STRATEGIC PLANNING AND DEVELOPMENT COMMITTEE MEETING

ATTACHMENTS UNDER SEPARATE COVER

7.30 PM, TUESDAY 5 NOVEMBER 2019

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ATTACHMENTS UNDER SEPARATE COVER

PD/5.3/19.11 40 km/h Speed Limit Changes

WAVERLEY 40KM/H ZONE 1 SPEED REVIEW REPORT

FOR

WAVERLEY COUNCIL

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Project No: P3792 Version No: 001 Issue date: 12 March 2019

DOCUMENT CONTROL SHEET

Issue History

Report File Name	Prepared by	Reviewed by	Issued by	Date	Issued to
P3792.001R Waverley 40km Zone 1 Speed Review Report	J. Yang / G. Yin	T. Wheatley	T. Wheatley	12/03/19	Jordan Laverty jordan.laverty@waverley.nsw.gov.au Waverley Council

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1. INTRODUCTION

1.1 BACKGROUND

In an effort to achieve Vision Zero, with zero road fatalities and minimal serious injuries, Waverley Council is aiming to reduce speeds across the Local Government Area (LGA) by introducing a contiguous 40km/h speed limit. This speed limit aims to increase road safety and to improve the road environment for other road users.

The introduction of a 50km/h default urban speed limit within Australia resulted in a 23 per cent reduction in casualty crashes and public support for speed changes significantly increased after the introduction of the lower speed limit. The widespread introduction of 40km/h School Speed Zones resulted in a further 24 per cent reduction in pedestrian and bicycle crashes outside schools.

A 40km/h reduced speed limit within the Waverley LGA may provide many benefits. Local factors that may support the reduction in speed limits within the Waverley LGA include:

- currently and historically the highest population density in Australia
- the large number of high pedestrian activity areas around village centres and schools (eight secondary schools and eight primary schools within nine square kilometres)
- narrow streets with steep grades in many locations
- growth in SUV registrations by 7% p.a. SUVs and trucks currently make up 32% of registered vehicles in the Waverley LGA
- the proportion of vulnerable age cohorts, particularly children and seniors, is projected to grow significantly in the future. These age cohorts are more sensitive to safe access to schools, services and healthcare
- Waverley's People, Movement and Places (2017) which aims to make it easier for people to travel by improving the quality of streetscapes and public places. The adopted transport hierarchy places pedestrians first, followed by people riding bicycles, people using public transport, service vehicles, shared mobility and private motor vehicles.

Waverley Council has commissioned Bitzios Consulting to undertake a speed review of the Waverley LGA area south of Bondi Road and Syd Einfeld Drive. This study is intended to support an application to Roads and Maritime Services to reduce the speed limits in the study area to 40km/h.

1.2 STUDY AREA

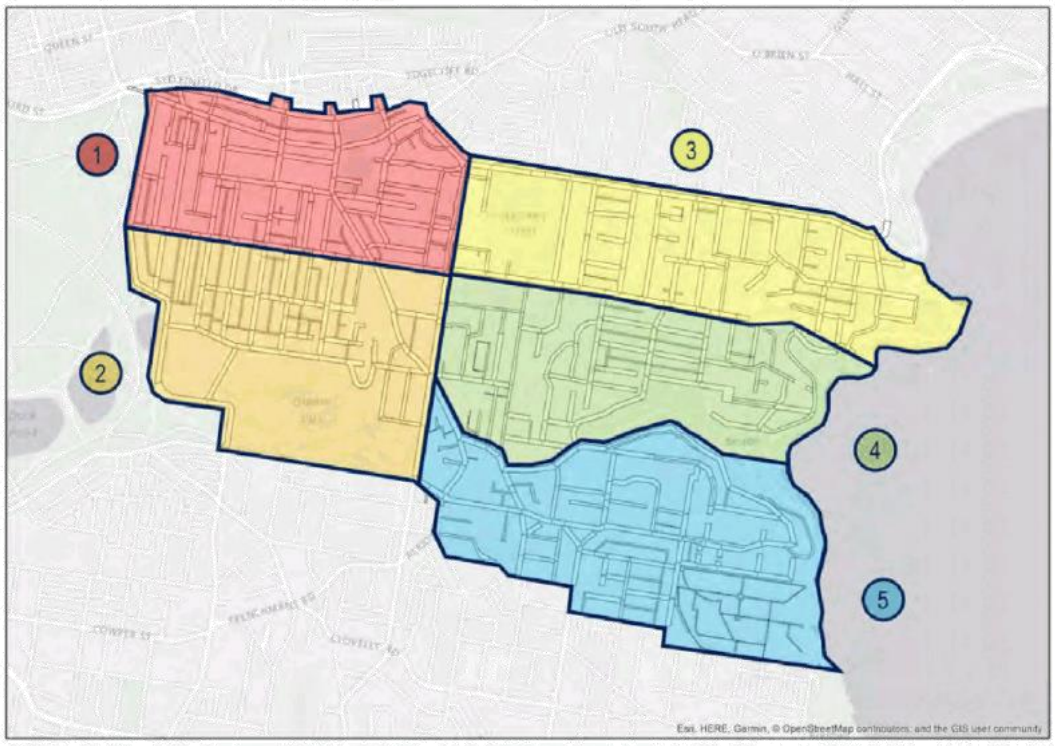
This speed review is for 'Zone 1' within the Waverley LGA (hereafter referred to as the 'study area'). The study area encompasses the southern half of the LGA, spanning from Bondi Road and Syd Einfeld Drive to the southern LGA boundary, as shown in Figure 1.1. Suburbs located within the study area include:

- Bondi
- Bondi Junction
- Bronte
- Queens Park
- Tamarama
- Waverley.

The study area was divided into five sub-zones, primarily following suburb boundaries. The zones are:

- **Zone 1 - Bondi Junction**: bounded by the northern and western LGA Boundaries, Council Street and Birrell Street
- **Zone 2 - Queens Park**: bounded by the western and southern LGA boundaries, Birrell Street and Carrington Road
- **Zone 3 - Bondi, Tamarama**: bounded by Bondi Road (up to Sandridge Street), Council Street, Birrell Street and Gaerloch Avenue
- **Zone 4 - Bronte North Waverley**: bounded by Birrell Street, Carrington Road and Bronte Road

- **Zone 5 - Bronte, South Waverley**: bounded by Bronte Road, Carrington Road and the southern LGA boundary.



Source: Esri Maps

Figure 1.1: Study Area and Zones

1.3 SCOPE OF STUDY

The scope of the speed review study is divided between Stage 1 and Stage 2. Stage 1 covers the speed review and proposal of new speed limits. Stage 2, taking into consideration the results of the Stage 1 analysis, proposes types and locations for the traffic calming treatments and speed signage to accompany the new 40km/h speed limits.

The **Stage 1** scope of work includes the following items:

- Reviewing the relevant guidelines including the NSW Speed Zoning Guidelines and Austroads Guide to Traffic Management
- GIS spatial mapping of the existing road network, land uses, schools, high pedestrian activity areas, bus routes, parking and cycling infrastructure to create a comprehensive map of the street movements within the study area
- crash data analysis and producing spatial mapping of crash severity and the vulnerable road users involved. Statistical crash analysis has also been completed to guide decisions as to whether a reduced speed environment would be beneficial to specific sections of road
- mapping and desktop analysis to review spatial information, crash, speed and traffic volume data together to identify locations that may present an opportunity to implement a 40km/h speed zone. This includes determining streets that may require further traffic calming measures to create a self-regulating 40km/h speed zone
- undertaking further speed and traffic volume surveys to cover any gaps within the existing data for key roads within the study area
- undertaking detailed street-based analysis, site visits and speed reviews to determine potential locations for further traffic calming measures and LATM treatments to create self-regulating 40km/h zones
- preparing detailed maps of potential and recommended 40km/h speed limits, including identification of Local Traffic Areas (LTA) and High Pedestrian Activity Areas (HPAA).

The **Stage 2** scope of work includes the following items:

- identifying appropriate locations for traffic calming road treatments, considering factors such as vehicle acceleration, device spacing, road network connectivity and bus and cycle routes
- designing and developing a set of 'standard' road treatments, consisting of traffic calming measures and Local Area Traffic Management (LATM) schemes
- preparing concept design plans of each standard treatment, with landscaped options designed to be suitable for the local context
- developing a set of criteria to apply the developed standard treatments to pre-identified locations across the study area
- preparing mapping for treatment locations and types, identifying the proposed type of road treatment that would be most suitable at assigned locations across the study area
- assessing the current speed signage within the study area to help identify the required signs to accompany an implementation of 40km/h speed limits, Local Traffic Areas and High Pedestrian Activity Areas
- preparation of mapping to show the type and preliminary positioning of proposed speed signage.

1.4 REPORT STRUCTURE

The structure of this report is as follows:

Study Background:

- **Chapter 1** – Introduction
- **Chapter 2** – Background Information
- **Chapter 3** – Existing Road Network

Stage 1:

- **Chapter 4** – Crash Data Analysis
- **Chapter 5** – Speed and Traffic Volume Analysis
- **Chapter 6** – Site Investigations
- **Chapter 7** – Speed Review and Proposed Speed Limits
- **Chapter 8** – Stage 1 Summary

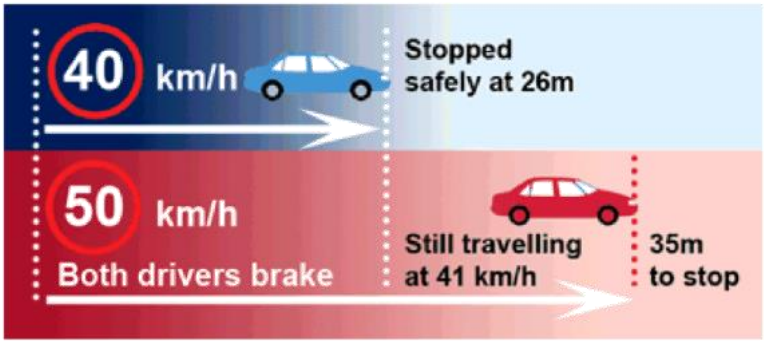
Stage 2:

- **Chapter 9** – Speed Environment Management and Preliminary Investigation
- **Chapter 10** – Road Treatments
- **Chapter 11** – Treatment Criteria
- **Chapter 12** – Proposed Road Treatments
- **Chapter 13** – Proposed Speed Signage
- **Chapter 14** - Conclusion

2. BACKGROUND INFORMATION

2.1 SPEED AND CRASH SEVERITY INFLUENCES

The NSW Centre for Road Safety (CFRS) has published information sheets which present the relationship between speed and crash severity and risk. Current and past research in Australia and internationally has provided evidence that the higher the vehicle speed, the longer the driver's reaction time and the longer the braking distance required, as shown in Figure 2.1. The CFRS has found that 40% of severe crashes were due to speeding and that speeding was determined as an aggravating factor in the severity of all crashes.

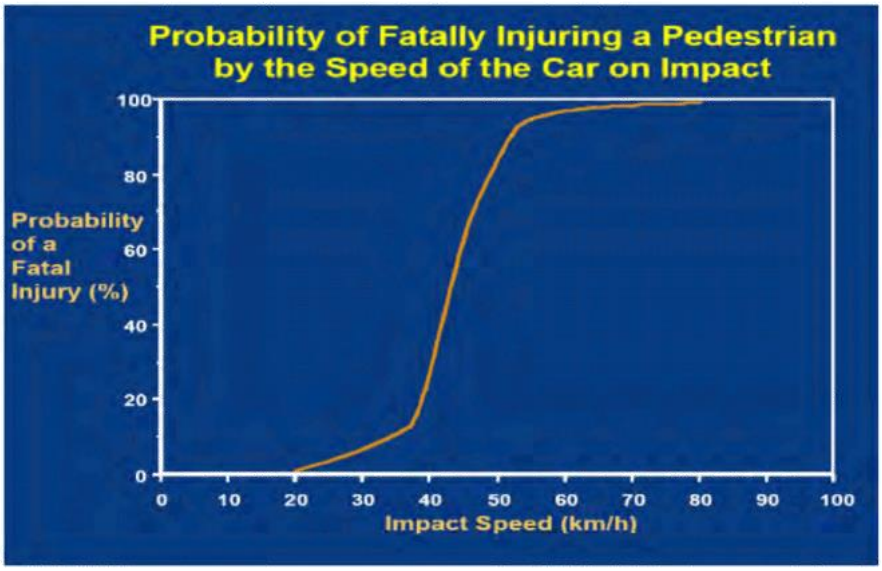


Source: http://roadsafety.transport.nsw.gov.au/speeding/speedlimits/safespeedlimits.html

Figure 2.1: Vehicle Distance to Stop

Vulnerable road users such as pedestrians, motorcyclists and cyclists are more prevalent on local streets compared to higher level roads.

Figure 2.2 shows the probability of fatally injuring a pedestrian related to the speed of the vehicle on impact. The data shows that a vehicle travelling at 50km/h has a 90% chance of fatally injuring a pedestrian. This probability is significantly reduced for a vehicle traveling at 40km/h, where fatalities occur for around 20% of cases.



Source: http://www.rms.nsw.gov.au/saferroadsnsw/speeding_and_crashes.pdf

Figure 2.2: Probability of Fatally Injuring a Pedestrian by the Speed of the Car on Impact

The CFRS broadly supports "*lower speed limits in built up areas to help reduce pedestrian fatalities and injuries. Travelling at lower speeds improves a driver's ability to stop and avoid crashes, especially in areas of high pedestrian activity. Where crashes do occur they are less severe, especially for children and the elderly*" [1]

2.2 NSW SPEED ZONE GUIDELINES

Guidelines for speed zones are found in the "NSW Speed Zoning Guidelines", NSW Centre for Road Safety (ver. 4, 2011). In NSW the standard speed zones are:

- 110 km/h, 100 km/h (rural roads), 90 km/h, 80km/h, 70km/h
- 60km/h, 50km/h (local roads), 40km/h, 10km/h (Shared Zones)

Under the Australian Road Rules (ARR), in the absence of signage or road marking, the default speed limit in rural areas is 100km/h and the default speed limit in urban areas 50km/h.

In NSW, 40km/h speed zones are applicable for:

- High Pedestrian Activity Areas
- Local Traffic Areas
- School Zones (prescribed times)
- School bus black spots.

The subject study area is proposed to be declared at 40km/h under the 'Local Traffic Area' category.

The speed zone review procedure is indicated in Figure 2.3. This study considers the procedures up to step 8 of this speed zone procedure.

Source: NSW Speed Zoning Guidelines

Figure 2.3: Speed Zone Review Process

2.3 WAVERLEY'S PEOPLE, MOVEMENT AND PLACES

Waverley People, Movement and Places: ***where we go and how we get there,*** is the current transport strategy for the Waverley LGA.

Adopted in December 2017, the plan aims to make it easier for people to move around by improving the quality of local streetscapes and public places. The plan creates an active strategy moving forward, by prioritising pedestrians first, followed by people riding bicycles, people using public transport, service vehicles, shared mobility and private motor vehicles.

The Strategy Report provides recommendations for Council to improve the full range of transport options for the community. This includes twelve Signature Projects as well as 96 short, medium and long term actions that Council can undertake between now and 2030, in partnership with the community and state government agencies.

The introduction of a reduced speed limit falls under the first signature project, *Better Streetscapes*, with the aim of creating 'complete streets' for everybody. The reduction of road speeds throughout the LGA to 40km/h is a key part of that plan.

