Austroads Guide to Traffic Management

*Austroads Guide to Traffic Management Part 8 – Local Area Traffic Management* was also consulted for recommended specifications on treatments not covered in AS1742 or the RMS supplement to AS1742.

The RMS Austroads Guide Supplements – *Austroads Guide to Traffic Management Part 8 – Local Area Traffic Management* (known simply as RMS supplement to Austroads) was consulted for any Roads and Maritime (RMS) modification or practices that differ from Austroads.

### 11.2.3 STA Bus Infrastructure Guidelines

The *State Transit Authority Bus Infrastructure Guidelines* outlines a number of infrastructure design aspects which must be taken into considering when implementing traffic calming treatments along bus routes. These are recommended to ensure a minimisation of impacts to bus operations.

### 11.2.4 Transport for NSW Technical Directions and Guidelines

Transport for NSW (and its predecessors Roads and Maritime Services (RMS) and Roads and Traffic Authority (RTA)) delineation guidelines were also consulted for specification for zebra crossings and edge and centre line markings:

- Roads and Traffic Authority Delineation Section 4 – Longitudinal Markings was consulted for dimensions of edge and centre line markings.
- Roads and Traffic Authority Delineation Section 7 – Transverse Lines Pedestrian Facilities was consulted for dimensions of pedestrian (zebra) crossings.

Transport for NSW technical direction *Design and implementation of shared zones including provision for parking* (TTD2016/001) was consulted for requires signage for shared zones.

## 11.3 Treatments


Each proposed treatment option was broken down into its key components, such as physical components and any required signage. Itemised components of the proposed standard treatments may include (but are not limited to):







- Concrete components (such as platforms, kerb blisters, refuge islands etc)
- Line marking or road surface marking
- Surfacing or surface colour treatment
- Signage
- Landscaping
- Civil works




Table 11.1 details the breakdown of each proposed treatment type.

These traffic calming devices are identified as being appropriate for the context of the zone and can assist in creating a safer local road environment.

**Table 11.1: Proposed Treatments**

| LATM Treatments           | Description   | Components   | Signs and Posts   |
|---------------------------|---|--|---|
| Road narrowing            | Landscaped kerb blisters with low height shrubs                 | <ul style="list-style-type: none"> <li>Kerb blisters</li> <li>Treatment surfacing</li> <li>Civil works</li> <li>Landscaping</li> </ul>         | n/a   |
| Contrasting pavement      | At-grade contrasting pavement treatment (embossed text pattern) | <ul style="list-style-type: none"> <li>Contrasting pavement (at-grade)</li> <li>Treatment surfacing</li> <li>Civil works</li> </ul>            | n/a   |
| Line marking              | Edge, centre line and lane delineation marking                  | <ul style="list-style-type: none"> <li>Edge line marking</li> <li>Centre line marking</li> <li>Lane Delineation (L1 and C1)</li> </ul>         | n/a   |
| Mountable concrete median | Mountable low-profile concrete median with contrasting pavement | <ul style="list-style-type: none"> <li>Low-profile median island</li> <li>Treatment surfacing</li> <li>Signage</li> <li>Civil works</li> </ul> | n/a   |
| Right Turn Only signage   |   | <ul style="list-style-type: none"> <li>Signage</li> <li>Civil works</li> </ul>   | <ul style="list-style-type: none"> <li>1 x R2-14_R</li> </ul>  <ul style="list-style-type: none"> <li>1 x signpost</li> </ul> |

| LATM Treatments    | Description   | Components   | Signs and Posts   |
|--------------------|---|--|---|
| Speed cushions     | 100mm high speed cushions (either in set of 2 or set of 4)  | <ul style="list-style-type: none"> <li>Speed cushions</li> <li>Signage</li> <li>Civil works</li> </ul>   | <ul style="list-style-type: none"> <li>2 x W5-10<br/></li> <li>2 x W8-2 (25 km/h)<br/></li> <li>1 x signpost<sup>1</sup></li> </ul> |
| Flat top road hump | 100mm high flat top road hump with contrasting surface treatment ('terracotta' colour surface of similar) | <ul style="list-style-type: none"> <li>Raised Hump</li> <li>Line marking</li> <li>Treatment surfacing</li> <li>Signage</li> <li>Civil works</li> <li>Roadside barrier (landscaping or bollard and chain type)</li> </ul> | <ul style="list-style-type: none"> <li>2 x W5-10<br/></li> <li>2 x W8-2 (25 km/h)<br/></li> <li>1 x signpost<sup>2</sup></li> </ul> |
| Bicycle facilities | Shared path and Bicycle on-ramp   | <ul style="list-style-type: none"> <li>Footpath demolition</li> <li>Shared path (new)</li> <li>Bicycle ramp</li> <li>Bicycle marking (bicycle symbols and arrows)</li> <li>Signage</li> <li>Civil works</li> </ul>       | <ul style="list-style-type: none"> <li>5 x R8-2<br/></li> <li>2 x R7-4<br/></li> <li>3 x signposts</li> </ul>                    |

| LATM Treatments             | Description  | Components   | Signs and Posts   |
|-----------------------------|--|--|---|
| Widened footpath            | Widened footpath of 2.5m width, with optional landscaped verge | <ul style="list-style-type: none"> <li>Footpath demolition</li> <li>Footpath (new)</li> <li>Treatment surfacing</li> <li>Civil works</li> <li>Landscaping (verge)</li> </ul> | <ul style="list-style-type: none"> <li>n/a</li> </ul>   |
| 3 tonne truck limit signage | 3 tonne truck limit signage                                    | <ul style="list-style-type: none"> <li>Signage</li> </ul>  | <ul style="list-style-type: none"> <li>2 x R6-10-2</li> <li></li> <li>2 x R9-231 (3 tonne)</li> <li></li> <li>1 x W8-245N_L</li> <li></li> <li>1 x signpost<sup>3</sup></li> </ul> |







| LATM Treatments | Description                                  | Components  | Signs and Posts   |
|-----------------|--|---|---|
| Shared zone     | 10 km/h shared zone with marked parking bays | <ul style="list-style-type: none"> <li>Signage</li> <li>Line marking</li> </ul> | <ul style="list-style-type: none"> <li>3 x R4-4<br/> </li> <li>3 x R5-5<br/> </li> <li>3 x R2-10<br/> </li> <li>3 x R5-65<br/> </li> <li>1 signpost<sup>4</sup></li> </ul> |

Image Source: Transport for NSW

1. The speed cushion treatment will only be installed at Holbeach Avenue, using an existing streetlight pole and a new signpost instead of two signposts.

2. It is assumed that each location requires one new signpost:

- The flat top road hump treatment (Option 2) at Wentworth Street north of South Street will utilise an existing streetlight pole and a new signpost
- The flat top road hump treatment (Option 2) at Wentworth Street south of Princes Highway will utilise the signpost used for the 3 tonne truck limit signage, and a new signpost
- The flat top road hump treatment (Option 1) at Stanley Street (at each location) will utilise an existing streetlight pole and a new signpost instead of two signposts.
- The flat top road hump treatment (Option 1) at Union Street (at both locations) will utilise an existing streetlight pole and a new signpost instead of two signposts. It will be assumed one new signpost is needed per location.

3. The 3 tonne truck limit signage treatment will only be installed at Wentworth Street south of Princes Highway, using an existing streetlight pole and a new signpost instead of two signposts.

4. The shared zone treatment will only be installed along Union Street, using an existing streetlight pole, an existing signpost, an existing traffic signal post and a new signpost.