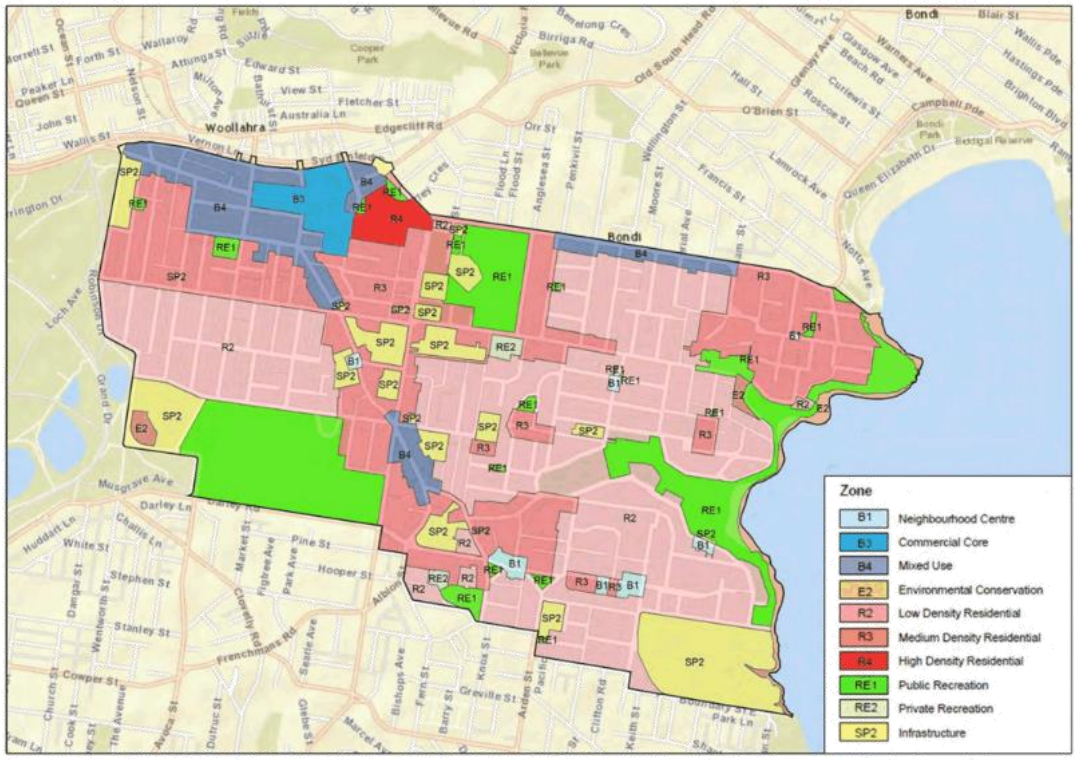
Safety is also one of the top priorities of the plan. Waverley are committed to Vision Zero, which aims for zero deaths or Major injuries on the roads. This is based on the safe systems approach of safe roads, safe speeds, safe vehicles, and safe people.

3. EXISTING ROAD NETWORK

3.1 LAND ZONING

3.1.1 General

The study area includes a mix of residential, commercial and recreation-based land uses, with low and medium density residential land uses making up most of the study area. A number of commercial centres and shopping villages are located across the area with the Bondi Junction the largest. A number of recreational areas are also spread-out across the study area including Tamarama Beach and Bronte Beach. A land zoning map of the study area is shown in Figure 3.1.



Source: Esri Maps

Figure 3.1: Land Zoning Map

3.1.2 Shopping Precincts and Villages

Shopping precincts and shopping villages within the study area include:

- Bondi Junction CBD
- Charing Cross Precinct
- Bondi Road Precinct
- Macpherson Street / Arden Street village
- Macpherson Street / St Thomas Street village
- Bronte Village.

3.1.3 Recreational Areas

The Waverley LGA has a large amount of its land zoned for recreation with many parks, beaches and other activity generators. The parks within the study area include:

- Queens Park
- Waverley Park
- Bronte Park

- Tamarama Park.

A key public recreation zone follows the coastline, connecting Bronte Beach, Tamarama Beach and Bondi Beach, following the route for the Bondi to Bronte Coastal Walk.

3.2 ROAD HIERARCHY

The road network within the study area is divided into three primary groups being: local roads, regional roads and state roads. The vast majority of roads in the study area are local streets and primarily service residential catchments.

The major connecting roads across the study area are classified as regional roads, including:

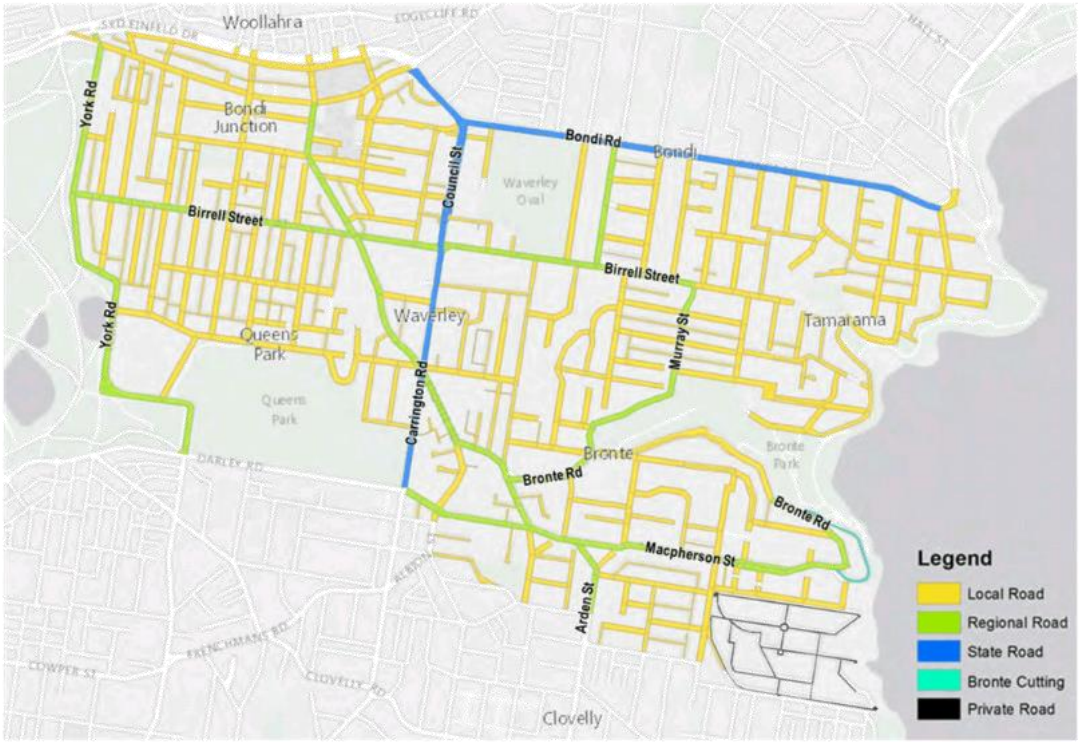
- Birrell Street - from York Road to Murray Street
- Bronte Road - from Oxford Street to Murray Street and from Nelson Avenue to MacPherson Street
- York Road - from Darley Road to Oxford Street
- Macpherson Street - from Carrington Road to Bronte Road.

A number of State-classified roads are located within the study area, including:

- Bondi Road
- Carrington Road
- Council Street.

'Bronte Cutting' in Figure 3.2 refers to the car park which runs along the length of Calga Place between Bronte Road and Macpherson Street. Private roads are present within the Waverley Cemetery area.

A map of road classifications is shown in Figure 3.2.



Source: Esri Maps

Figure 3.2: Road Hierarchy Map

Roads which function as key collector roads throughout the study area include:

- Carrington Road
- Council Street
- Bondi Road
- Birrell Street
- Bronte Road
- Macpherson Street
- Murray Street
- Arden Street
- York Road.

3.3 SPEED LIMITS

3.3.1 General

There is a range of speed limits within the study area's road network from 8km/h to 50km/h. Figure 3.3 shows the study area with posted speed limit highlighted.

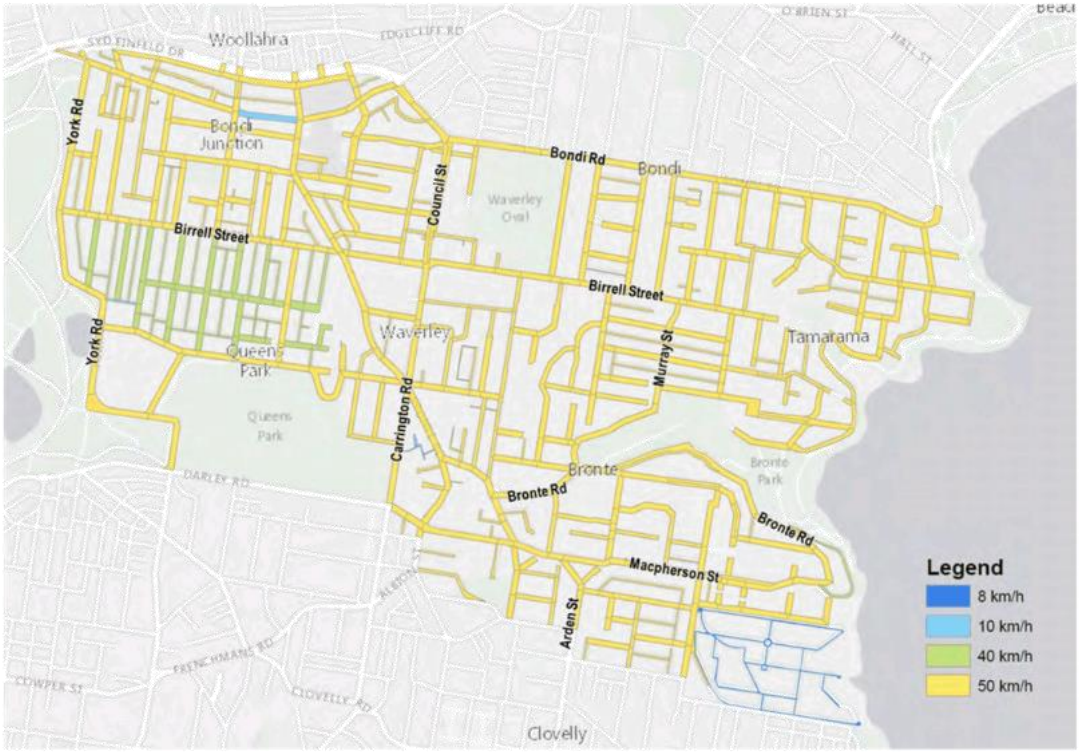


Figure 3.3: Speed Limits

The majority of the streets within the study area have speed limits of 50km/h with a few notable exceptions:

- Carrington Road and Council Street were previously 60km/h streets, and have only recently been converted to a speed limit of 50km/h. They are the primary north-south arterial road connections to and from Bondi Junction.
- the majority of streets within Queens Park are a part of an existing 40km/h Local Traffic Area
- a number of 10km/h Shared Zones are present within the study area, including Lynch Avenue in Queens Park, Oxford Street Mall (between 6:00AM and 9:00AM) and Judges Lane in Waverley
- Calga Place (Bronte Cutting) is now a 40km/h High Pedestrian Activity Area (implemented September 2018).

Many local streets are signposted or have a default 50km/h speed limit with some streets posted as Local Traffic Areas.

3.3.2 Queens Park Local Traffic Area

As shown in Figure 3.3, local roads within Queens Park are subject to a 40km/h speed limit and are defined within a Local Traffic Area (with the exception of Bourke Street). This area is bounded by Queens Park Road, York Road and Birrell Street.

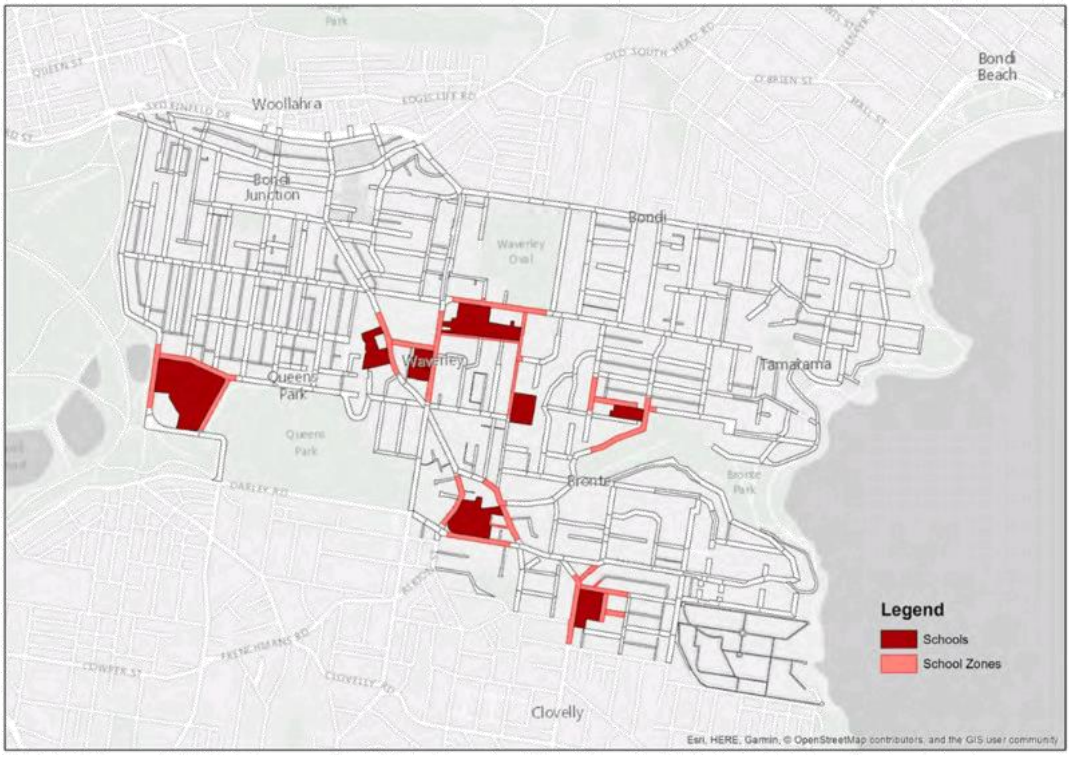
3.3.3 School Zones

A number of 40km/h school zones are present throughout the study area. These speed limits operate at the following times on Monday to Friday (except during school holidays):

- 8:00am to 9:30am
- 2:30pm to 4:00pm.

There are a total of eight schools located within the study area, primarily clustered towards the centre of the study area and positioned between the beaches and Bondi Junction CBD along the main roads (Birrell Street, Bronte Road, Macpherson Road, etc.).

The existing 40km/h school zones in the study area is shown in Figure 3.4.



Source: Esri Maps

Figure 3.4: Schools and School Zones

4. CRASH DATA ANALYSIS

4.1 CRASH HISTORY

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 made available by Council was taken from years 2013 to 2017 (inclusive) representing five years of data.

4.2 ALL CRASHES

All crashes recorded within the study area over the five-year period are shown in Figure 4.1.

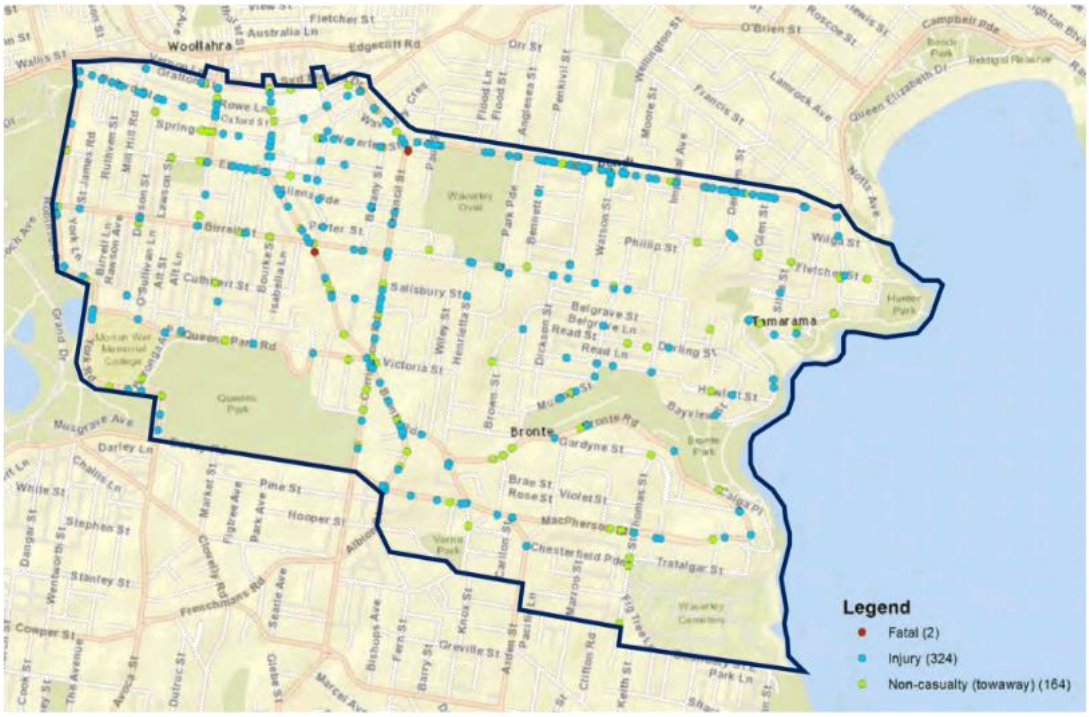


Figure 4.1: Crash Locations between 2013 and 2017

Over the entirety of the study area, a total of 490 crashes were recorded within the five year period. Of these crashes:

- 324 (66%) incidents resulted in injury
- 164 (33%) incidents were non-casualty (tow-away)
- 2 (<1%) incidents resulted in a fatality.

The mapping of crash data shows a clear pattern of most crashes along the major roads within the study area including Bondi Road, Bronte Road, Carrington Road and Oxford Street.