# 12. COST ESTIMATION

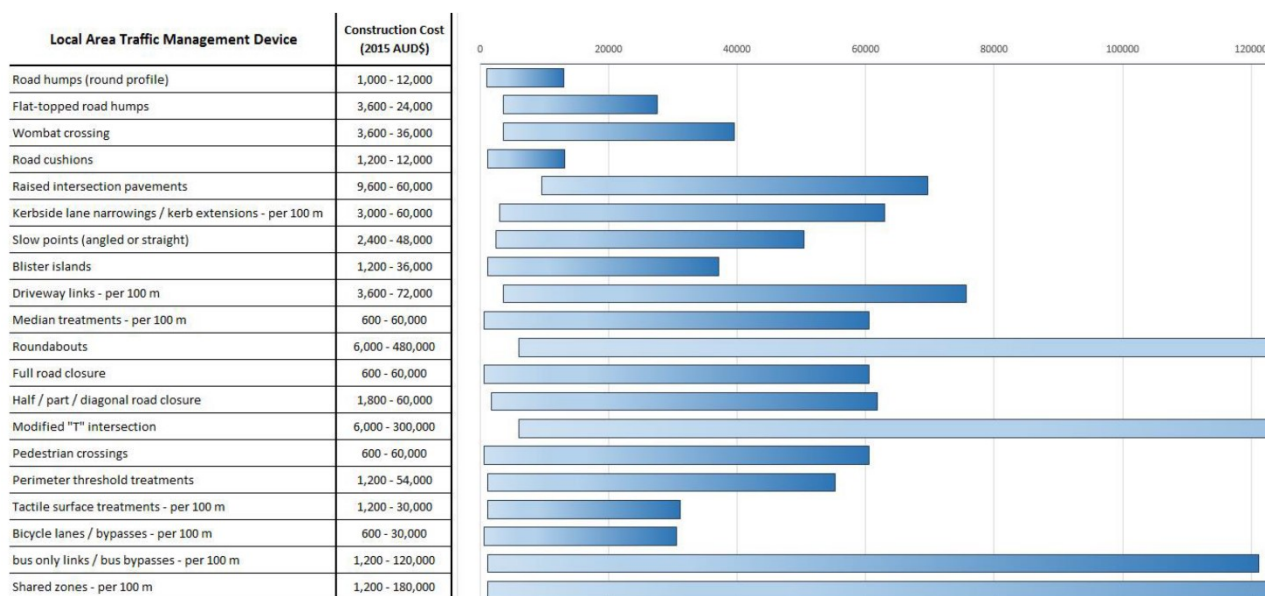
## 12.1 Treatments

### 12.1.1 Cost Factors

The cost of implementing these treatments is highly dependent upon the contextual surroundings at each install site. Factors which can affect the costs include:

- Material selection
- Size of treatment
- Accommodation for drainage
- Street lighting
- Any kerb or gutter works
- Adjustments to any pits
- Any landscaping
- Requirement of street closures or traffic control
- Any other additional features, such as supplementary line marking or pedestrian fencing.

In developing cost estimates for the different types of treatments, *Austrroads Guide to Traffic Management Part 8 (Local Area Traffic Management)* was consulted. The graph in Figure 12.1 shows the relative construction costs of LATM devices.



Source: Damen (2007) cited in *Austrroads Guide to Traffic Management Part 8*

**Figure 12.1: Relative LATM Device Costs**

Council has provided average standard costs for various LATM treatments, signage, installation and marking, which is the main source used for cost estimation. The Independent Pricing and Regulatory Tribunal New South Wales (IPART NSW) report *Local Infrastructure Benchmark Costs* was also consulted for the cost estimates of some treatments.

The costs detailed in this report should be taken as indicative only. The final treatment costs will ultimately be subject to detailed design at each specific site location.

### 12.1.2 Treatment Signage

There is a minimum provision of signs required to be installed to accompany the specific treatments proposed, as previously detailed in Section 11.3. These primarily include warning signage associated with the treatments modifying road geometry, such as 'speed hump' warning signs. The provision of these signs is included within the treatment-specific signage costs.

The standard costs of signs were provided for 3 tonne load limit (two signs), speed hump and speed advisory signs, which is \$83 per sign. The standard cost of a galvanised signpost is \$105, and the cost of installing a signpost in concrete is \$205.

#### 12.1.2.1 Assumptions

The following assumptions were made for estimating treatment-associated signage costs:

- The cost of a single sign was estimated at \$83
- All signposts are assumed to be installed in concrete. As such, the total cost for a signpost and its installation was assumed to be \$310.
- Parking restriction signs (certain treatments like kerb blisters have specific restrictions on nearby on-street parking) have ***not*** been included, as their implementation will be specific to parking conditions at each location.

The minimum sign requirement for each type of treatment is presented in Table 12.1 below.

**Table 12.1: Signage Costs per Treatment**

| LATM Treatment  | No. of Signs (each) | No. of Posts (each) | Cost   |
|---|---------------------|---------------------|--------|
| Road narrowing  | -                   | -                   | -      |
| Contrasting pavement  | -                   | -                   | -      |
| Line marking  | -                   | -                   | -      |
| Mountable concrete median   | -                   | -                   | -      |
| Right Turn Only signage (Smith Street)                                  | 1                   | 1                   | \$393  |
| Speed cushions  | 4                   | 1                   | \$642  |
| Flat top road hump  | 4                   | 1                   | \$642  |
| 3 tonne truck limit Signage (Wentworth Street south of Princes Highway) | 5                   | 1                   | \$725  |
| Bicycle facilities (Smith Street)                                       | 7                   | 3                   | \$1511 |
| Shared zone   | 12                  | 1                   | \$1306 |

It should be noted the values presented in Table 12.1 do not include labour and installation costs, other than the installation of signposts. The costs of the individual signs and posts are shown to be a relatively small component of the total treatment cost.

Depending on Council's sign inventory and the quality of replaced/removed signs, there may be opportunities to recycle use of old signs where appropriate. Due to their nature, these considerations are subject to detailed design and the actual installation process.

#### 12.1.3 Item Unit Costs

The total unit cost of each component of the treatments identified in Table 11.1 have been estimated at the following costs in Table 12.2. It is important to note that these prices are indicative.

**Table 12.2: Item Unit Cost**

| Item   | Unit  | Unit Cost (\$) |
|--|---|----------------|
| <b>Treatment (excludes treatment-specific signage)</b>   |   |                |
| Kerb blister   | Each  | \$5,000        |
| Contrasting pavement (at-grade)  | Each  | \$15,000       |
| Mountable concrete median  | Each  | \$10,000       |
| Speed cushion  | Each  | \$900          |
| Flat top road hump   | Each  | \$35,000       |
| Footpath demolition  | Per square metre                                    | \$55           |
| New footpath or shared path  | Per square metre                                    | \$120          |
| Kerb and gutter  | Per metre   | \$115          |
| Bicycle ramp   | Each  | \$5,000        |
| Barrier (Landscape or Fence type)  | Each  | \$1,000        |
| Verge Landscaping  | Per metre   | \$100          |
| <b>Signage</b>   |   |                |
| Right Turn Only signage at Smith Street  | -   | \$393          |
| Speed cushions signage   | Per set of speed cushions                           | \$642          |
| Flat top road hump signage   | Per flat top road hump                              | \$642          |
| Bicycle signage at Smith Street  | -   | \$1511         |
| 3 tonne truck limit signage at Wentworth Street south of Princes Highway   | -   | \$725          |
| Shared zone signage at Union Street  | -   | \$1306         |
| <b>Marking</b>   |   |                |
| Line marking of 100-150mm width (including edge and centreline)  | Per metre   | \$6            |
| Shared zone parking bay marking<br>- assumed 4x6m longitudinal marking and 2x2.1m transverse marking, equating to 28m of linemarking | Per 6 metre (a pair of parking bays) of shared zone | \$169          |
| Bicycle symbols  | Per symbol  | \$62           |
| Directional symbols (arrow)  | Per symbol  | \$62           |
| Speed Marker   | Per symbol  | \$62           |

These estimates are based on the following assumptions:

- Estimates were prepared for a 'standard' treatment for typical conditions within the study area
  - Dimensions and specifications (other than width) are assumed to be the same for each treatment regardless of site and conditions
- Cost of the treatments exclude costs of treatment-specific signage (speed hump warning signs for flat top road humps etc.)
- Costs of treatment-specific and associated sign posts exclude associated parking restriction signs (see Section 12.1.2).
- Flat top road humps have the same cost as a raised pedestrian crossing, which has a cost of \$35,000 based on Council's average standard costs

- Footpath widening or shared path construction includes a complete demolition of the old footpath and construction of a 100mm tall reinforced concrete footpath
- General and landscaping maintenance costs are not included

## 12.2 Landscaping

The provision of landscaped treatments allows for visually attractive devices with additional functionality. For example, landscaped kerb blisters deter pedestrians from using devices such as flat-top road humps as road crossing devices.

Landscaped treatments can contribute to a more positive community reception of new traffic calming devices. Residents may be inclined to more readily accept a device which contributes to the local streetscape aesthetic with landscaping reflective of the contextual surrounds. Conversely, there may be community backlash over an excessive implementation of devices perceived as intrusive and utilitarian due to the impact to local amenity.

An example of a landscaped versus non-landscaped kerb blister is displayed in Figure 12.2.



**Figure 12.2: Kerb Blisters – Landscaping (left) and Standard (right)**

However, providing landscaping on treatments requires additional costs, both capital costs for the installation process (soil infill, plant species, etc.) and on-going maintenance costs (watering, general upkeep of the plants, potential future replacements).

*Austrorads Guide to Traffic Management Part 8*, citing City of Knox's Annual LATM Program Review (2002), suggests that the construction costs of an LATM can be reduced by 20-25% with the removal of landscaped features.

## 12.3 Maintenance

Maintenance costs are an additional consideration when installing treatments, dependent upon a number of factors including:

- Material choice: concrete treatments tend to have a longer life-span than those made out of asphalt or small unit pavers, therefore requiring less future maintenance costs
- Any supplementary elements to the treatment, including street furniture and accompanying warning signage is vulnerable to ongoing damage and potential vandalism
- Devices which require a horizontal deflection of the vehicle (chicane slow points, wide median splitter islands, etc.) may require further reinforcement works to the pavement to handle the side pressures exerted by the vehicle tyres
- Line marking and road symbols must be maintained and refreshed if their condition deteriorates, as efficiency and effectiveness is strongly linked to their visibility.

The high degree of variability in maintenance costs renders it difficult to estimate with a satisfactory degree of accuracy. Maintenance needs and costs will be monitored by Council following the installation of the treatments.

## **12.4 Estimated Total Treatment Costs**

The estimated treatment cost for the entire study area is itemised in Table 12.3. This cost includes all treatment and sign costs identified in the earlier sections. Lengths measured for line marking and landscaping treatments are approximate only.



**Table 12.3: Estimated Treatment Cost**

| Road         | Option  | Item                                | Unit Cost (\$)         | Quantity            | Total (\$)       | Including 10% Contingency Cost & 10% Design Cost |
|--------------|---|-------------------------------------|------------------------|---------------------|------------------|--|
| Smith Street | Option 1a<br>- Road Narrowing & Contrasting Pavement<br>(including additional measures) | Kerb blisters                       | \$5,000                | 2                   | \$10,000         | \$12,000   |
|              |   | Contrasting pavement                | \$15,000               | 1                   | \$15,000         | \$18,000   |
|              |   | Right Turn Only signage             | \$393                  | 1                   | \$393            | \$472  |
|              |   | Line marking                        | \$6 / m                | approx. 350m        | \$2,100          | \$2,520  |
|              |   | Shared path (western)               | \$120 / m <sup>2</sup> | approx. 30m x 2m    | \$7,200          | \$8,640  |
|              |   | Shared path (eastern)               | \$120 / m <sup>2</sup> | approx. 65m x 2.5m  | \$19,500         | \$23,400   |
|              |   | Bicycle ramp                        | \$5,000                | 2                   | \$10,000         | \$12,000   |
|              |   | Bicycle symbols and arrows          | \$62                   | 14                  | \$868            | \$1,042  |
|              |   | Footpath demolition                 | \$55 / m <sup>2</sup>  | approx. 230m x 1.5m | \$18,975         | \$22,770   |
|              |   | New footpath                        | \$120 / m <sup>2</sup> | approx. 200m x 2m   | \$48,000         | \$57,600   |
|              |   | Kerb and gutter                     | \$115 / m              | approx. 230m        | \$26,450         | \$31,740   |
|              |   | <b>Total</b>                        |                        |                     | <b>\$158,486</b> | <b>\$190,183</b>                                 |
|              | Option 1b<br>- Road Narrowing & Contrasting Pavement<br>(including additional measures) | Similar to Option 1a                | \$153,900              | 1                   | \$158,486        | \$190,183  |
|              |   | Less one kerb blister               | \$5,000                | - 1                 | - \$5,000        | - \$6,000  |
|              |   | Less line marking (on western side) | \$6 / m                | - 100 m             | - \$600          | - \$720  |
|              |   | Verge landscaping                   | \$100 / m              | 180m                | \$18,000         | \$21,600   |
|              |   | <b>Total</b>                        |                        |                     | <b>\$170,886</b> | <b>\$205,063</b>                                 |

| Road            | Option  | Item                                | Unit Cost (\$)         | Quantity            | Total (\$)       | Including 10% Contingency Cost & 10% Design Cost |
|-----------------|---|-------------------------------------|------------------------|---------------------|------------------|--|
| Smith Street    | Option 2a<br>- Mountable Concrete Median Treatment<br>(including additional measures) | Mountable concrete median           | \$10,000               | 1                   | \$10,000         | \$12,000   |
|                 |   | Right turn only signage             | \$393                  | 1                   | \$393            | \$472  |
|                 |   | Line marking                        | \$6 / m                | approx. 500m        | \$3,000          | \$3,600  |
|                 |   | Shared path (western)               | \$120 / m <sup>2</sup> | approx. 30m x 2m    | \$7,200          | \$8,640  |
|                 |   | Shared path (eastern)               | \$120 / m <sup>2</sup> | approx. 65m x 2.5m  | \$19,500         | \$23,400   |
|                 |   | Bicycle ramp                        | \$5,000                | 2                   | \$10,000         | \$12,000   |
|                 |   | Bicycle symbols and arrows          | \$62                   | 14                  | \$868            | \$1,042  |
|                 |   | Footpath demolition                 | \$55 / m <sup>2</sup>  | approx. 230m x 1.5m | \$18,975         | \$22,770   |
|                 |   | New footpath                        | \$120 / m <sup>2</sup> | approx. 200m x 2m   | \$48,000         | \$57,600   |
|                 |   | Kerb and gutter                     | \$115 / m              | approx. 230m        | \$26,450         | \$31,740   |
|                 |   | <b>Total</b>                        |                        |                     | <b>\$144,386</b> | <b>\$173,263</b>                                 |
|                 | Option 2b<br>- Mountable Concrete Median Treatment<br>(including additional measures) | Similar to Option 1a                | \$138,900              | 1                   | \$144,386        | \$173,263  |
|                 |   | Less line marking (on western side) | \$6 / m                | - 140 m             | - \$840          | - \$1,008  |
|                 |   | Verge landscaping                   | \$100 / m              | 150m                | \$15,000         | \$18,000   |
|                 |   | <b>Total</b>                        |                        |                     | <b>\$158,546</b> | <b>\$190,255</b>                                 |
| Holbeach Avenue | Option 1<br>- Speed Cushions  | Speed cushions                      | \$900                  | 4                   | \$3,600          | \$4,320  |
|                 |   | Speed cushion signage               | \$642                  | 1 set               | \$642            | \$770  |
|                 |   | <b>Total</b>                        |                        |                     | <b>\$4,242</b>   | <b>\$4,666</b>                                   |
|                 | Option 2<br>- Speed Cushions & Road Narrowing   | Speed cushions                      | \$900                  | 2                   | \$1,800          | \$4,320  |
|                 |   | Kerb blister                        | \$5,000                | 2                   | \$10,000         | \$12,000   |
|                 |   | Speed cushion signage               | \$642                  | 1                   | \$642            | \$770  |
|                 |   | <b>Total</b>                        |                        |                     | <b>\$14,242</b>  | <b>\$17,090</b>                                  |