As shown in Figure 4.2, there is a trending reduction in crashes per year, with the number of crashes in 2017 showing a reduction of more than 50% since 2013.

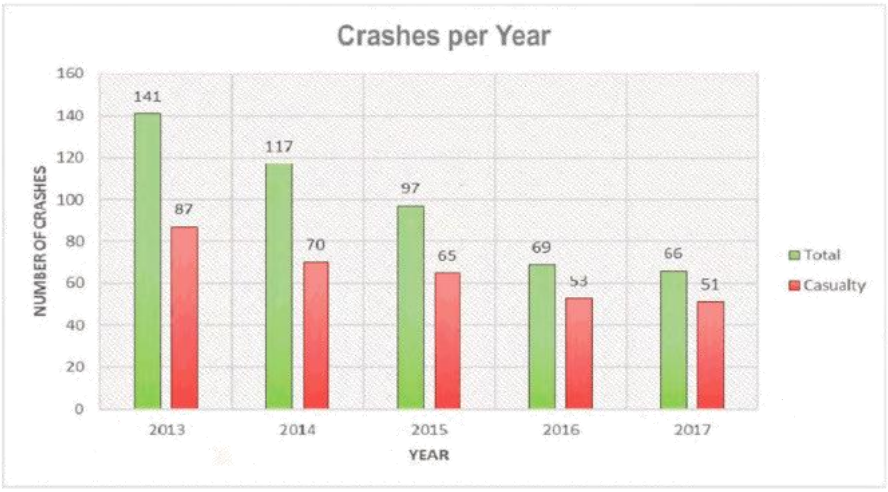


Figure 4.2: Annual Total Crashes and Casualty Crashes

Despite the annual reduction in total crashes over the five-year period, casualty crashes experienced a reduction at a lower rate than total crashes making up a greater proportion of total crashes in later years (i.e. 62% casualty crashes in 2013 increasing to 77% casualty crashes in 2017).

4.3 VULNERABLE ROAD USER CRASHES

Vulnerable Road Users (VRU) include pedestrians, cyclists and motorcyclists. Of the 490 crashes within the assessed 5-year period, 217 crashes (44%) involved a vulnerable road user. Of these 217 crashes:

- 74 crashes involved at least one pedestrian
- 56 crashes involved a cyclist
- 87 crashes involved a motorcycle.

It should be noted the only two fatalities recorded between 2013 and 2017 in the study area (as shown in Figure 4.1) involved pedestrians. One of these fatalities involved a pedestrian crossing the carriageway on Bronte Road and the other crossing Council Street. Figure 4.3 shows crashes involving vulnerable road users.

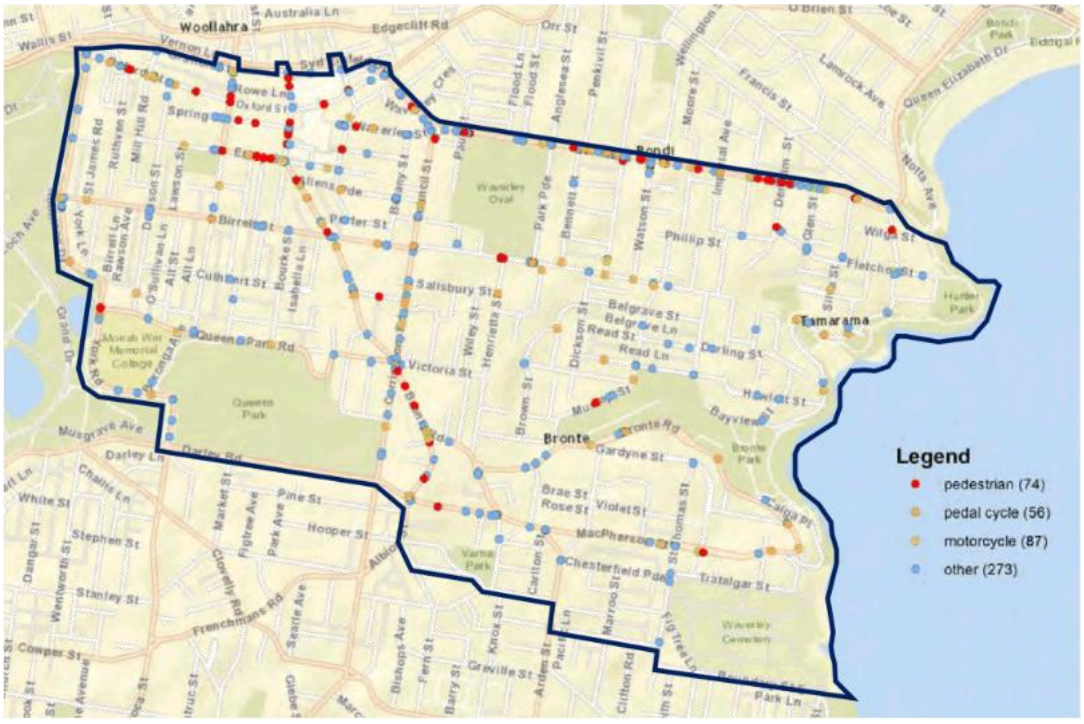


Figure 4.3: Crashes Involving Vulnerable Road Users

4.4 CASUALTY CRASH 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 4.1.

Table 4.1: 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: NSW Speed Zoning Guidelines (Section 3)

The applicable 'benchmark' casualty rate as part of this study is:

- 50km/h road: 0.446 casualties per km per year

A detailed breakdown of the crash history for each Zone within the study area is provided in Sections 4.5 to 4.9. Crash analysis mapping is also provided in **Appendix A.**

4.5 ZONE 1 CRASH DATA ANALYSIS

4.5.1 Severity

A total of 199 crashes were recorded within Zone 1. Of these crashes:

- 131 (66%) crashes resulted in injury
- 67 (33%) crashes were non-casualty (tow-away)
- 1 (<1%) crash resulted in a fatality.

Crashes by severity are shown in Figure 4.4.

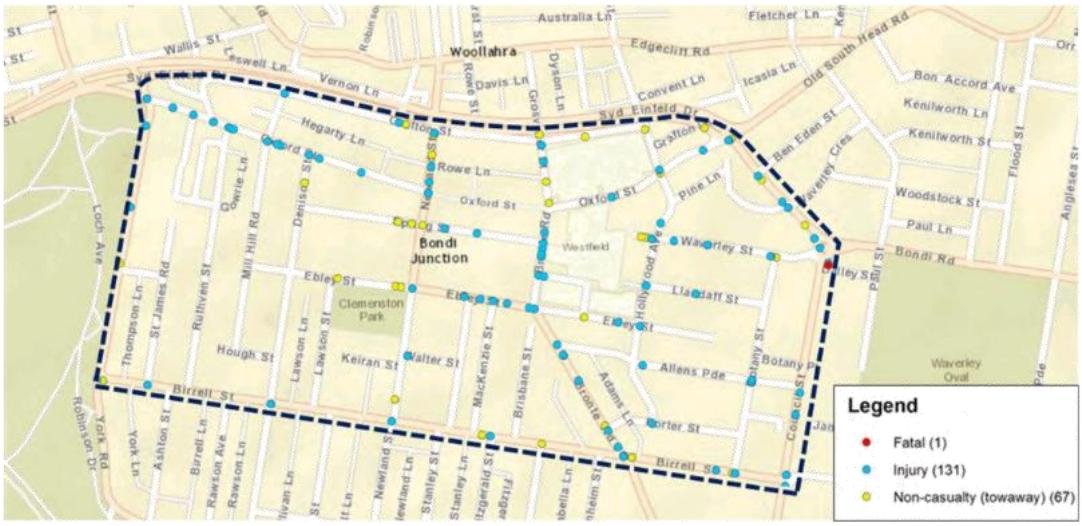


Figure 4.4: Zone 1 - Crash Severity

4.5.2 Vulnerable Road Users

Of the 199 crashes recorded within Zone 1, 87 crashes (44%) involved a vulnerable road user. Of these 87 crashes:

- 37 crashes involved at least one pedestrian
- 14 crashes involved a cyclist
- 36 crashes involved a motorcycle.

Mapping of VRU-related crashes shows a significant number of pedestrian related crashes occur within Bondi Junction and along Bronte Road, Ebley Street, and Oxford Street as shown in Figure 4.5. This may be attributed to the built-up road environment and high pedestrian volumes in these areas.

Figure 4.5: Zone 1 – Crashes Involving Vulnerable Road Users

4.5.3 Crash Statistics

Table 4.2 summarises the number of crashes per year and calculated casualty rate (casualties per year per km) for each section of road within Zone 1.

Table 4.2: Zone 1 – Crash Summary and Casualty Rate

Road Name	Length (km)	Casualties							
		2013	2014	2015	2016	2017	Total	Rate (per year)	Rate (per km per year)
Adelaide Street	0.13	0	1	0	0	0	1	0.20	1.54
Allens Parade	0.43	2	1	2	0	0	5	1.00	2.33
Birrell Street	1.24	2	1	1	2	2	8	1.60	1.29
Bondi Road	0.25	2	7	2	3	3	17	3.40	13.49
Bronte Road	0.28	8	3	4	1	4	20	4.00	14.23
Council Street	0.40	5	4	2	0	1	12	2.40	6.00
Denison Street	0.44	0	1	1	0	1	3	0.60	1.36
Ebley Street	0.71	1	1	5	1	1	9	1.80	2.54
Grafton Street	0.79	2	0	1	3	1	7	1.40	1.77
Gray Street	0.095	0	0	0	0	1	1	0.20	2.11
Grosvenor Street	0.17	0	1	0	0	0	1	0.20	1.18
Hollywood Avenue	0.29	1	2	2	1	1	7	1.40	4.83
Leswell Street	0.082	0	0	0	1	1	2	0.40	4.88
Llandaff Street	0.21	0	1	0	0	0	1	0.20	0.94
Nelson Street	0.065	0	0	0	0	2	2	0.40	6.15
Newland Street	0.56	2	1	5	0	0	8	1.60	2.86
Oxford Street	1.10	4	3	0	2	3	12	2.40	2.18
Spring Street	0.44	1	0	0	1	0	2	0.40	0.91
Walter Street	0.10	0	1	0	0	0	1	0.20	2.00
Waverley Street	0.28	2	0	1	1	0	4	0.80	2.86
York Road	0.55	1	2	2	1	3	9	1.80	3.30
Zone 1 Total		**33**	**30**	**28**	**17**	**24**	**132**	**26.40**	-

From the crash casualty rate results calculated in Table 4.2, it can be seen that every 50 km/h street within Zone 1 that has recorded casualty crashes presents a rate exceeding the benchmark 0.446 casualties per km per year.

Certain streets (most notably Bondi Road and Bronte Road) experience a relatively high volume of casualty crashes, despite being only several hundred metres long within the bounds of Zone 1.

4.6 ZONE 2 CRASH DATA ANALYSIS

4.6.1 Severity

A total of 65 crashes were recorded within Zone 2, shown in Figure 4.6.

- 37 (57%) crashes resulted in injury
- 27 (41%) crashes were non-casualty (tow-away)
- 1 (2%) crash resulted in fatality.

One of the two fatalities within the study area occurred in Zone 2, on Bronte Road. The majority of the crashes within Zone 2 are along Carrington Road. Other major streets like Bronte Road and York Road show a history of crashes along their length. The intersection of Carrington Road / Victoria Street / Bronte Road shows a local concentration of crashes.

There is a relative low number of crashes within the existing 40km/h Local Traffic Area in Queens Park. A number of crashes recorded within these areas occurred at the intersections of side streets with Queens Park Road.

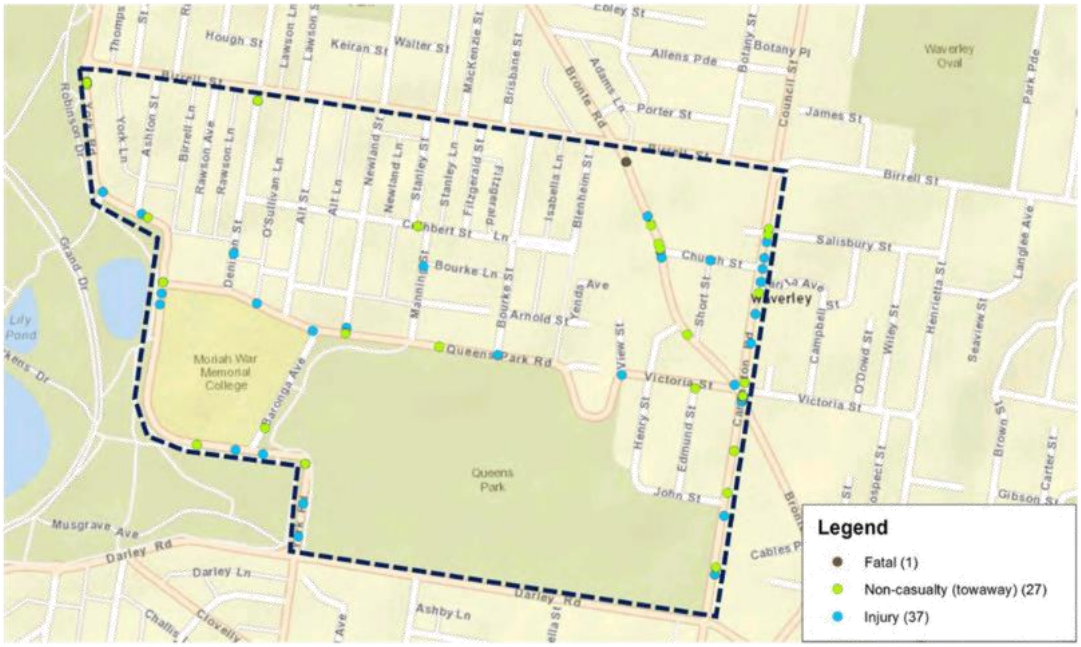


Figure 4.6: Zone 2 – Crash Severity

4.6.2 Vulnerable Road Users

Of the 65 crashes recorded within Zone 2, 21 crashes (32%) involved a vulnerable road user. Of these 21 crashes:

- 5 crashes involved at least one pedestrian
- 6 crashes involved a cyclist
- 10 crashes involved a motorcycle.

Two of the five pedestrian-related crashes occurred at the Carrington Road / Victoria Street / Bronte Road intersection. The single fatality recorded in Zone 2 involved a pedestrian on Bronte Road near Birrell Street.

A map of crashes involving VRUs within Zone 2 is shown in Figure 4.7.

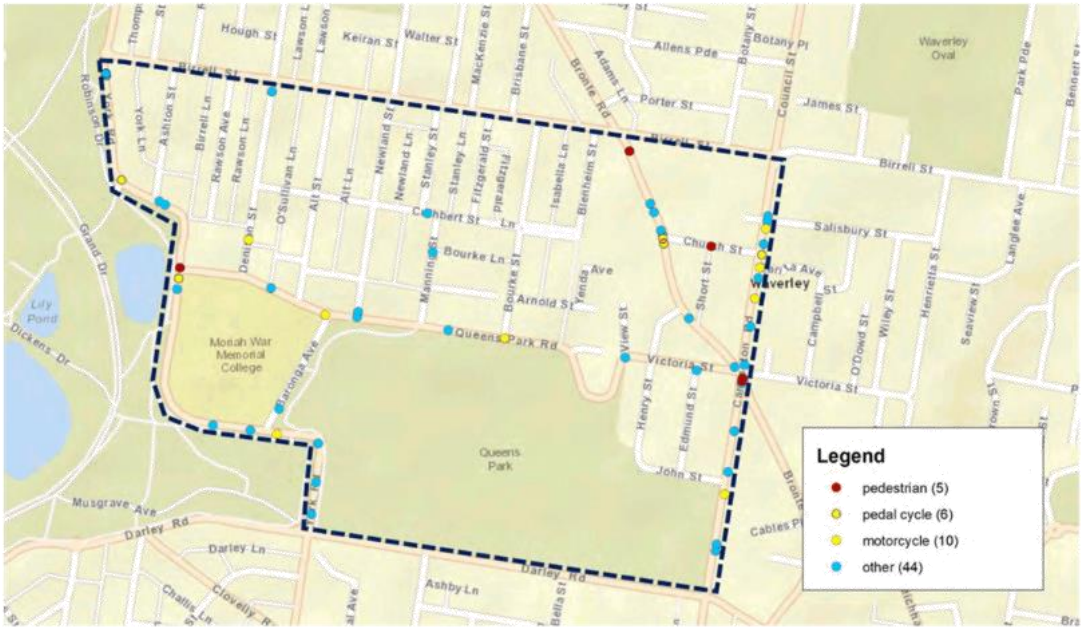


Figure 4.7: Zone 2 – Crashes Involving Vulnerable Road Users

4.6.3 Crash Statistics

Table 4.3 summarises the number of crashes per year and calculated casualty rate (casualties per year per km) for each section of road within Zone 2.