| Road             | Option   | Item                        | Unit Cost (\$)              | Quantity                | Total (\$)      | Including 10% Contingency Cost & 10% Design Cost |
|------------------|--|-----------------------------|-----------------------------|-------------------------|-----------------|--|
| Stanley Street   | Option 1 – Flat Top Road Hump  | Flat top road humps         | \$35,000                    | 2                       | \$70,000        | \$84,000   |
|                  |  | Flat top road hump signage  | \$642                       | 2                       | \$1,284         | \$1,541  |
|                  |  | Landscaping barrier         | \$1,000                     | 4                       | \$4,000         | \$4,800  |
|                  |  | <b>Total</b>                |                             |                         | <b>\$71,284</b> | <b>\$85,541</b>                                  |
|                  | Option 2 – Road Narrowing  | Kerb blisters               | \$5,000                     | 4                       | \$20,000        | \$24,000   |
|                  |  | <b>Total</b>                |                             |                         | <b>\$20,000</b> | <b>\$24,000</b>                                  |
| Wentworth Street | Option 1<br>- Road narrowing & Contrasting Pavement<br>(including additional measures) | Kerb blisters               | \$5,000                     | 4                       | \$20,000        | \$24,000   |
|                  |  | Contrasting pavement        | \$15,000                    | 2                       | \$30,000        | \$36,000   |
|                  |  | 3 Tonne Truck Limit signage | \$725                       | 1 set                   | \$725           | \$870  |
|                  |  | <b>Total</b>                |                             |                         | <b>\$50,275</b> | <b>\$60,870</b>                                  |
|                  | Option 2<br>- Flat Top Road Hump<br>(including additional measures)                    | Flat top road humps         | \$35,000                    | 2                       | \$70,000        | \$84,000   |
|                  |  | Flat top road hump signage  | \$642                       | 2                       | \$1,284         | \$1,541  |
|                  |  | 3 Tonne Truck Limit signage | \$725                       | 1 set                   | \$725           | \$870  |
|                  |  | Bollard and Chain barrier   | \$1,000                     | 4                       | \$4,000         | \$4,800  |
|                  |  | <b>Total</b>                |                             |                         | <b>\$76,009</b> | <b>\$91,211</b>                                  |
|                  | Option 1<br>- Flat Top Road Hump<br>(including additional measures)                    | Flat top road humps         | \$37,000                    | 2                       | \$74,000        | \$84,000   |
|                  |  | Flat top road hump signage  | \$642                       | 2                       | \$1,284         | \$1,541  |
|                  |  | Contrasting pavement        | \$15,000                    | 1                       | \$15,000        | \$18,000   |
|                  |  | Bollard and Chain barrier   | \$1,000                     | 4                       | \$4,000         | \$4,800  |
|                  |  | <b>Total</b>                |                             |                         | <b>\$90,284</b> | <b>\$108,341</b>                                 |
| Union Street     | Option 2<br>- Shared Zone<br>(including additional measures)                           | Shared zone signage         | \$1,306                     | 1                       | \$1,306         | \$1,567  |
|                  |  | "10" speed marker           | \$62                        | 2                       | \$124           | \$149  |
|                  |  | Parking bay marking         | \$169 per 6m of shared zone | 215 m (roughly 36 * 6m) | \$1,015         | \$1,218  |

| Road           | Option                         | Item                        | Unit Cost (\$)  | Quantity | Total (\$)      | Including 10% Contingency Cost & 10% Design Cost |
|----------------|--------------------------------|-----------------------------|-----------------|----------|-----------------|--|
|                |                                | Contrasting pavement        | \$15,000        | 1        | \$15,000        | \$18,000   |
|                |                                | <b>Total</b>                |                 |          | <b>\$17,445</b> | <b>\$20,934</b>                                  |
| Barden Street  | Contrasting Pavement Threshold | <b>Contrasting Pavement</b> | <b>\$15,000</b> | <b>1</b> | <b>\$15,000</b> | <b>\$18,000</b>                                  |
| Fanning Street | Contrasting Pavement Threshold | <b>Contrasting Pavement</b> | <b>\$15,000</b> | <b>1</b> | <b>\$15,000</b> | <b>\$18,000</b>                                  |
| Hart Street    | Contrasting Pavement Threshold | <b>Contrasting Pavement</b> | <b>\$15,000</b> | <b>1</b> | <b>\$15,000</b> | <b>\$18,000</b>                                  |
| Station Street | Contrasting Pavement Threshold | <b>Contrasting Pavement</b> | <b>\$15,000</b> | <b>1</b> | <b>\$15,000</b> | <b>\$18,000</b>                                  |
| Edwin Street   | Flat Top Road Hump             | Flat top road hump          | \$37,000        | 1        | \$35,000        | \$42,000   |
|                |                                | Flat top road hump signage  | \$642           | 1        | \$642           | \$770  |
|                |                                | Landscaping barrier         | \$1,000         | 2        | \$2,000         | \$2,400  |
|                |                                | <b>Total</b>                |                 |          | <b>\$37,642</b> | <b>\$45,170</b>                                  |
| Tramway Street | Contrasting Pavement Threshold | <b>Contrasting Pavement</b> | <b>\$15,000</b> | <b>2</b> | <b>\$30,000</b> | <b>\$36,000</b>                                  |

# 13. COMMUNITY ENGAGEMENT

## 13.1 Overview

A draft version of the LATM report (Version 2, dated 25<sup>th</sup> September 2020), which incorporated sections 1 to 12, was released for exhibition on the *Your Say Inner West* website between 3<sup>rd</sup> November 2020 and 12<sup>th</sup> January 2021. On the website, participants could participate in a survey voting for the most preferred option for each road, and could provide additional comments and feedback. A total of 92 participants participated in the survey.

In addition to the survey, a number of comments have also been received via email from residents and businesses in the area.

A summary of the survey responses and comments are described in the Engagement Outcomes Report in **Appendix E**.

## 13.2 Survey Preferred Option

During the survey, participants could provide an indication on their most preferred treatment options proposed for each road. They could also vote for “neither option” or “no opinion” for each question. For Edwin Street and Tramway Street where there was only one option, participants had the option to choose how satisfied or dissatisfied they were with the proposed option. The preferred options are summarised in Table 13.1.

**Table 13.1: Survey Preferred Option**

| Road                                      | Survey Result   |
|---|---|
| Smith Street                              | Preference for Option 1a (road narrowing and contrasting pavement, with widened footpath)                                   |
| Holbeach Avenue                           | Preference for Option 2 (speed cushions & road narrowing)   |
| Stanley Street                            | Preference for Option 1 (flat top road hump)  |
| Wentworth Street                          | Preference for Option 2 (flat top road hump)  |
| Union Street                              | Non-support for either option (flat top road hump or shared zone). Shared zone is the most preferred option out of the two. |
| Edwin Street                              | Non-support for flat top road hump  |
| Tramway Street                            | Non-support for contrasting pavement threshold  |
| Barden, Fanning, Hart and Station Streets | Support for contrasting pavement threshold  |

## 13.3 Participant Comments

In addition to the survey, participants could provide any feedback or additional comments. Additional comments were also received via email by residents or affected businesses in the study area.

Comments received from the 92 survey participants and via email have been summarised into general themes in Table 13.2.