Table 4.3: Zone 2 – Crash Casualty Rates

Road Name	Length (km)	Casualties							
		2013	2014	2015	2016	2017	Total	Rate (per year)	Rate (per km per year)
Barongs Avenue	0.23					1	1	0.20	0.89
Bourke Street	0.40				1		1	0.20	0.51
Bronte Road	0.49	3	1	4	1		9	1.80	3.67
Carrington Road	0.83	2	2	3	3	1	11	2.20	2.64
Church Street	0.17	1					1	0.20	1.18
Denison Street	0.36			1			1	0.20	0.56
Manning Street	0.20				1		1	0.20	1.00
Newland Street	0.40		1				1	0.20	0.50
O'Sullivan Lane	0.37			1			1	0.20	0.54
Victoria Street	0.18		1				1	0.20	1.11
York Road	1.17	1	3	1	4	1	10	2.00	1.71
Zone 2 Total		**7**	**8**	**10**	**10**	**3**	**38**	**7.60**	-

From the crash casualty rate results calculated in Table 4.3, it can be seen that every 50km/h street within Zone 2 that recorded any casualty crashes produced a rate exceeding the benchmark of 0.446 casualties per km per year.

York Road, Carrington Road and Bronte Road experienced a relatively high volume of casualty crashes and are some of the longest sections of road within Zone 2. Some of the local streets reported a high casualty rate despite having only a single crash, primarily due to the short total street length. Crashes recorded at intersections along Queens Park Road have been recorded on the corresponding side street. While the analysis does not show any crashes along Queens Park Road, the number of crashes recorded at intersections remains relatively high, resulting in a casualty rate of 0.8 casualties per km per year.

4.7 ZONE 3 CRASH DATA ANALYSIS

4.7.1 Severity

A total of 128 crashes were recorded within Zone 3. Of these crashes:

- 94 (73%) incidents resulted in injury
- 34 (27%) incidents were non-casualty (tow-away)
- No fatalities were recorded within Zone 3 over the five-year period.

Approximately two-thirds of all the crashes in Zone 3 occur on or near Bondi Road with a total of 85 crashes. Of these crashes, over 80% resulted in injury.

Significant crash clusters are noted at specific intersections, namely:

- Ocean Street / Bondi Road (signalised)
- Watson Street / Bondi Road (signalised)
- Fletcher Street / Denham Street / Illawong Avenue (T-junction).

A map showing the crashes by severity is shown in Figure 4.8.

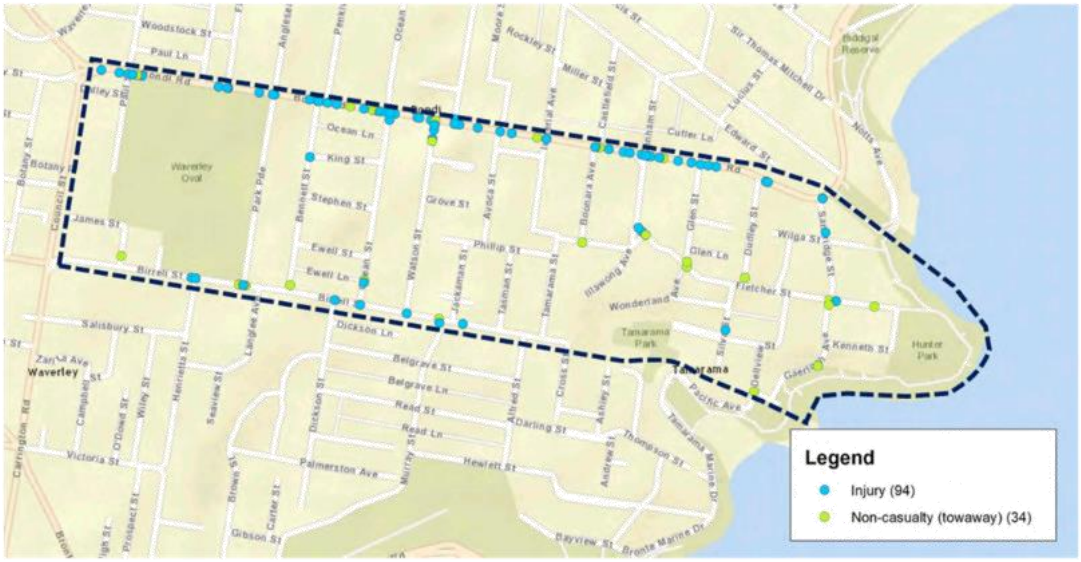


Figure 4.8: Zone 3 - Crash Severity

4.7.2 Vulnerable Road Users

Of the 128 crashes recorded within Zone 3, 69 crashes (54%) involved a vulnerable road user. Of these 69 crashes:

- 23 crashes involved at least one pedestrian
- 21 crashes involved a cyclist
- 25 crashes involved a motorcycle.

Over half of the crashes recorded within Zone 3 involved a vulnerable road user, with a significant concentration of pedestrian and cyclist-related crashes along Bondi Road.

A cluster of pedestrian crashes are shown immediately west of the Denham Street / Bondi Road intersection where a small shopping and commercial strip is located.

Two pedestrian crashes occurred at the intersection of Birrell Street and Henrietta Street. The data identified that in both cases the pedestrians were struck by vehicles while using the pedestrian crossing at this location.

A map of crashes involving VRUs within Zone 3 is shown in Figure 4.9.

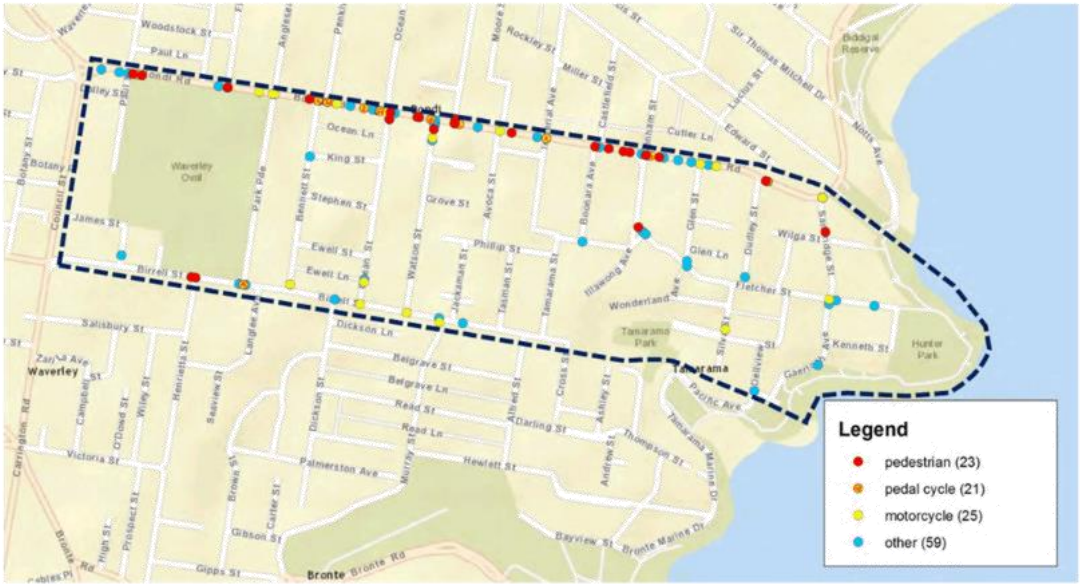


Figure 4.9: Zone 3 - Crashes Involving Vulnerable Road Users

4.7.3 Crash Statistics

Table 4.4 summarises the number of crashes per year and calculated casualty rate (casualties per year per km) for each section of road within Zone 3.

Table 4.4: Zone 3 - Crash Casualty Rates

Road Name	Length (km)	Casualties							
		2013	2014	2015	2016	2017	Total	Rate (per year)	Rate (per km per year)
Bennett Street	0.41				1		1	0.20	0.494
Birrell Street	1.15	1	3	4	1	1	10	2.00	1.739
Bondi Road	1.64	19	16	12	9	16	72	14.40	8.780
Denham Street	0.19	2					2	0.40	2.116
Fletcher Street	0.59	1		1			2	0.40	0.678
Ocean Street	0.41		1		1		2	0.40	0.983
Sandridge Street	0.21	1					1	0.20	0.952
Silva Street	0.18				1		1	0.20	1.124
Watson Street	0.41	1			2		3	0.60	1.471
Zone 3 Total		**25**	**20**	**17**	**15**	**17**	**94**	**18.80**	-

From the crash casualty rate results calculated in Table 4.4, it can be seen that every street within Zone 3 that recorded any casualty resulting crashes resulted in a rate which exceeds the benchmark of 50km/h of 0.446 casualties per km per year.

Bondi Road exceeds the benchmark crash rate by a factor of 20 indicating there may be significant issues along this corridor relating to traffic/pedestrian safety and the road environment.

A small number of local streets are calculated as having high casualty rates mostly due to their short length.

4.8 ZONE 4 CRASH DATA ANALYSIS

4.8.1 Severity

A total of 32 crashes were recorded within Zone 4. Of these crashes:

- 21 (66%) incidents resulted in injury
- 11 (34%) incidents were non-casualty (tow-away)
- No fatalities were recorded within Zone 4 over the five-year period.

A relatively low number of crashes occurred in Zone 4. This is primarily due to this area having a larger proportion of local roads and the exclusion of the bordering main roads (Birrell Street, Carrington Road, and Bronte Road) from this zone. A total of 32 crashes occurred within Zone 4.

Five crashes were recorded along the relatively short length of Pacific Avenue. Two of these crashes were identified as speed-related.

Murray Street also experiences a larger number of crashes with a cluster of crashes at the bottom of the hill between Palmerston Avenue and Gibson Street.

A map showing crashes by severity is shown in Figure 4.10.

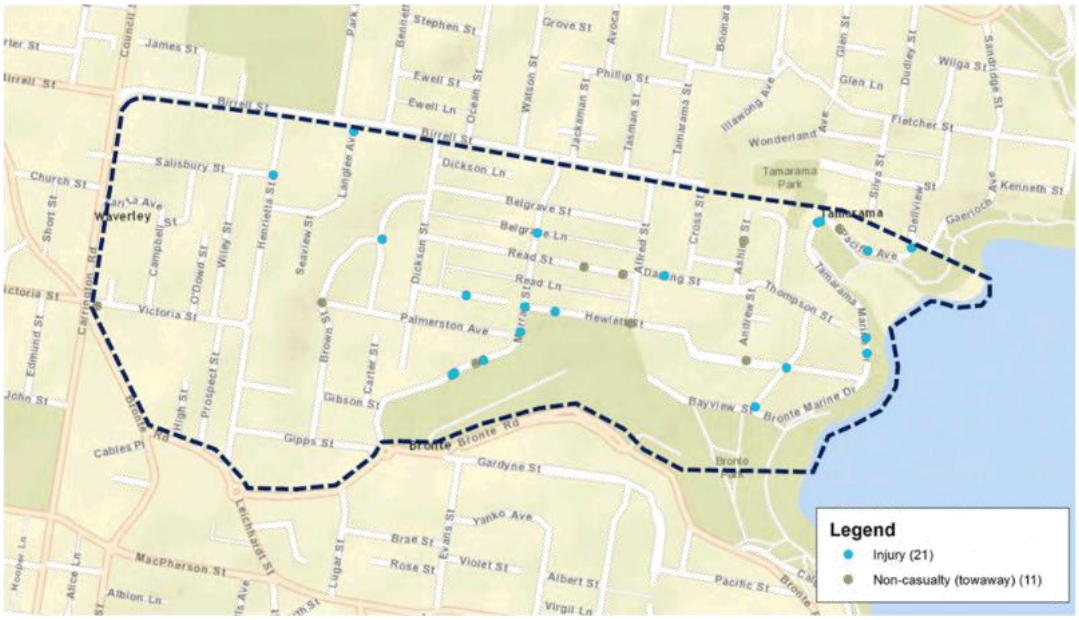


Figure 4.10: Zone 4 - Crash Severity

4.8.2 Vulnerable Road Users

Of the 32 crashes recorded within Zone 4, 13 crashes (41%) involved a vulnerable road user. Of these 13 crashes:

- 1 crash involved at least one pedestrian
- 5 crashes involved a cyclist
- 7 crashes involved a motorcycle.

Of the five crashes on Pacific Avenue, two crashes involved a cyclist and two crashes involved motorcycles.

A single pedestrian crash occurred on Murray Street within the cluster identified between Palmerstone Avenue and Gibson Street.

A map of crashes involving VRUs within Zone 4 is shown in Figure 4.11.

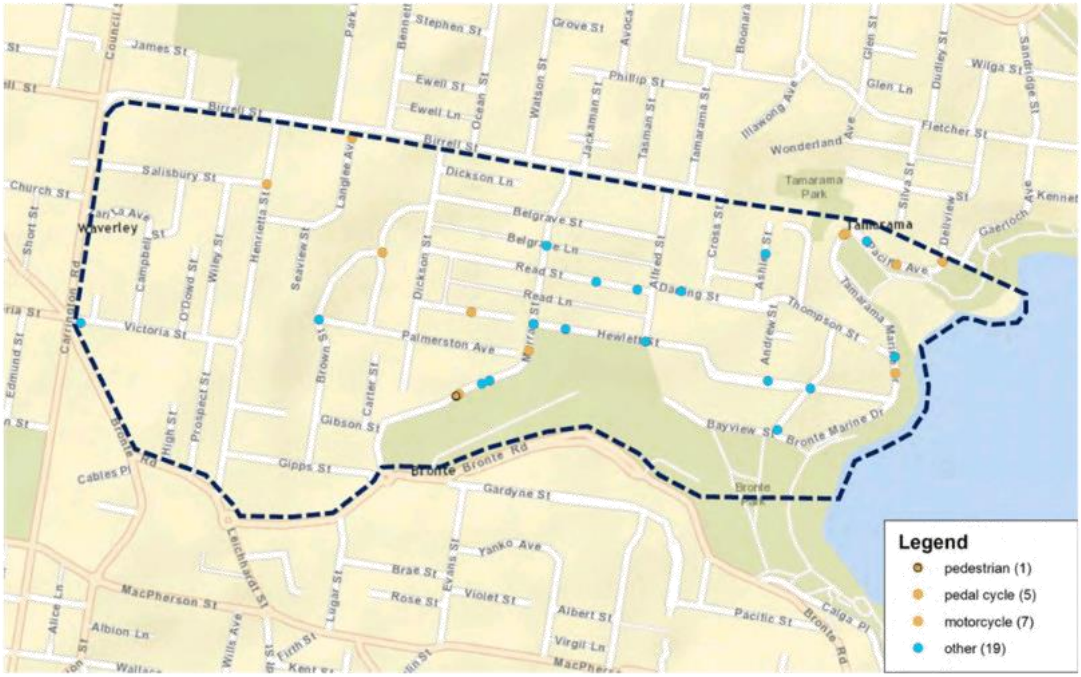


Figure 4.11: Zone 4 – Crashes Involving Vulnerable Road Users

4.8.3 Crash Statistics

Table 4.5 summarises the number of crashes per year and calculated casualty rate (casualties per year per km) for each section of road within Zone 4.

Table 4.5: Zone 4 – Crash Casualty Rates

Road Name	Length (km)	Casualties							
		2013	2014	2015	2016	2017	Total	Rate (per year)	Rate (per km per year)
Bayview Street	0.29	1					1	0.20	0.694
Blandford Avenue	0.28	1					1	0.20	0.714
Darling Street	0.22	1					1	0.20	0.909
Henrietta Street	0.69	1					1	0.20	0.292
Hewlett Street	0.67	3		1			4	0.80	1.203
Langlee Avenue	0.30	1					1	0.20	0.667
Murray Street	0.73	2	1		1	2	6	1.20	1.639
Pacific Avenue	0.21	1	1	1		1	4	0.80	3.810
Tamarama Marine Drive	0.36			2			2	0.40	1.111
Zone 4 Total		**11**	**2**	**4**	**1**	**3**	**21**	**4.20**	-

From the crash casualty rate results calculated in Table 4.5, it can be seen that all streets within Zone 4 (with the exception of Henrietta Street) recorded casualty crash rates exceeding the 50km/h road benchmark of 0.446 casualties per km per year.

Pacific Avenue exceeds the benchmark casualty rate by a factor of 10 due to its relatively short length and large number of crashes.

Other roads with high casualty rates include Hewlett Street, Murray Street and Tamarama Marine Drive.

4.9 ZONE 5 CRASH DATA ANALYSIS

4.9.1 Severity

A total of 66 crashes were recorded within Zone 5. Of these crashes:

- 41 (62%) incidents resulted in injury
- 25 (38%) incidents were non-casualty (tow-away)
- No fatalities were recorded within Zone 5 over the five year period.