**Table 13.2: Comments Themes and Responses**

| Category / Theme                                  | Description  | Response  |
|---|--|---|
| Existing parking issues                           | Residents have highlighted difficulty in parking outside their property due to parking by nearby workers, airport users and other visitors. They prefer a residential parking scheme to be implemented to improve parking in the local area. | As part of the study, a parking survey on a number of streets was undertaken. The parking levels found were generally within 50-70% occupancy during weekdays and weekends, which do not meet the level required for a resident parking scheme as outlined in Council's Public Domain Parking Policy. |
| Efficiency of LATM proposals                      | Residents do not agree that the proposals will be able to address the increase in non-local traffic and do not reduce non-local traffic volumes.   | The proposals aim to deter non-local traffic by reducing vehicle speeds and increasing travel time as to make routes using local roads less desirable for non-local traffic. LATM proposal was selected based on traffic volumes, speed and/or crash history.   |
| Existing rat-running and non-local traffic issues | Residents have highlighted existing rat-running routes and use by non-local traffic. They have suggested schemes such as one-way system or road closures.  | The LATM study focuses on the additional non-local traffic caused by Bunnings and may not universally address existing rat running issues.  |
| Alternative Union Street proposal                 | Union Street residents have suggested closing Union Street to Smith Street through traffic, i.e. left turn entry only from Princes Highway   | This option may be required given the direct route along Union Street and presence of schools. This option is to be further explored.   |
| Children safety                                   | Local streets often have children and residents have highlighted that additional Bunnings related traffic will make the streets unsafe   | The LATM study aims to minimise additional traffic by reducing through traffic and vehicle speeds using the selected proposals.   |
| Alternative Bunnings entrance and exit            | Bunnings traffic should not exit via Smith Street and an alternative access be provided on Princes Highway.  | An alternative access on Princes Highway will be the subject of further investigations, however it is noted that Transport for NSW has not supported an alternative signalised exit on Princes Highway.   |
| Alternative transport                             | Residents preferred solutions that encourage alternative transport such as cycleways to ensure walking and cycling are more attractive   | Active transport has been considered in Smith Street, which provides connectivity to existing routes. Traffic calming results in lower vehicle speeds, and improving safety for vulnerable road users such as pedestrians and cyclists.   |

## 13.4 Changes Following Community Engagement

### 13.4.1 New Traffic Surveys

The community has expressed concerns over the collection and use of traffic data (March 2020) in the analysis and LATM assessment as outlined in Section 4. The primary concern was that the surveys were undertaken in the midst of the COVID-19 pandemic lockdown period and would



provide an under representation of existing traffic. To address this, additional 24-hour tube counts have been undertaken in February 2021, including:

- Tube Count 1: Wednesday, 10 February 2021 to Wednesday, 17 February 2021
- Tube Count 2: Monday, 15 February 2021 to Sunday, 21 February 2021
- Tube Count 3: Monday, 22 February 2021 to Sunday, 28 February 2021

The average daily traffic (ADT) volumes, the 85<sup>th</sup> percentile speeds, and daily heavy vehicle percentages are shown in Table 13.3. The peak hour volumes are shown in Table 13.4.

**Table 13.3: Union Street Tube Count Data Summary (February 2021)**

| Tube Count                 | Location                               | Direction | ADT Volumes | ADT Weekday | ADT Weekend | 85 <sup>th</sup> %ile Speed (km/h) | Heavy Vehicle (%) |
|----------------------------|--|-----------|-------------|-------------|-------------|------------------------------------|-------------------|
| Tube Count 1               | Between Princes Highway & Edwin Street | WB        | 517*        | 567*        | 416         | 34.9                               | 3.5%              |
| Tube Count 2               |  |           | 547         | 578         | 469         | 34.6                               | 3.2%              |
| Tube Count 3               |  |           | 545         | 583         | 432         | 34.4                               | 3.1%              |
| Average                    |  |           | 536         | 576         | 439         | 34.6                               | 3.3%              |
| March 2020 tube counts     |  |           | 487         | -           | -           | 26.9                               | 3.4%              |
| Difference with March 2020 |  |           | +49 (10%)   | -           | -           | +7.7                               | -0.1%             |

\*The volumes for Tube Count 1 are lower due to missing volume data on Thursdays afternoon and evening.

**Table 13.4: Union Street Peak Hour Data Summary (February 2021)**

| Tube Count                            | Location                               | Direction | AM Peak | PM Peak  | Weekend Peak |
|---------------------------------------|--|-----------|---------|----------|--------------|
| Tube Count 1                          | Between Princes Highway & Edwin Street | WB        | 82      | 52       | 36           |
| Tube Count 2                          |  |           | 81      | 53       | 42           |
| Tube Count 3                          |  |           | 82      | 56       | 37           |
| Average                               |  |           | 81      | 54       | 38           |
| March 2020 intersection count surveys |  |           | n/a     | 49       | 38           |
| Difference with March 2020            |  |           | n/a     | +5 (10%) | 0            |

A comparison of the new tube count data finds:

- An increase in daily traffic volumes (approximately 10%)
- Heavy vehicle composition remains approximately similar
- An increase in 85<sup>th</sup> percentile speeds (approximately 7%, likely due to the location of the survey further away from the intersection with Princes Highway)
- Max hourly traffic flows occur during the AM peak hour, approx. 82 veh.hr

While the 85<sup>th</sup> percentile speeds are within the posted 50km/h speed limit, it may be considered too high for the narrow roadway with a high pedestrian presence, particularly school aged children.

Engagement comments also indicated frequent side-swiping occurrences between moving and parked vehicles.

While 'typical' traffic volumes and speeds are found to be higher, the assessment criteria and points system presented in Section 8 has not been modified.

Updated traffic volumes have been further considered in the calculation of expected future volumes along Union Street in Table 13.8 and reassessing shared zone criteria in Table 13.9.

### 13.4.2 Changes to Traffic Generation

Members of the USTAG have expressed concern that traffic generation rates within *RTA Guide to Traffic Generating Developments 2002 (GTGD)* or *Trip Generation and Parking Generation Surveys - Bulky Goods / Hardware Stores Analysis Report (2009)* was not used to determine future Bunnings traffic and provided an under-representation of traffic resulting from the proposed Bunnings site. We agree that documents by RTA (and successors) should be used to calculate generated trips from Bunnings. The guide provided average traffic generation rates for bulky goods retail stores for the PM peak and weekend. However, Bunnings does not exactly match the definition of bulky goods retail, which is more associated with furniture or whitegoods stores.

Instead, a traffic generation analysis report titled *Trip Generation and Parking Generation Surveys - Bulky Goods / Hardware Stores Analysis Report (2009)*, jointly produced by RTA and Hyder Consulting, was used for analysis. The report is available online at *OpenGov NSW*. The report defined Bunnings and Mitre 10 as hardware stores, undertook traffic surveys at a few hardware stores across NSW and analysed the traffic generation rates for each store. A review of RTA / Hyder rates in comparison to rates previously adopted (developed by GTA Consultants and TTPA, Section 6.2.2) showed that the RTA/ Hyder rates provide more a higher hourly rate and more conservative figure.

The report has identified that Mitre 10 is more 'tradesman' orientated and will have slightly higher traffic generation rates than Bunnings in the weekdays and lower in the weekends. It also identified that Sydney metropolitan stores have a lower traffic generation rate than similar stores in the regional areas outside Sydney.

Table 13.5 shows the traffic generation rates calculated by RTA / Hyder for Bunnings stores in Sydney for various peak hours and per day.

**Table 13.5: Traffic Generation Rates Specific to Bunnings in Sydney**

| <b>Traffic Generation Rates<br/>(veh/100m<sup>2</sup> GFA)</b>                        | <b>Bunnings North<br/>Parramatta (HW1)</b> | <b>Bunnings<br/>Bankstown<br/>Airport (HW2)</b> | <b>Bunnings<br/>Minchinbury<br/>(HW4)</b> | <b>Average</b> |
|---|--|---|---|----------------|
| <b>Weekday</b>  |  |   |   |                |
| Peak specific to store (per hour)<br>(generally in late mornings or early afternoons) | 4.11                                       | 3.15  | 4.12                                      | 3.79           |
| AM Peak (per hour)  | 1.43                                       | 0.60  | 2.04                                      | 1.36           |
| PM Peak (per hour)  | 2.30                                       | 2.05  | 2.84                                      | 2.40           |
| <b>Daily</b>  | <b>36.36</b>                               | <b>26.80</b>                                    | <b>39.75</b>                              | <b>34.30</b>   |
| <b>Weekend</b>  |  |   |   |                |
| Peak (per hour)   | 6.69                                       | 5.98  | 6.33                                      | 6.33           |
| <b>Daily</b>  | <b>49.05</b>                               | <b>39.74</b>                                    | <b>46.16</b>                              | <b>44.98</b>   |

Source: *Trip Generation and Parking Generation Surveys – Bulky Goods / Hardware Stores Analysis Report (RTA, Hyder 2009)*

From the RTA / Hyder report, the PM peak and weekend generation rates were higher than the rates used by GTA Consultant. Therefore, using the RTA / Hyder rates in place of GTA rates, the volumes generated by Bunnings were recalculated and presented in Table 13.6.

**Table 13.6: Recalculated Traffic Generation Volumes**

| Peak               | Total Trips | Directional Split |     | Volumes (veh / hour) |      |
|--------------------|-------------|-------------------|-----|----------------------|------|
|                    |             | In                | Out | In                   | Out  |
| Weekday            |             |                   |     |                      |      |
| AM Peak (vph)      | 194         | 50%               | 50% | 97                   | 97   |
| PM Peak (vph)      | 347         |                   |     | 173                  | 173  |
| Daily (vpd)        | 4893        |                   |     | 2447                 | 2447 |
| Weekend            |             |                   |     |                      |      |
| Weekend Peak (vph) | 903         | 50%               | 50% | 452                  | 452  |
| Daily (vpd)        | 6417        |                   |     | 3209                 | 3209 |

The recalculated PM and weekend volumes are 60 and 117 higher than the previous calculation. Following the same traffic distribution methodology in Section 6.2.2.2, recalculated volumes of up to 30% of Bunnings traffic using local streets north of Princes Highway are provided in Table 13.7.

**Table 13.7: Recalculated Traffic Distribution (Using Local Streets)**

| Peak               | Total Trips | Vehicle Volumes |     |     |     |
|--------------------|-------------|-----------------|-----|-----|-----|
|                    |             | 10%             | 20% | 25% | 30% |
| Weekday            |             |                 |     |     |     |
| AM Peak (vph)      | 97          | 10              | 19  | 24  | 29  |
| PM Peak (vph)      | 173         | 17              | 35  | 43  | 52  |
| Daily (vpd)        | 2447        | 245             | 489 | 612 | 734 |
| Weekend            |             |                 |     |     |     |
| Weekend Peak (vph) | 452         | 45              | 90  | 113 | 136 |
| Daily (vpd)        | 3209        | 321             | 642 | 802 | 963 |

Adding on to the February 2021 tube counts, the potential traffic volumes on Union Street are shown in Table 13.8.

**Table 13.8: Potential Traffic Volumes on Union Street (based on February 2021 Volumes)**

| Peak               | February 2021 Volumes | Total Traffic on Union Street |      |      |      | Acceptable Environmental Limit |
|--------------------|-----------------------|-------------------------------|------|------|------|--------------------------------|
|                    |                       | 10%*                          | 20%* | 25%* | 30%* | Local Road                     |
| Weekday            |                       |                               |      |      |      |                                |
| AM Peak (vph)      | 81                    | 91                            | 100  | 105  | 110  | < 200 vph                      |
| PM Peak (vph)      | 54                    | 71                            | 89   | 97   | 106  |                                |
| Daily (vpd)        | 576                   | 821                           | 1065 | 1188 | 1310 | < 1,500 vpd                    |
| Weekend            |                       |                               |      |      |      |                                |
| Weekend Peak (vph) | 38                    | 83                            | 128  | 151  | 174  | < 200 vph                      |
| Daily (vpd)        | 439                   | 760                           | 1081 | 1241 | 1402 | < 1,500 vpd                    |

\* by proportion split of Bunnings Warehouse traffic

With a worse case assessment of up to 30% of the expected traffic generated by Bunnings Warehouse, the increase in traffic can be accommodated by Union Street and does not exceed the acceptable environmental limit (200 vehicles per hour).

### 13.4.3 Updated Assessment of Shared Zone Criteria

In the draft version of the report, Union Street was assessed against the shared zone criteria in Table 10.2. However, the future traffic flows along Union Street including Bunnings traffic were not considered or used to assess the shared zone criteria. The reassessment using February 2021 traffic volumes and the recalculated Bunnings traffic volumes (worst case) are shown in Table 13.9.

**Table 13.9: Updated Shared Zone Volume Criteria Assessment**

| Scenario   | Shared Zone Volume Criteria  | Union Street between Princes Highway and School Lane   | Meets Criteria? |
|--|--|--|-----------------|
| <b>Existing volumes</b>  |  |  |                 |
| February 2021  | <ul style="list-style-type: none"> <li>≤ 100 vehicles per hour</li> <li>≤ 1000 vehicles per day</li> </ul> | <ul style="list-style-type: none"> <li>82 vehicles per hour (AM)</li> <li>576 vehicles per day (weekday)</li> </ul>  | Yes             |
| <b>Future traffic volumes including Bunnings traffic</b>   |  |  |                 |
| No ban on through movement from Smith Street to Union Street – i.e. volumes calculated in Table 13.8 | <ul style="list-style-type: none"> <li>≤ 100 vehicles per hour</li> <li>≤ 1000 vehicles per day</li> </ul> | <ul style="list-style-type: none"> <li>174 vehicles per hour (weekend)</li> <li>1402 vehicles per day (weekend)</li> </ul>   | No              |
| A ban on through movement from Smith Street to Union Street  |  | If Bunnings traffic is not allowed to travel into Union Street from Smith Street, the future traffic volumes on Union Street is roughly expected to equal to current flows | Yes             |

Therefore, to enable the implementation of the shared zone, further treatments such as the banning of through movement must be in place to maintain traffic volumes at existing or lower levels.

### 13.4.4 Ban of Through Movement from Smith Street into Union Street

A ban of through movement from Smith Street into Union Street was previously assessed in Section 7.4 and was initially not recommended in the draft version of this report. However, this treatment was requested by residents along Union Street and through the USTAG.

Based on the future volume analysis in Section 13.4.3, in order to satisfy the shared zone criteria on Union Street, traffic volumes will need to be maintained at existing levels. A ban of the through movement from Smith Street will allow traffic volumes to remaining at existing levels and will allow the implementation of a shared zone. Additionally, the benefits of a ban outweigh the impacts identified in Section 7.4. Therefore, a ban of the through movement from Smith Street is now proposed as part of this LATM study.

Due to the existing geometry of the Princes Highway / Union Street / Smith Street intersection, a physical barrier or closure to stop through traffic from Smith Street is not feasible. Instead, a 'soft closure' using signage and line marking can be used, and arrow markings on Smith Street will be amended to left and right arrows only. These treatments will indicate to drivers the through movement to Union Street is not permitted.

The proposed signage includes:

- “No Entry” (R2-4n) signs, supplemented with “From Smith Street” tag plates.
  - It is noted that the No Entry signs may cause confusion to drivers, especially those intending to turn left from Princes Highway to Union Street.
  - However, the signs will also help to deter non-local traffic turning left from Princes Highway to Union Street, even though this turn is still permitted. This is because drivers may see the No Entry sign but not the tag plate, and assume that they are not allowed to turn into Union Street. This will then deter the non-local drivers from turning into Union Street.
  - Local residents would have been familiar with the new intersection arrangement, and would not be affected or confused by the No Entry signs.
- Custom “Left and Right Only” sign, supplemented with “Into Princes Highway” tag plates. An example of the use of this sign includes Johnston Street at Collins Street, Annandale (shown in Figure 13.1), also within Inner West LGA.



Source: Google StreetView

**Figure 13.1: Left / Right Turn only Signage - Annandale**

As previously identified in Section 7.4, an alternative route to enter Union Street from Smith Street would be a right turn from Smith Street to Princes Highway, then left from Princes Highway to Brooklyn Street, then left at Brooklyn Lane or School Lane to access Union Street. Despite the narrow widths of Brooklyn Lane or School Lane, Bunnings traffic could still potentially use this route to enter Union Street towards Unwins Bridge Road. Therefore, a partial closure (one-way exit to Princes Highway only) may be required at Brooklyn Street. Such a proposal will also have to undergo community consultation.



Residents south of Princes Highway, which are within the school catchment for Tempe Public and High Schools, may be impacted by the 'soft' closure. A 'soft' closure would require residents to take longer trips via Holbeach Avenue and may not be favoured by these residents. Since the 'soft' closure was not proposed as part of the community engagement, the proposal may have to undergo further community consultation for comments and opinions by residents. If the proposal is not supported by the residents, the shared zone proposal for Union Street may not go ahead due to traffic volumes.