Most of the recorded crashes in Zone 5 are along collector roads such as Macpherson Street, Bronte Road Albion Street, Leichardt Street and Arden Street. Macpherson Street and Bronte Road experience the largest number of crashes with 31 and 18 crashes respectively.

Crash clusters occur at the Bronte Road / Albion Street and Leichardt Street / Macpherson Street intersections.

Crashes by severity are shown in Figure 4.12.

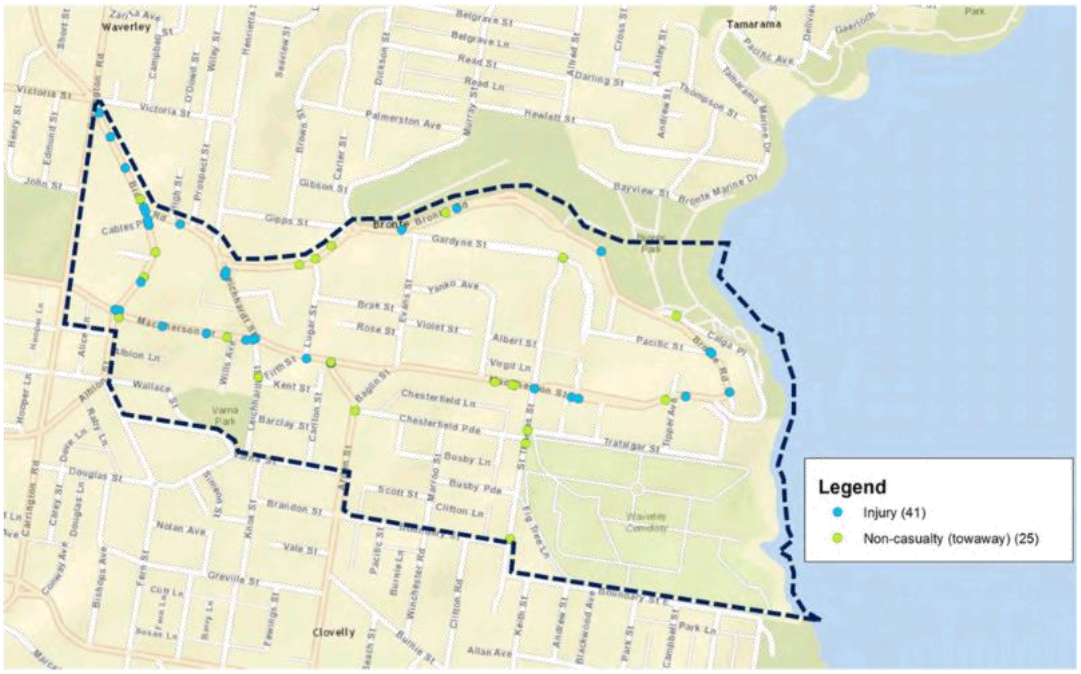


Figure 4.12: Zone 5 – Crash Severity

4.9.2 Vulnerable Road Users

Of the 66 crashes recorded within Zone 5, 27 crashes (40%) involved a vulnerable road user. Of these 27 crashes:

- 8 crashes involved at least one pedestrian
- 10 crashes involved a cyclist
- 9 crashes involved a motorcycle.

Mapping of crashes show a significant number of VRU related crashes occur within shopping areas and built up areas including the Charing Cross precinct, Macpherson Street / St Thomas Street village, and within the St Catherine's School 40km/h school zone. A noticeable number of pedestrian-related crashes are located along Bronte Road and along Albion Street within Charing Cross.

A map of crashes involving VRUs within Zone 5 is shown in Figure 4.13.

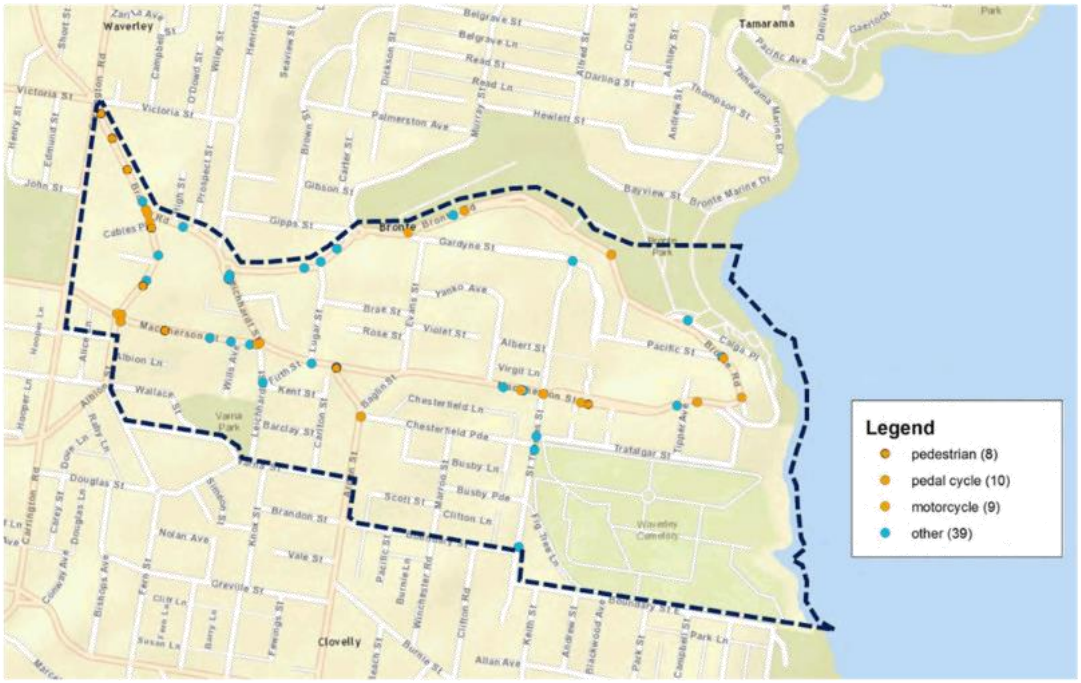


Figure 4.13: Zone 5 – Crashes Involving Vulnerable Road Users

4.9.3 Crash Statistics

Table 4.6 summarises the number of crashes per year and calculated casualty rate (casualties per year per km) for each section of road within Zone 5.

Table 4.6: Zone 5 – Crash Casualty Rates

Road Name	Length (km)	Casualties							
		2013	2014	2015	2016	2017	Total	Rate (per year)	Rate (per km per year)
Albion Street	0.29	1		1		1	3	0.60	2.069
Arden Street	0.25	2			1		3	0.60	2.400
Bronte Road	1.89	3	6		3	1	13	2.60	1.376
Leichhardt Street	0.25				1		1	0.20	0.800
Macpherson Street	2.24	5	4	5	5	2	21	4.20	1.873
Zone 5 Total		**11**	**10**	**6**	**10**	**4**	**41**	**8.20**	-

From the crash casualty rate results calculated in Table 4.6, it can be seen that every street within Zone 5 that recorded any casualty crashes had a rate exceeding the 50km/h benchmark rate of 0.446 casualties per km per year.

Arden Street has a relatively high casualty crash rate (2.4 crashes per km per year) due to its short length and its crashes occur at its intersections with Macpherson Street and Chesterfield Parade.

4.10 CRASH DATA ANALYSIS SUMMARY

Based on the crash analysis results, almost all of the streets which recorded a casualty crash were calculated with a resulting crash rate which exceeded the benchmark casualty crash rate for urban roads of the corresponding 50km/h speed limit. It is noted that the benchmark casualty crash rates (from Table 4.1) tend to be low and are commonly exceeded during crash analysis of trafficked streets. However, a number of notable streets within the study area exhibit a casualty crash rate significantly in excess of the benchmark rate, which is indicative of a consistent issue causing higher severity crashes.

The proposal to reduce the speed limit within the study area to a 'blanket' 40km/h would most likely reduce casualty crash rates across the study area.

The roads with the highest casualty crash rates include:

- Bondi Road (within Zone 1 and Zone 3)
- Bronte Road (within Zone 1)
- Carrington Road
- Council Street
- Oxford Street
- York Road.

Other key roads within Local Areas that show unusually high casualty crash rates include:

- Albion Street
- Arden Street
- Birrell Street (Zone 2 and Zone 3)
- Denham Street
- Hewlett Street
- Hollywood Avenue
- Leswell Street
- Macpherson Street
- Murray Street
- Pacific Avenue
- Queens Park Road.

5. TRAFFIC VOLUME AND TRAFFIC SPEED SURVEYS

5.1 STUDY AREA SURVEY DATA

Available Average Annual Daily Traffic (AADT) and speed data was provided by Council. Data from the last five years (2013-2018) was extracted and used as a part of this study.

Additional traffic volume and speed data was collected to determine the current operating speeds of key streets within the study area. The 85th percentile vehicle speeds were used to identify whether streets under their current configuration were capable of maintaining a self-regulating 40km/h speed limit.

Figure 5.1 below shows the locations where data was available or collected in the study area. A summary of all traffic volume and speed data, and associated mapping are provided in **Appendix B**.

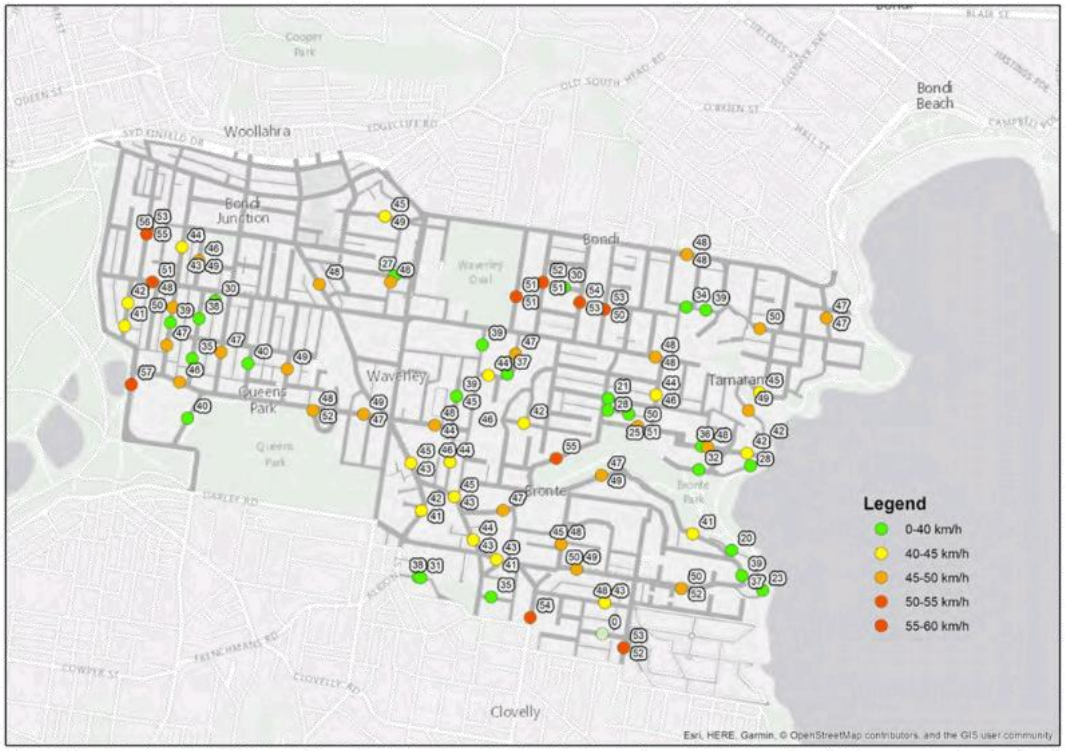


Figure 5.1: Map of Speed Survey Data

The analysis of speed data shows that some road sections are currently capable of self-regulating a 40km/h speed environment. These streets are defined as those which recorded 85th percentile vehicle speeds of 40 km/h or less.

The streets which recorded 85th percentile vehicle speeds of 43 km/h or under were judged to be also potentially capable of maintaining a 40km/h speed limit, provided that drivers were informed of the speed limit via signage. Given that the speed limit on these streets is currently the default urban 50 km/h speed limit, streets recording 85th percentile speeds of 43 km/h or less indicates that drivers are not comfortable with higher speeds on these streets.

The streets which recorded 85th percentile vehicle speeds in excess of 43km/h would require additional measures to achieve a self-regulating 40 km/h road environment.

5.2 ZONE 1

Within Zone 1, areas with relatively high vehicle speeds include Birrell Street and Ruthven Street. Birrell Street recorded 85th percentile speeds of around 50 km/h showing that the majority of vehicles are travelling at the existing speed limit.

Ruthven Street recorded 85th percentile speeds that exceeded the current 50 km/h speed limit, at around 55 km/h revealing an existing speeding issue along this section of road.

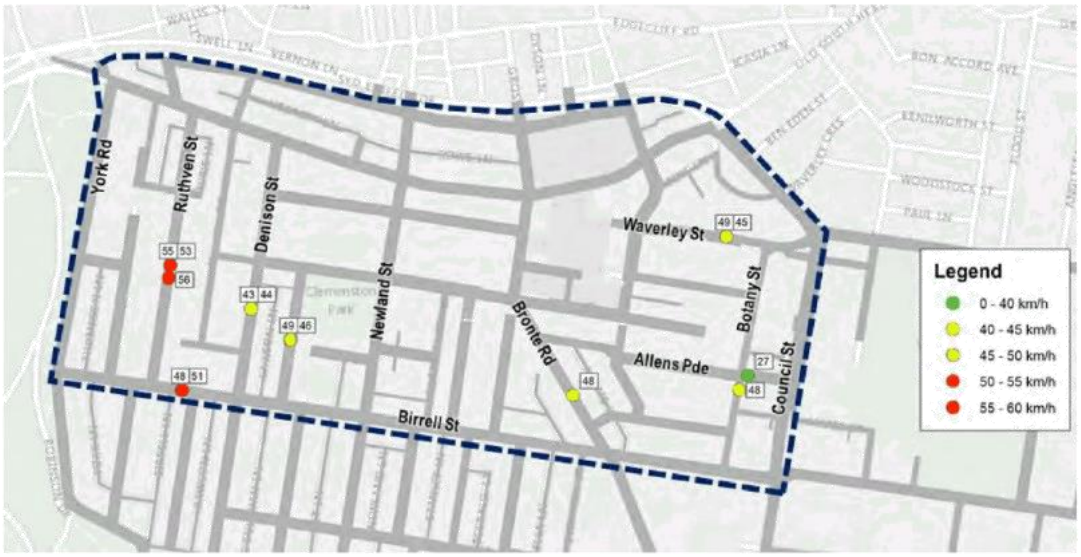


Figure 5.2: Zone 1 – 85th Percentile Speeds

Traffic volume data shows the most trafficked street surveyed in Zone 1 is Bronte Road between Birrell Street and Victoria Street with an AADT of 7,280 northbound vehicles. Waverley Street and Birrell Street both record bi-directional AADT volumes of over 8,000 vehicles, while the remaining surveyed streets reported under 3,000 vehicles per day.

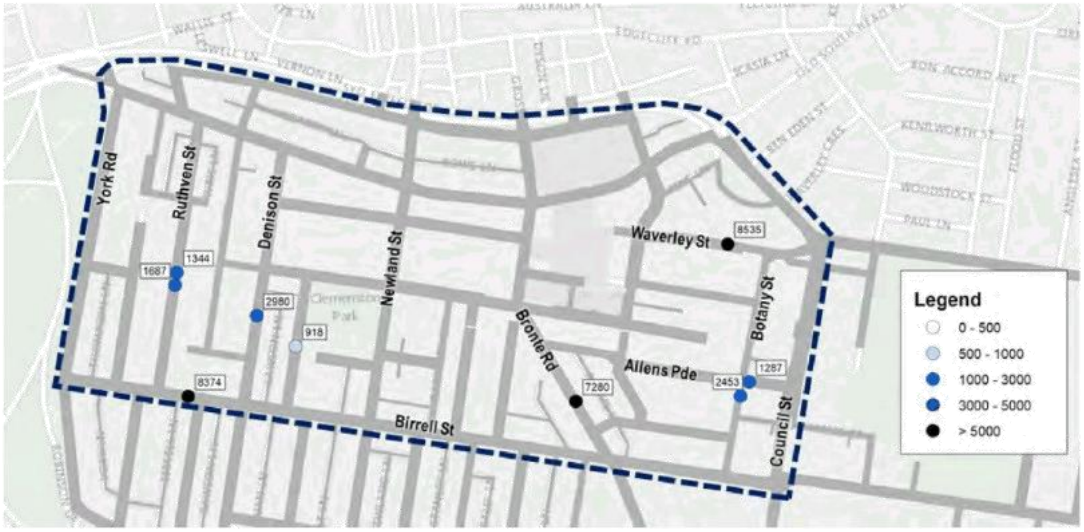


Figure 5.3: Zone 1 - AADT Volumes

5.3 ZONE 2

Within Zone 2, a significant proportion of the recorded 85th percentile vehicle speeds show drivers travelling at 40 km/h or under. This included Newland Street, Manning Street and Baronga Avenue and is expected due to the existing 40 km/h Local Traffic Area within the Queens Park suburb. There were some exceptions to this finding. Denison Street recorded two separate locations of 85th percentile speeds around 50 km/h, despite the presence of two slow points on this street.

Higher 85th percentile speeds were also observed along Bourke Street, Queens Park Road and York Road. These streets currently have 50 km/h speed limits. York Road recorded an 85th percentile speed of 57 km/h just south of Queens Park Road. This area lies within the School Speed Zone for Moriah College.

Figure 5.4: Zone 2 - 85th Percentile Speeds

Traffic volume data shows generally low traffic volumes through the Zone 2 local traffic area. York Road, and Baronga Avenue carry the highest traffic volumes in the area. Despite being speed limited to 40km/h and having a number of traffic calming measures, Newland Street attracts an AADT over 5,000vpd. Newland Street provides a direct connection with Birrell Street and Ebley Street from Queens Park Road and vice-versa.

Figure 5.5: Zone 2 – AADT Volumes

5.4 ZONE 3

Speed surveys on Farrellys Avenue recorded 85th percentile speeds of under 40 km/h. Higher speed data was observed on Park Parade, Bennett Street, Ocean Street and Watson Street. All of these streets recorded 85th percentile vehicle speeds in excess of 50 km/h.

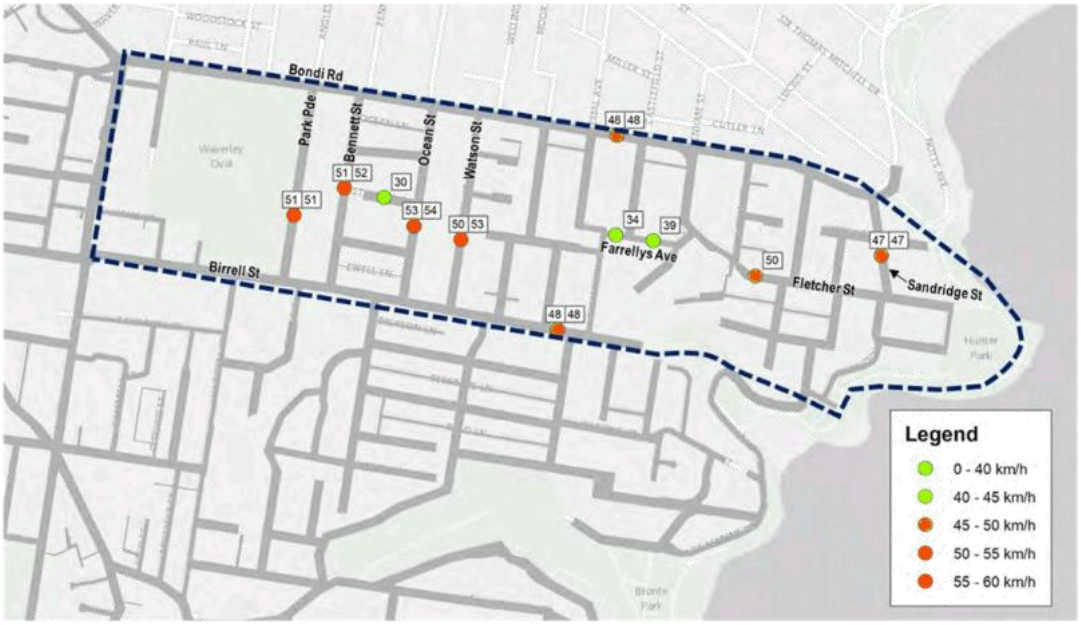


Figure 5.6: Zone 3 – 85th Percentile Speeds

Despite being a narrow, one-way local street, 5,000 vehicles per day was noted on Farrellys Avenue. This street is being used as a through connection to Fletcher Street for eastbound drivers on Birrell Street seeking to travel towards Bondi Beach / Mackenzie Point / Tamarama Beach whilst bypassing Bondi Road.

Bondi Road and Birrell Street both experience a heavy flow of traffic throughout the day, with total bi-directional AADT volumes of around 20,000 vehicles for Bondi Road and 14,000 vehicles for Birrell Street. Connecting streets between the two main streets include the parallel streets of Park Parade, Bennett Street, Ocean Street and Watson Street.

These streets all record bi-directional volumes of several thousand vehicles each day, with Watson Street being the most heavily trafficked route at around 7,500 vehicles.

Figure 5.7: Zone 3 - AADT Volumes

5.5 ZONE 4

The speed survey results show a range of vehicle speeds through Zone 4. On Hewlett Street and Murray Street 85th percentile vehicle speeds of 50 km/h and 55 km/h were recorded respectively, despite a number of LATM treatments on both streets. A number of the other local streets recorded lower 85th percentile speeds of under 40 km/h, including Read Street and Bayview Street. Pacific Avenue and Tamarama Marine Drive recorded vehicle speeds of 45 km/h and 49 km/h adjacent to Tamarama Beach, slowing to 42 km/h closer to the end of Hewlett Street.

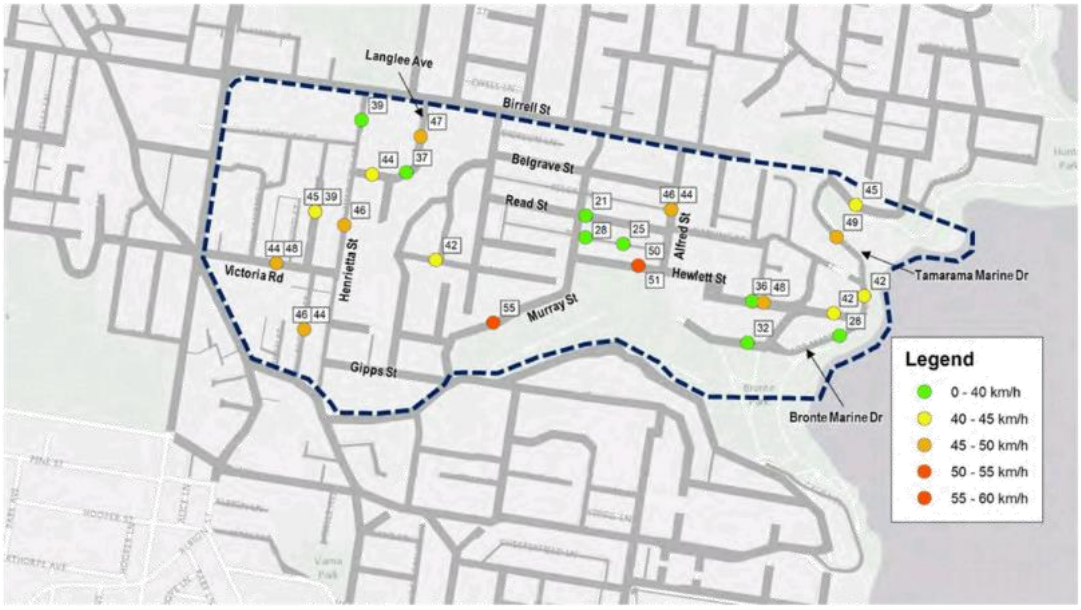


Figure 5.8: Zone 4 - 85th Percentile Speeds

The vehicle volumes in Zone 4 reveal the main travel routes through the zone. A high AADT volume was reported on the route of Pacific Avenue and Tamarama Marine Drive to Murray Street via Hewlett Street, most likely due to visitors to the coastal streets and beaches. Murray Street experiences a very high AADT at just over 15,000 vehicles, which is reflective of it being the main connecting street through the zone.

The surrounding local streets are relatively lowly-trafficked, with the exception of Henrietta Street and Victoria Road as access and egress streets to Waverley College Junior High.

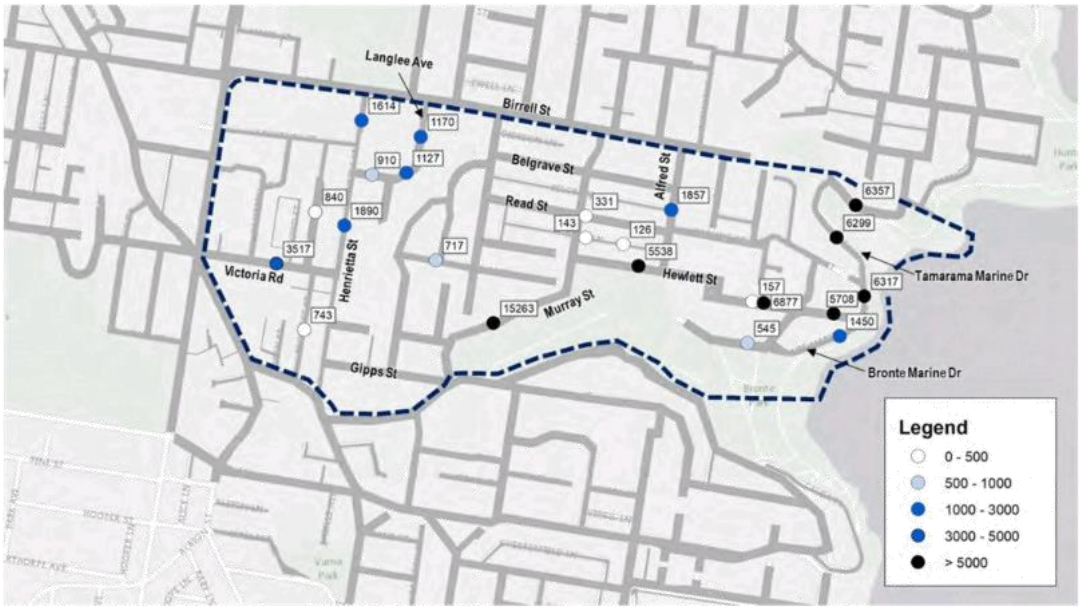


Figure 5.9: Zone 4 - AADT Volumes

5.6 ZONE 5

Along the length of Bronte Road, Albion Street and Leichhardt Street towards Macpherson Street (which are all highly trafficked streets), 85th percentile vehicle speeds are in the range of 40 km/h - 45 km/h, below the 50 km/h speed limit.

Leichhardt Street and Albion Street both include school zones. Along Macpherson Street, vehicle speeds are at, or in excess of, 50 km/h, slowing to around 40km/h at the transition into Bronte Road towards the Bronte village. Speed data on Bronte Road adjacent to Bronte Park shows that despite 'tight' horizontal curves, drivers are traveling at just under 50 km/h. Arden Street and St Thomas Street, both recorded 85th percentile vehicle speeds over 50 km/h speed limit.

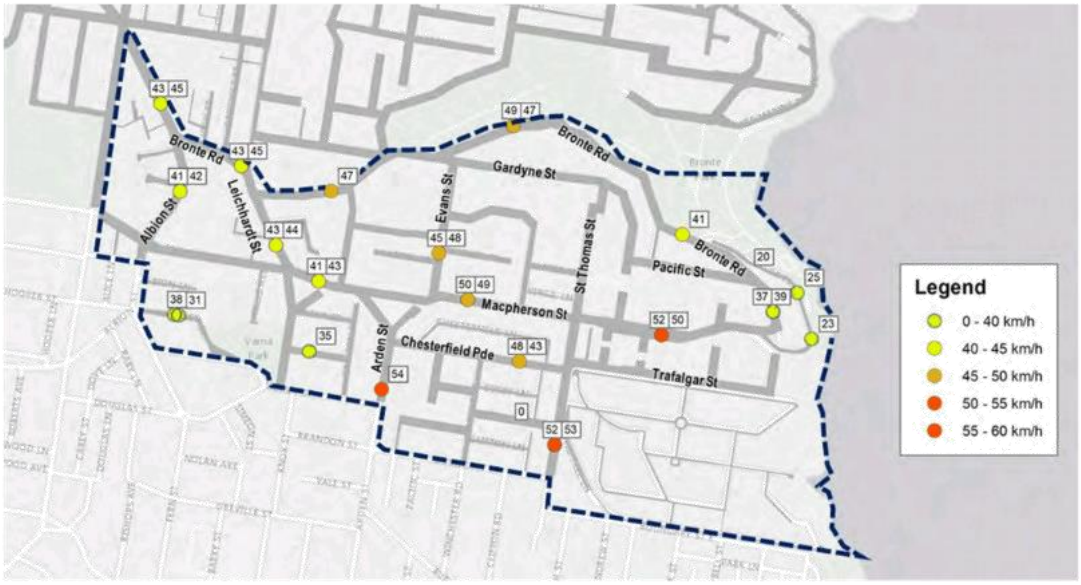


Figure 5.10: Zone 5 - 85th Percentile Speeds

The main travel route in Zone 5 is Bronte Road, Leichardt Street, Albion Street, Macpherson Street and Arden Street. This route experiences high volumes of traffic in excess of 10,000 vehicles per day in most parts. This route provides the major connection in the area, with Arden Street linking south to Coogee and Bronte Road providing access towards Bondi Junction.

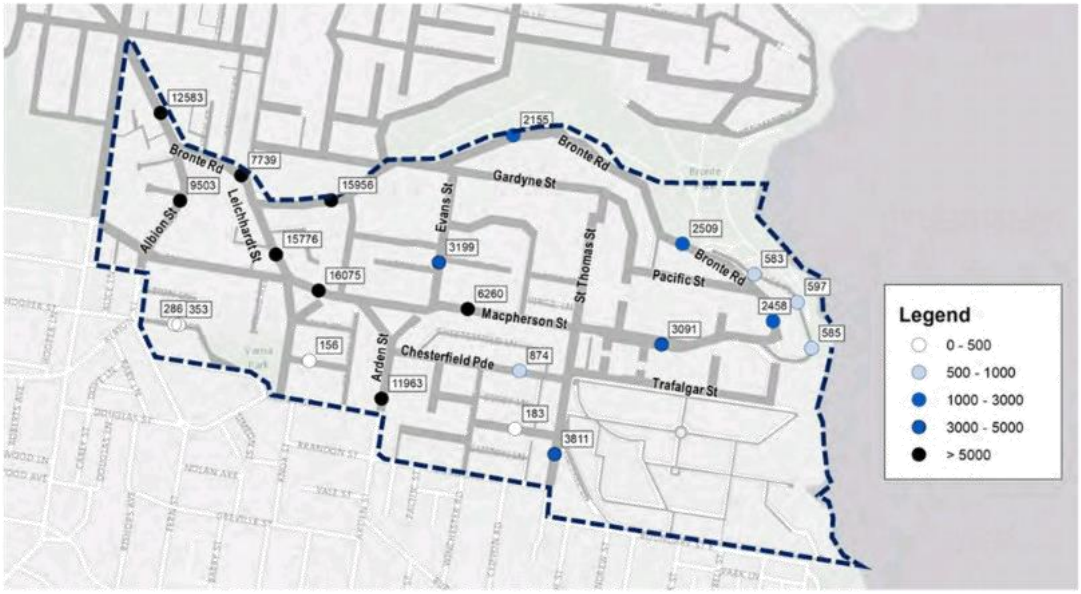


Figure 5.11: Zone 5 - AADT Volumes

6. SITE INSPECTIONS

6.1 OVERVIEW

A number of site inspections were undertaken during early-mid October 2018 to gain an understanding of the current conditions of the streets within the study area. The site inspections focused on streets which were identified as capable of accommodating 40km/h speed limits during preliminary assessment stages, and streets also potentially requiring additional traffic calming infrastructure as a part of Stage 2 of this study (see Section 9).

The findings and observations from the site visits are detailed by zone in following sections.

6.2 ZONE 1

Zone 1 comprises the main Bondi Junction district. Within a predominately 'built up' urban environment. Signalised intersections are common within the zone, as well as a number of pedestrian crossings on Spring Street, Oxford Street and Ebley Street (such as the one shown below in Figure 6.1). A number of bus services operate through the Bondi Junction terminal and in surrounding streets. The road network features a number of turning restrictions controlling the direction of traffic.

Figure 6.1: Pedestrian Crossing at Intersection

6.3 ZONE 2

Zone 2 encompasses the suburb of Queens Park within which the majority of streets are defined as Local Traffic Areas with posted speed limits of 40km/h.

Raised entry thresholds are common at the intersections to the Local Traffic Area streets, signifying this boundary and controlling the speeds of vehicles entering the area. Depending on the width of the roadway and cycling infrastructure, some additional controls were observed, such as the median island seen in Figure 6.2.