#### **13.4.5 Feasibility Study of Traffic Signals at Princes Highway / Bunnings Access**

Following a Council resolution in December 2020, a further feasibility study of traffic signals at the Princes Highway / Bunnings access will be undertaken in addition to this LATM study. If traffic signals are approved by Transport for NSW, it will allow Bunnings traffic to exit directly onto Princes Highway instead of using the Smith Street exit, which could then be converted to entry only. The proposed treatments along Smith Street, Union Street, Edwin Street and Tramway Street may not be required to be implemented as a result.

#### **13.4.6 Changes to Concept Design**

Based on the preferred options, community feedback and the above assessments, the following changes to concept designs were made:

- **Wentworth Street**
  - The 3 tonne truck load limit signage (R6-10-2 and R9-231) at Wentworth Street near Princes Highway was moved further south to allow waste vehicles to access the waste access at Tempe Tyres
  - The 3 tonne truck load limit signage with left arrow (R6-10-2, R9-231 and W8-245\_L) at Princes Highway before Wentworth Avenue was replaced with a single sign with a similar message (G9-321\_N\_L)
- **Smith Street**
  - The kerb blister on the western side of Smith Street was moved southwards to allow for a proposed dual driveway at 28 Smith Street. The kerb blister on the eastern side will remain at the proposed location.
  - The footpath widening on Smith Street was applied only between Princes Highway and the Bunnings access
- **Tramway Street:** A new flat top road hump was proposed on Tramway Street, located north of the accesses to 402 and 404 Unwins Bridge Road. This was based on the feedback that there are existing rat-running issues where vehicles travel via Tramway and Edwin Streets to Gannon Street, bypassing the traffic signals at Richardson Crescent. The hump will assist to mitigate existing rat-running issues as well as deterring Bunnings traffic from rat-running in both directions.
- **Union Street:** The through movement from Smith Street to Union Street was banned using signage and arrow markings ('soft' closure) – subject to further investigation and community consultation

#### **13.4.7 Changes to Cost Estimation**

Only roads requiring significant changes to the extent of civil works had the associated cost estimate recalculated. This excludes minor works such as change of signage and line marking. The cost estimation for Smith Street and Tramway Street was recalculated and shown in Table 13.10. Only the option that is most preferred by the community was recalculated.



**Table 13.10: Recalculated Treatment Cost**

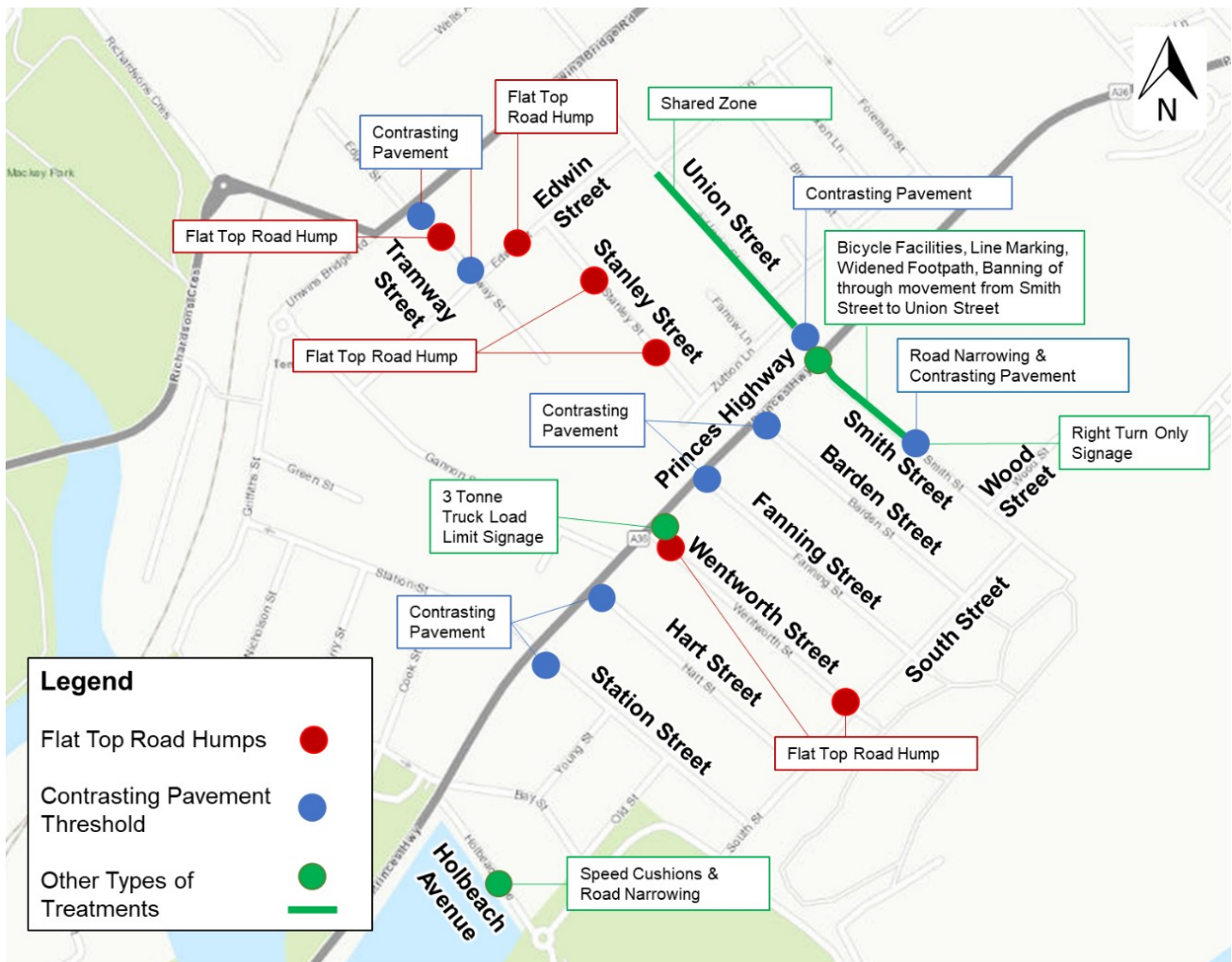
| Option   | Item                       | Unit Cost (\$)         | Quantity            | Total (\$)       | Including 10% Contingency Cost & 10% Design Cost |
|--|----------------------------|------------------------|---------------------|------------------|--|
| Smith Street<br>Option 1a<br>- Road<br>Narrowing &<br>Contrasting<br>Pavement          | Kerb blisters              | \$5,000                | 2                   | \$10,000         | \$12,000   |
|  | Contrasting pavement       | \$15,000               | 1                   | \$15,000         | \$18,000   |
|  | Right Turn Only signage    | \$393                  | 1                   | \$393            | \$472  |
|  | Line marking               | \$6 / m                | approx. 350m        | \$2,100          | \$2,520  |
|  | Shared path (western)      | \$120 / m <sup>2</sup> | approx. 30m x 2m    | \$7,200          | \$8,640  |
|  | Shared path (eastern)      | \$120 / m <sup>2</sup> | approx. 65m x 2.5m  | \$19,500         | \$23,400   |
|  | Bicycle ramp               | \$5,000                | 2                   | \$10,000         | \$12,000   |
|  | Bicycle symbols and arrows | \$62                   | 14                  | \$868            | \$1,042  |
|  | Footpath demolition        | \$55 / m <sup>2</sup>  | approx. 125m x 1.5m | \$10,313         | \$12,375   |
|  | New footpath               | \$120 / m <sup>2</sup> | approx. 95m x 2.5m  | \$22,800         | \$27,360   |
|  | Kerb and gutter            | \$115 / m              | approx. 125m        | \$14,375         | \$17,250   |
|  | <b>Total</b>               |                        |                     | <b>\$112,549</b> | <b>\$135,058</b>                                 |
| Tramway<br>Street –<br>Contrasting<br>Pavement<br>Threshold &<br>Flat Top Road<br>Hump | Contrasting pavement       | \$15,000               | 2                   | \$30,000         | \$36,000   |
|  | Flat top road hump         | \$35,000               | 1                   | \$35,000         | \$42,000   |
|  | Flat top road hump signage | \$642                  | 1                   | \$642            | \$770  |
|  | Landscaping barrier        | \$1,000                | 1                   | \$2,000          | \$2,400  |
|  | <b>Total</b>               |                        |                     | <b>\$67,642</b>  | <b>\$81,170</b>                                  |

## 13.5 Adopted Treatments

Table 13.9 shows the adopted treatments to be used in the LATM scheme, and its cost estimate. A map of the treatments is shown in Figure 9.2.