Figure 6.2: Raised Entry Thresholds with Median Island and Cycle Lane

One of the remaining 50km/h streets in Zone 2, Baronga Avenue, is a highly trafficked street, with an AADT of over 10,000 vehicles per day. Site observations noted a steady flow of vehicles through the street, connecting Queens Park Road and York Road. A raised flat-top pedestrian crossing with protective kerb blisters is located at the mid-point of the street, adjacent to pedestrian accesses to both Moriah College and Queens Park (as seen in Figure 6.3).

Figure 6.3: Wombat Crossing on Baronga Avenue

6.4 ZONE 3

Zone 3 mainly comprises the Bondi region to the east side of Waverley Park between Bondi Road and Birrell Street. The local streets in this zone are mostly residential streets, with the exception of the shopping strip along Bondi Road and a small shopping village on Fletcher Street near Dudley Street.

Bondi Road was observed to carry large volumes of cars and buses. High levels of pedestrian activity were also observed along the shopping strip, with several mid-block crossing locations.

A number of the local streets are signed as 50km/h Local Traffic Areas, including Watson Street, Bennett Street and Ocean Street (see Figure 6.4).

Figure 6.4: Start of Local Traffic Area on Watson Street

A number of entry thresholds exist in the area at side streets to Birrell Street. These thresholds often included either a median island or pedestrian refuge in the centre of the roadway as well as landscaped kerb blister islands. The thresholds were painted contrasting colours, though some exceptions to this were observed (see Figure 6.5).

Staggered flat-top speed humps are located on Watson Street at its intersection with Grave Street, with a median island and protective rail also installed.

Figure 6.5: Entry Threshold with Pedestrian Refuge on Jackaman Street

6.5 ZONE 4

Zone 4 is primarily comprised of the Tamarama and Waverley suburbs, between Birrell Street, Bronte Road and Carrington Road. The roads in this zone are mostly residential streets, with the exception of the Charing Cross village area, the Bronte Road village shopping strip along Bondi Road and a small shopping village on Fletcher Street near Dudley Street.

LATMs devices within Zone 4 are along Murray Street and Hewlett Street. Staggered flat-top speed humps with median kerbs are located near the intersection of Murray Street and Gibson Street and on the bend near Palmerston Avenue. A number of flat top road humps are also located along Murray Street north of Hewlett Street, and on Hewlett Street between Alfred Street and Bayview Street. A flat top road hump on Murray Street (near Hewlett Street) is shown in Figure 6.6.

Figure 6.6: Flat Top Road Hump on Murray Street

50km/h Local Traffic Area signage was also observed on side streets connecting to Murray Street as shown in Figure 6.7.

Figure 6.7: 50km/h Local Traffic Area Signage

6.6 ZONE 5

Zone 5 primarily includes the suburb of Bronte, with parts of the Waverley suburb towards the western end of this zone. The zone is primarily bounded by Bronte Road, Carrington Road and the southern LGA boundary.

The roads in this zone are mostly residential streets, with a number of collector roads such as Macpherson Street, Arden Street and Albion Street. Small shopping villages are located along Macpherson Street and at Bronte Beach. The Charing Cross precinct is located along Bronte Road towards the west.

LATM schemes within Zone 5 vary but mostly include pedestrian refuges or median blister treatments, primarily located along collector roads. These blisters vary in size and width, with some treatments accommodating pedestrians crossing (refuge islands) such as one located on St Thomas Street at Trafalgar Street (shown in Figure 6.8)

Figure 6.8: Pedestrian Refuge on St Thomas Street

A number of pedestrian crossings are located along Macpherson Street, including a raised crossing at St Catherine's School, a crossing at Lugar Street (shown in Figure 6.9 and crossing at St Thomas Street. All crossings include a median and kerbside blister islands, narrowing the effective roadway at these locations.

Figure 6.9: Pedestrian Crossing with Assorted Blisters (Lugar Street)

7. CANDIDATE 40 KM/H SPEED ZONES

Based on the preliminary assessment of crash data, vehicle speed data, traffic volume data and visual inspections, it was determined that most streets within the study area may be suitable for implementation of a 40km/h speed limit.

A map of the recommended streets is shown in Figure 7.1 below and provided in **Appendix C**.

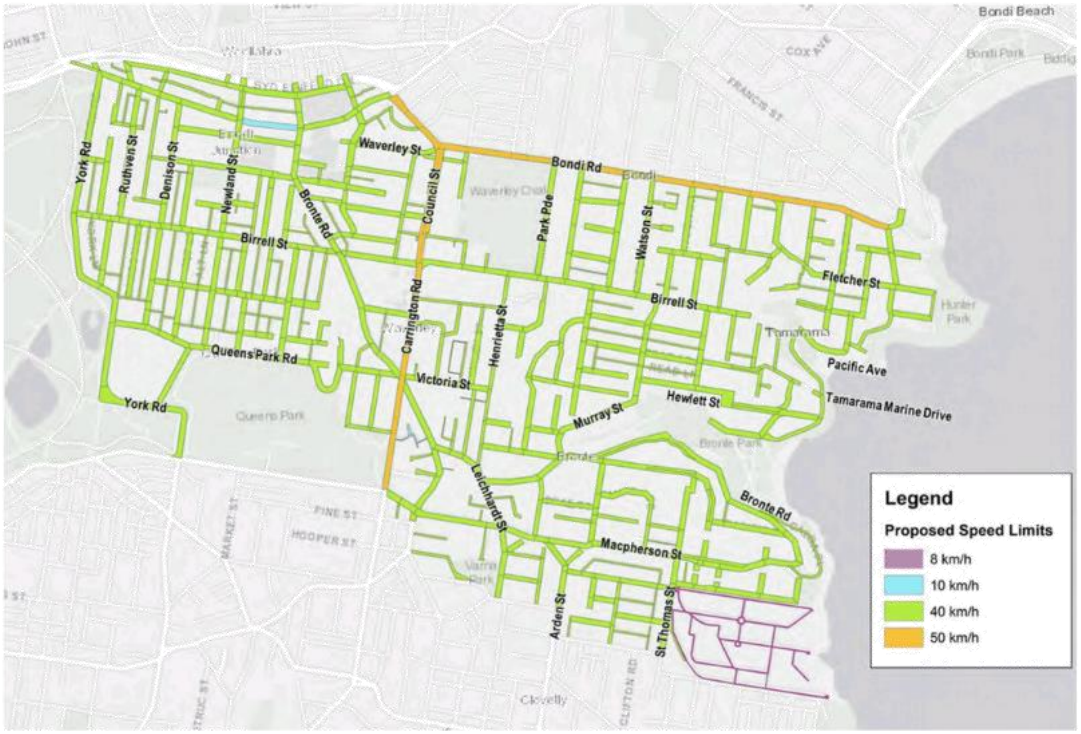


Figure 7.1: Recommended Speed Zones

7.1 LOCAL STREETS

All local streets within residential areas are recommended for conversion to 40km/h Local Traffic Area speed zoning. Some of these streets will require additional LATM devices to reinforce the new speed environment as detailed in Section 9.

7.2 COLLECTOR AND ARTERIAL ROADS

The following 'higher order' roads within the study area have also been identified for further consideration for a 40km/h speed limit:

- **Bondi Road** – see Section 7.2.1 below.
- **Birrell Street** - This local collector road mostly runs through residential areas, with a long school zone near Carrington Road. There are existing LATM devices along Birrell Street in the form of a number of pedestrian refuges, with opportunity to raise existing pedestrian crossings to provide further calming effects on traffic. Furthermore, the crash data highlights that this corridor may benefit from a reduction in speed.
- **Macpherson Street** - This collector road primarily runs through residential areas, with a number of shopping villages located along the roadway and a school zone towards the west. It does not serve as a connecting road from adjacent areas and therefore the introduction of a 40km/h speed limit will not have a significant impact on non-local traffic.
- **Murray Street** - This north-south road connects to a number of residential streets, includes a long school zone and has revealed a casualty crash rate higher than the benchmark rate. Existing LATM treatments may also assist in regulating traffic speeds along some sections.

- **Bronte Road** – whilst carrying a substantial volume of traffic, sections of this road travel through heavily built up areas such as Bondi Junction, through local villages (e.g. Charing Cross) and through residential areas. The crash data also indicates a higher casualty crash rate. A 40km/h speed limit along its full length will avoid inconsistency issues with changes in speed limits in different sections.
- **York Road** – this road carries a substantial volume of traffic however a 40km/h speed limit may be beneficial due to the number of horizontal curves along its length and the presence of a school zone. Residential areas also front York Road towards Birrell Street and Queens Park Road. A number of existing LATM treatments can assist in regulating vehicle speeds along the road way, including pedestrian refuges, kerb blisters and a flat-top road hump with median.

7.2.1 Bondi Road

Bondi Road is noted to be a State Road carrying a substantial volume of traffic each day, acting as a major movement corridor in the Waverley LGA by connecting the Bondi Junction CBD to Bondi Beach. Traffic management procedures are in place along the road to provide additional capacity when required, including tidal 'No Stopping' restrictions and special event clearway conditions (large-scale annual events such as City2Surf). In addition to this, it makes up a significant part of a number of major bus routes in the area, including the 381, 380 and 333.

However, the crash analysis indicates a markedly high amount of crashes along this corridor, showing that a reduction in speed along this roadway could be highly beneficial and potentially reduce the likelihood and consequence of crashes experienced along this corridor. Pedestrian safety is a key consideration as the crash data shows a significant number of crashes involving pedestrians within and surrounding the shopping area along Bondi Road.

It is understood that any proposed modifications (including speed limits and installation of traffic calming treatments) to Bondi Road are subject to approval by Roads and Maritime Services. Due to the unique road environment on Bondi Road and on-going investigations into ameliorating strategies along the corridor, Bondi Road has been removed from the scope of this study.

7.2.2 Exclusions to the 40km/h Speed Limit

Roads within the study area that are not recommended for implementation of a 40km/h speed limit are:

- **Carrington Road** - This State road is a major north-south connecting road through the study area, carrying a substantial volume of traffic. It connects neighbouring areas (i.e. Randwick LGA) to Bondi Junction and onwards to the City via Syd Einfeld Drive, with a current speed limit of 50km/h.
- **Council Street** – Council Street is a continuation of Carrington Road north of Birrell Street and exhibits similar conditions to Carrington Road.
- **Bondi Road** – see Section 7.2.1.

7.3 40KM/H ZONE TYPES

A breakdown of the different types of proposed 40km/h speed limits is mapped in Figure 7.2. Mapping of 40km/h zone types is also provided in **Appendix C**.

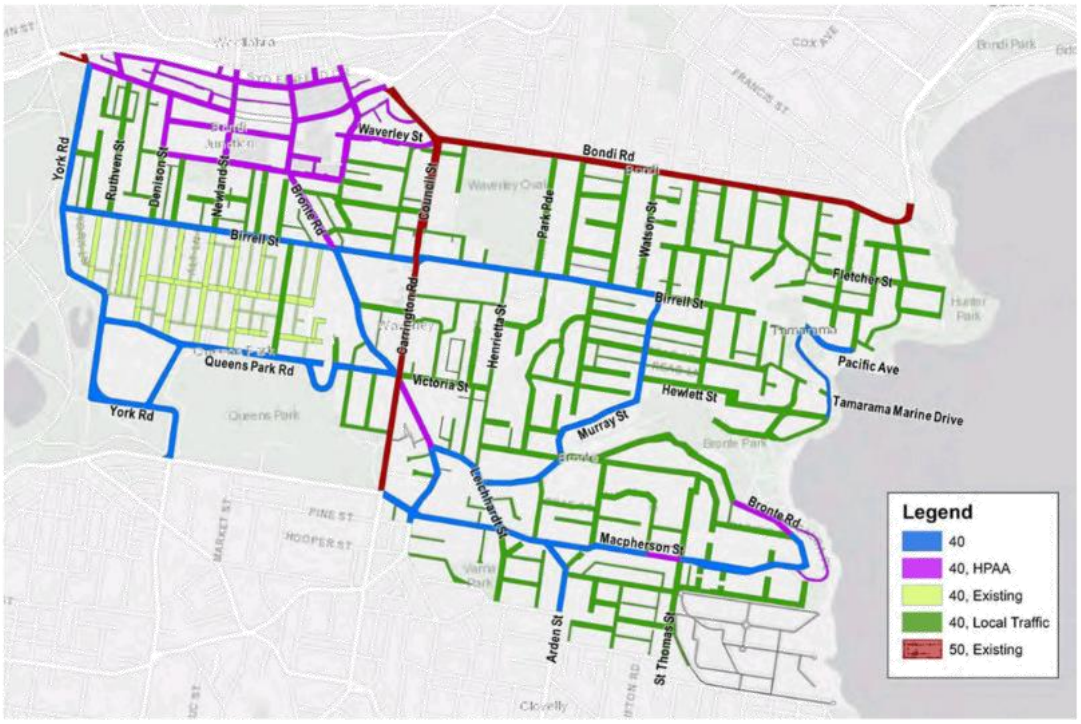


Figure 7.2: Proposed 40km/h Zone Type Breakdown

7.3.1 40km/h Local Traffic Areas

Local roads within residential areas and those that have traffic volumes of 5,000 vehicles per day or less qualify under the Local Traffic Area definition. These roads need to be clearly signposted on entry, with 'end' signage located at the exit of each street onto a 'non-local traffic area' road.

7.3.2 40km/h High Pedestrian Activity Areas

Sections of road which experience high levels of pedestrian activity can be classified as High Pedestrian Activity Areas (HPAAs). A 40km/h speed limit is enforced within HPAAs as a means of reducing the severity of pedestrian-vehicle conflicts. A warrant must be met prior to the installation of a HPAA, outlined in *40km/h speed limits in high volume pedestrian areas* (Roads and Maritime Services).

Calga Place is an existing HPAA adjoining Bronte Road (see Section 3.3.1).

An assessment of these warrants for specific locations is outlined in Table 7.1.

Table 7.1: HPAA Warrants

Location	Category A	Category B	Category C	Criteria Satisfied
Bronte Road *Between Victoria Street and Albion Street*	n/a	Servicing a small shopping strip less than 1km	Servicing a restaurant area Adjacent to a social security office or medical centre	One item from Category B. Two items from Category C.
Macpherson Street *Shops west of St Thomas Street*	n/a	Servicing a small shopping strip less than 1km	Servicing a restaurant area Adjacent to a social security office or medical centre	One item from Category B. Two items from Category C.
Bronte Road *Bronte Village*	n/a	Servicing a small shopping strip less than 1km	Adjacent to a recreational area/beach or park Servicing a restaurant area	One item from Category B. Two items from Category C. **See Note 1 below**
Bondi Junction CBD *(see map)*	Servicing a business or commercial area	n/a	n/a	One item from Category A.
Pacific Avenue and Tamarama Marine Drive *Adjacent to Tamarama Beach*	n/a	n/a	Adjacent to a recreational area/beach or park	n/a **See Note 2 below**

Note 1: Detailed assessment of Bronte Village (near the bus interchange adjacent to Bronte Beach) is subject to a separate traffic study.

Note 2: Pacific Avenue and Tamarama Marine Drive adjacent to Tamarama Park and Beach do not meet the full requirements for a High Pedestrian Activity Area. However, a very high level of pedestrian activity was observed during site visits to the area, owing to the nearby beach and the fact that the road section comprises part of the popular Bondi to Bronte Coastal Walk. It is further noted that there is no road verge between the footpath and roadway, minimising pedestrian-vehicular separation. For these reasons, it is recommended to consider a reduction in speed limits along this section of the two streets to improve pedestrian safety in the area.

7.3.3 40km/h Collector Roads

A number of roads have been included despite not having qualified as a Local Traffic Area or High Pedestrian Activity Area due to higher traffic volumes or other factors. These roads are primarily collector roads within each zone, including Queens Park Road, Macpherson Street and Murray Street. While it is acknowledged that these roads do not meet the requirements for the standard types of 40km/h speed zones (local traffic areas, HPAAs or school zones), it is noted that they would benefit with the implementation of a lower speed limit.

The use of 40km/h speed signage, including '40 Area' and associated 'end' signage is required to be installed where a road connects to a road of a different type of speed limit. This includes interfaces between local traffic area side streets and local collector roads, even if both streets feature the same speed limit. Repeater signs are also to be located at suitable intervals along the roadway.

8. STAGE 1 INVESTIGATION SUMMARY

The investigation and review of traffic conditions within the study area indicates that there is an opportunity to implement a 40km/h speed limit across most of the study area covering the suburbs of Bondi Junction, Bondi, Bronte, Tamarama, Queens Park, and Waverley.