**Table 13.11: Adopted Treatments**

| Road                                      | Adopted Treatment  | Rationale                               | Estimated Cost    |
|---|--|---|-------------------|
| Smith Street                              | Road narrowing and contrasting pavement, with widened footpath           | Preferred by community based on survey  | \$135,058         |
| Holbeach Avenue                           | Speed cushions & road narrowing  | Preferred by community based on survey  | \$17,090          |
| Stanley Street                            | Flat top road hump   | Preferred by community based on survey  | \$85,841          |
| Wentworth Street                          | Flat top road hump   | Preferred by community based on survey  | \$91,211          |
| Union Street                              | Shared zone, with contrasting pavement threshold and 'soft' road closure | Preferred option out of the two options | \$20,934          |
| Edwin Street                              | Flat top road hump   | Deters rat-running via Edwin Street     | \$45,170          |
| Tramway Street                            | Contrasting pavement threshold and flat top road hump                    | Deters rat-running via Tramway Street   | \$81,170          |
| Barden, Fanning, Hart and Station Streets | Contrasting pavement threshold   | Supported by community based on survey  | \$18,000 per road |



**Figure 13.2: Adopted Treatments**

# 14. CONCLUSION

In order to manage the traffic impacts related to the proposed Bunnings Development at No. 728-750 Princes Highway, an LATM study was conducted on behalf of Inner West Council. The study area included a number of local streets within Tempe South adjoining the Princes Highway.

The study reviewed existing conditions on site and expected future traffic conditions within the local area and provides recommendation on appropriate LATM treatment options to be implemented along certain streets.

A summary of key processes undertaken and findings in this study is as follows:

- Background information and documents relating to the proposed Bunnings development were reviewed, providing information on future proposed traffic and road changes in the area
- Existing site conditions, surrounding land uses and road network information was reviewed
- A site inspection and audit was conducted, including identification of existing LATM devices, traffic signs, parking signs and restrictions, pedestrian and bicycle facilities, and refuse collection issues
- Traffic and parking surveys were conducted to capture the levels of traffic and parking demand within the study area. This included tube counts, parking occupancy surveys and intersection counts
- The survey of on-street parking on Smith Street showed that on average, there are 18 vacant spaces on Thursday and 27 vacant spaces on Saturday. After the removal of spaces due to the Bunnings development and the proposed LATM treatments Smith street parking is expected to be at capacity.
- The traffic survey data was analysed and identified streets requiring further LATM devices in order to:
  - Provide traffic calming and reduce vehicle speeds
  - Reduce general traffic volumes by deterring traffic
  - Reduce Heavy Vehicle volumes
  - Reduce crash risk
- A scoring system was developed to determine priority streets requiring LATM treatments
- A detailed selection criteria and list of suitable LATM measures were developed based on existing devices in the area and typical LATM devices presented in *Austrroads Guide to Traffic Management Part 8 - Local Area Traffic Management*
- Up to two LATM Treatment options were presented for each priority street. These treatment options included:
- Holbeach Avenue – Outside No. 14 and No 16 Holbeach Avenue
  - Option 1: *Speed Cushions*, set of four across roadway
  - Option 2: *Speed Cushions*, set of two with *Kerb Blisters*
- Smith Street – Outside No. 28 Smith Street and south of proposed Bunnings Access
  - Option 1: Road Narrowing using Kerb blisters and contrasting pavement marking
  - Option 2: Mountable Concrete Median and associated line marking
  - Both options are to be supplemented by *Right Turn Only signage*, *edge line marking*, *bicycle ramp*, and *shared path* between Princes Highway and the LATM treatment, and *widened footpath* between Princes Highway and South Street. An optional *landscaped verge* may also be provided between the widened footpath and roadway, which will result in the removal of kerbside parking.
- Stanley Street – Outside No. 14 and No. 35 Stanley Street
  - Option 1: Flat Top Road Hump
  - Option 2: Road narrowing using *Kerb Blisters*

- Wentworth Street – South of Princes Highway and North of South Street
  - Option 1: Road narrowing using Kerb Blisters and contrasting pavement marking
  - Option 2: Flat Top Road Hump
  - Both options will include *3 Tonne Truck Limit signage* at Princes Highway and Wentworth Street to deter heavy vehicles from entering Wentworth Street
- Union Street
  - Option 1: Flat Top Road Hump outside 2D and 46 Union Street
  - Option 2: *Shared Zone* between Princes Highway and School Lane
  - Both options will include a contrasting pavement threshold
- Edwin Street
  - Option 1: Flat Top Road Hump outside No. 14 Edwin Street
- Tramway Street
  - Option 1: Contrasting Pavement Threshold at Unwins Bridge Road and Edwin Street
- Additionally, contrasting pavements were proposed for the entries of Barden, Fanning, Hart and Station Streets from Princes Highway.
- Each treatment was assessed for its merits and impacts to parking, property accesses, cyclists and emergency service vehicles.
- Concept designs of each treatment were developed
- The treatments proposed were itemised into their constituent parts, including signage and line marking
- The type and number of signs associated with each type of treatment were identified, along with the number of signposts required
- A baseline treatment unit cost was established, based on:
  - Council provided rates
  - Previous experience
  - IPART Benchmark infrastructure costs
  - Austroads Guide to Traffic Management Part 8
  - A review of previous LATM studies and pedestrian facility planning reports for other studies in NSW
- A standard cost of signs (such as speed hump warning signs etc.) was included in the treatment unit cost
- Ancillary signs such as advance warning signs and parking restriction signs were not included in the treatment unit cost, as they are subject to the specific implementation site of each treatment
- Estimated costs for each option or measure, including contingency and design costs, range from **\$18,000 to \$190,000**, with an at-grade contrasting pavement as the least cost option and treatment options along Smith Street resulting with the highest cost.
- A draft version of this report was released for exhibition on the Your Say Inner West website between 3<sup>rd</sup> November 2020 and 12<sup>th</sup> January 2021. Participants could participate in a survey voting for the most preferred option for each road.
- Changes were made to the concept designs, and a design was adopted for each road based on the survey results. The adopted designs are:
- Holbeach Avenue – Outside No. 14 and No 16 Holbeach Avenue
  - *Speed Cushions*, set of two with *Kerb Blisters*
- Smith Street – Outside No. 26 Smith Street and south of proposed Bunnings Access
  - Road Narrowing using Kerb blisters and contrasting pavement marking
  - Supplemented by *Right Turn Only signage*, *edge line marking*, *bicycle ramp*, and *shared path* between Princes Highway and the LATM treatment, and *widened footpath* between Princes Highway and Bunnings access

- Stanley Street – Outside No. 14 and No. 35 Stanley Street
  - Flat Top Road Hump
- Wentworth Street – South of Princes Highway and North of South Street
  - Flat Top Road Hump
  - Supplemented by *3 Tonne Truck Limit signage* at Princes Highway and Wentworth Street to deter heavy vehicles from entering Wentworth Street
- Union Street
  - *Shared Zone* between Princes Highway and School Lane
  - A 'soft' road closure at Union Street and Princes Highway to ban northbound through traffic travelling from Smith Street to Union Street (subject to further investigation and community consultation)
  - Supplemented by a contrasting pavement threshold at the entry from Princes Highway
- Edwin Street
  - Flat Top Road Hump outside No. 14 Edwin Street
- Tramway Street
  - Contrasting Pavement Threshold at Unwins Bridge Road and Edwin Street
  - Flat Top Road Hump at mid-block outside 404 Unwins Bridge Road
- The estimated costs for the adopted treatments, including contingency and design costs, range from **\$18,000** to **\$135,000**,