Key findings from the preliminary study and detailed site investigations include:

- Crash data shows a total of 490 crashes recorded within the study area over a five-year period, with 66% of crashes resulting in an injury, and 44% involving a vulnerable road user
- Two crashes resulted in fatalities and involved pedestrians
- Key roads in the study area such as Bondi Road, Bronte Road, Carrington Road and Oxford Street showed high casualty crash rates
- Many of the streets within the study area show casualty crash rates (expressed in casualties per year per km) higher than benchmark casualty rates for urban roads with a 50km/h speed limit
- Surveyed traffic volumes reveal many local streets do not exceed the recommended 5000vpd AADT for local residential streets and may be suitable for implementation of a Local Traffic Area scheme. Many of these areas are already signposted as Local Traffic Area
- Some roads which carry greater than 5,000 vehicles per day may still be suitable for implementation of a 40km/h speed limit due to their crash history, surrounding land use or levels of pedestrian/cycling activity
- Speed surveys also show many local streets already exhibit a slow speed environment and are suitable for application without further treatment. However, 85th percentile speeds of some local streets indicate vehicles travelling at the current posted speed of 50km/h and would require further traffic calming measures to enable a self-enforcing 40km/h speed zone
- Site visits revealed there are already several local area traffic calming devices and road treatments that facilitate a lower speed environment along certain roads within the study area
- The recorded speeds indicate that most local streets may not need further traffic calming measures to create self-regulating speed environments
- Traffic management devices should be provided along key corridors where road geometry and speed data indicate control of vehicle speeds is required.

The outcome of Stage 1 of this study necessitates an exploration of options for infrastructure and speed signage across the proposed 40km/h areas. These will primarily include different types of physical traffic calming devices and road signs to indicate changes in speed and road condition.

9. SPEED ENVIRONMENT TRAFFIC MANAGEMENT

9.1 INTRODUCTION

The implementation of a 40km/h speed limit must take into account the control and enforcement of the lower speed limit. The speed data analysis undertaken in Section 5 identified existing vehicle speeds at key locations within the study area. As the existing speed limit through most of the study area is currently the default urban 50km/h speed limit, it was determined that 85th percentile vehicle speeds of under 43km/h indicated road environments which naturally inhibited vehicle speeds (travel lane widths, kerbside parking, existing traffic calming infrastructure, etc.). These streets were therefore suitable for a reduced speed limit, provided drivers are made aware of the change in speed limit via signage, without further implementation of any physical treatments.

However, certain streets (and street sections) were found to report 85th percentile traffic speeds in excess of 43km/h, up to over 50km/h. The physical geometry and environment of these streets were hence acknowledged as allowing drivers to travel at speeds in excess of the limit if not controlled. Examples of these road conditions include downhill gradients, long and straight sections, and wide roadways. For these locations, a successful implementation of a 40km/h speed zone must also be supported by installation of appropriate traffic calming road treatments to help create a self-enforcing and self-regulating 40km/h speed limit.

Stage 2 of this speed review study details the rationalisation in design and implementation of the various road treatments to assist in creating a self-enforcing 40km/h speed limited environment.

Figure 9.1: Narrow street with parking on both sides

9.2 RELEVANT GUIDELINES

As part of the development of various road treatments in this stage of the speed limit review, the following documents have been reviewed and referred to for the selection and design of appropriate road treatments across the study area:

- NSW Speed Zoning Guidelines
- Austroads Guide to Traffic Management: Part 8 – Local Area Traffic Management
- STA Bus Infrastructure Guidelines
- NSW Bicycle Guidelines
- Relevant Roads and Maritime Technical Directions
- Australian Standards AS1742.2

A summary of some of the most relevant guidelines is provided in the sections below.

9.2.1 Austroads Guide to Traffic Management

Austroads Guide to Traffic Management Part 8 – Local Area Traffic Management was the primary reference consulted for this study for specifications on traffic calming devices and their usage.

9.2.2 NSW Bicycle Guidelines

The *NSW Bicycle Guidelines* outline specifications and general arrangements of bicycle infrastructure and road treatments related to cycling. In general, flat top road humps are suitable for installation on local streets without formal cycling infrastructure.

If there are marked bicycle or shoulder lanes, any physical treatments aiming to slow vehicles down should not encroach on the cycle area to avoid 'pinching' the flow of vehicular and bicycle traffic. It is recommended that cycle lanes should instead bypass or be directed around the traffic calming device.

9.2.3 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. The specifications are summarised in Table 9.1.

Table 9.1: STA Bus Flat Top Road Hump Specifications

Infrastructure	Design Aspect	Specification
Flat Top Road Hump	Height	Max 75mm
	Platform Length	Max 5.5m
	Ramp Gradient	Max 1:16
	Travel Lane width	3.5m
Lane Width	Kerbside Parking Lane	3.0m
	Kerbside Travel lane	3.5m
	Non-Kerbside Travel Lane	3.2m
Speed Cushions	Width	Max 1.6m
	Height	Max 75mm
	Offset	1m from median or kerb blisters
Road Narrowing	Lane Width (Barrier Kerb)	3.5m
	Lane Width (Semi-Mountable Kerb)	3.2m

9.3 PRELIMINARY INVESTIGATION

A preliminary investigation was undertaken at a high level to determine recommended treatment locations. This was conducted at as a high level analysis, and focused on potential locations which could benefit from additional traffic calming infrastructure.

Streets that were found to have 85th percentile speeds exceeding 43 km/h were assessed via site investigations to determine the suitability of, and requirements for LATM treatments. The site investigations also determined suitable location of potential treatments based on observations of traffic conditions, road use behaviour and the local environment context.

Figure 9.2 details the identified preliminary treatment locations, with a total of 65 treatment locations across the five zones in the study area.

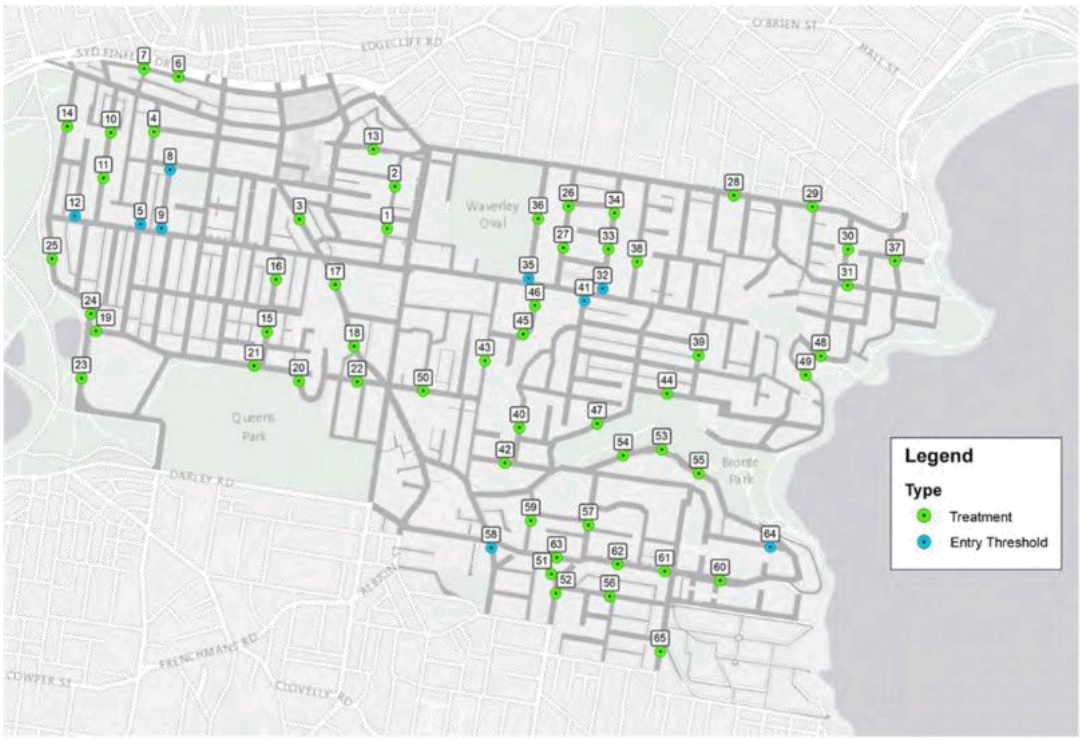


Figure 9.2: Potential Treatment Locations

Furthermore, the existing speed signage across the study area was evaluated as a part of the preliminary investigation. Existing signs, road markings and line marking contrary to the recommended 40km/h speed limit would need to be replaced or removed. A number of existing Local Traffic Area (50km/h), End School Zone (50km/h) and 50km/h repeater signs were identified for replacement with corresponding 40km/h variants.

Detailed investigations for both road treatments and speed signage were undertaken following this preliminary stage.

10. ROAD TREATMENTS

10.1 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, particularly along local residential streets and activity areas.

The primary objective of such road treatments 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 driving behaviour on that street. This also aims to reduce traffic volumes and speeds in local streets to increase amenity, liveability, and improve safety and access for all road users. General implementation of road treatments and traffic calming are considered in the context of road safety.

The need for an LATM device or traffic calming measure 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. Waverley People Movement and Places).

10.2 EXISTING TREATMENTS AND INFRASTRUCTURE

To gain an understanding of the types of road treatments and traffic calming devices already in place within the Waverley LGA, site visits were conducted as part of the Stage 1 investigation. The investigation found a variety of traffic calming devices already in use within the study area, including:

- Single flat top road humps
- Split flat top road humps with medians
- Entry thresholds
- Raised pedestrian crossings
- Slow points (chicane)
- Median treatments / Splitter islands
- Pedestrian refuges
- Contrasting pavement treatments
- Edge line marking.

These existing traffic calming treatments formed the basis of proposed treatments as part of creating a self-enforcing 40km/h speed limit road environment. Examples of existing traffic calming treatments are shown in Figure 10.1.

From Top to bottom, left to right: Entry threshold with cycle lanes, Split flat top road humps with medians, Pedestrian refuge, Entry Threshold with landscaped blisters and concrete median, Slow point with landscaped blisters, and Raised pedestrian crossing with blisters.

Figure 10.1: Examples of existing traffic calming treatments

The point locations of existing traffic management infrastructure within the study area were mapped out from data provided by Waverley Council, shown in Figure 10.2.

Figure 10.2: Existing Traffic Calming Treatments

It was noted that a significant number of the existing devices are located in Zone 2, the Queens Park region. This is expected due to the existing 40km/h Local Traffic Area between Queens Park Road and Birrell Street. These devices manage the speed environment within the area consistent with the speed limit. The majority of treatments are raised thresholds at the entries to the LTA from each side as well as at intermediate points along the longer connecting roads. There are also a number of slow points on Denison Street and Ashton Street which further act to regulate the speed of vehicles.

Other notable treatments in the study area include:

- A large number of pedestrian refuges along Birrell Street west of Bronte Road, within the Bondi Junction CBD, and along Macpherson Street
- A number of flat-top road humps along Murray Street between Bronte Road and Birrell Street
- A number of entry thresholds off local side streets in Zone 3 (including Jackaman Street, Tasman Street and Tamarama Street) where they interface with Birrell Street
- A series of humps along Calga Place acting as dedicated traffic calming devices through the Bronte Cutting car park area.

10.3 PROPOSED TREATMENT TYPES

For the purpose of creating self-enforcing 40km/h speed limited streets, 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* and those found in the previous investigation were used as a basis for developing a list of suitable devices that could be used. These are to accompany the implementation of a 40km/h speed limit in the study area:

- Entry thresholds
- Flat top road humps
- Raised Pedestrian Crossings
- Speed cushions
- Slow points
- Road narrowing / Kerb blisters
- Refuge islands
- Median / Splitter islands
- Line marking (edge line and/or centreline).

Detailed descriptions of these treatments are provided in the following sections.

10.3.1 Physical Devices

Entry thresholds

Entry thresholds provide a physical and visual gateway to a local street and assist in slowing traffic both entering and exiting the residential area. These treatments provide a vertical deflection of vehicles via flat top speed humps located at the entry of a local street from a collector road.

Width permitting, this treatment can also incorporate kerbside blisters (two-sides or one) and/or median blister. The kerb blisters and median present an opportunity to introduce landscaped elements to the treatment which may enhance the local streetscape or suit the context of the local street. Landscaped variations of this treatment would further highlight the change in road conditions at the start of these streets and provide a visual gateway for drivers entering and exiting.

Based on our understanding of the local area, landscaped versions of entry thresholds are preferred. Best examples of landscaped designs contributing to the aesthetic of the local area are those observed in Bondi Junction and Queens Park.

As these are placed near or at the intersection, they may impact turning movements of larger vehicles (i.e. heavy vehicles) by restricting the roadway width. For this reason, this type of treatment is not recommended for roads with a bus route.

Entry threshold design can be varied to accommodate bicycles, varying road widths and road geometries. It can also provide an improvement to the local streetscape by introducing landscaped elements.

Flat-top Road Humps

Flat-top road humps perform the same function as speed humps along a section of road by reducing traffic speeds through the means of a vertical deflection. This type of treatment is generally more visually appealing than a standard speed hump (Watts profile or other) and blends in easier with the local road environment.

A flat-top road hump is a raised surface approximately 75–150 mm high, typically with a 2 to 6 m long platform ramped up from the normal level of the street. The raised section (or platform) is flat instead of being curved as is the case with a (round profile) road hump.

While the width of a flat-top road hump varies depending on the road geometry, they typically cover the full width of the road, thereby preventing drivers from attempting to navigate around them. To accomplish this, width permitting, flat-top road humps can also incorporate kerbside blisters (two-sides or one) and/or a median blister into their design. The kerb blisters and median present an opportunity to introduce landscaped elements to the treatment which may enhance the local streetscape or match to the context of the local street.

Care needs to be taken not to locate flat-top road humps in the vicinity of pedestrian thoroughfares, as pedestrians may incorrectly perceive the presence of such devices as pedestrian crossings. Unlike crossings, pedestrians do not have priority over vehicular traffic across a flat-top road hump. Kerb ramps and pedestrian refuges should not be incorporated in the design and if possible, pedestrian footpaths should be physically separated from the device through the application of landscaping or other means.

Landscaped kerb blisters provide additional road narrowing at a road hump and are more attractive than plain concrete blisters. Blisters can assist with distinguishing the treatment from a raised crossing or continuous footpath, deterring pedestrians from using the platform as a crossing.

The design of a flat-top road hump can be varied to accommodate different road widths, geometries and utilisations (bicycles and buses). Treatments implemented along bus routes are to follow the relevant specifications outlined in Table 9.1 (see section 9.2.3).

Advantages of flat-top road humps include:

- A significant reduction in vehicle speeds in the vicinity of the device
- A significant reduction in road crashes
- They are relatively low cost to install and maintain, but not as low as a Watts profile speed hump
- They may discourage through traffic
- When used in a series they regulate speeds over the entire length of the street
- They can be designed to limit discomfort to cyclists
- Effectiveness may be improved by use of kerb extensions and/or median treatments.

Raised Pedestrian Crossings (Wombat Crossing)

Raised pedestrian crossings, also known as 'wombat crossings', are similar to flat-top road humps in terms of traffic calming, but also function as a pedestrian crossing. This type of treatment allows for management of traffic speeds and of pedestrian priority at the crossing locations with the pedestrian crossing located on the flat platform of the road hump.

This type of treatment improves pedestrian safety by raising pedestrians to a level which may be more easily seen by drivers, whilst simultaneously providing traffic calming in that vehicles are required to slow down on approach to the raised crossing. This treatment is best implemented where there is existing pedestrian activity and where an existing crossing is not raised. Implementation at a new location will require a traffic and pedestrian warrant assessment against the relevant Roads and Maritime Services guidelines.

Speed Cushions

Speed cushions are another form of vertical deflection, and are an alternative to full-width speed humps or road humps. In comparison, these devices are often smaller or narrower in width and will slow regular traffic (light vehicles) while allowing vehicles with a wide track (such as buses) to pass over the device without significant interruption to travel. These devices are therefore considered a good option along bus routes.

Individual speed cushions need to be installed in each vehicle lane that requires calming. Depending on the available road width, kerb blisters and/or median treatments can also be incorporated to prevent drivers navigating around speed cushions. Alternatively, if kerbside parking is present, an additional speed cushion may be placed in the kerbside lane, which will allow a vehicle to park over it along the kerbside, but extend the device to the kerb when a parked vehicle is not present.

Slow Points

Slow points are traffic calming treatments that control traffic speeds by providing a horizontal deflection using a series of kerb extensions or blisters on alternating sides of the roadway. A median often accompanies a slow point to demarcate the new centreline, as well as to prevent drivers from driving straight through the middle without substantial horizontal deflection. The roadway is effectively angled at the slow point, channelling vehicles through a chicane in the road. Drivers are forced to slow down while navigating through the slow point, and it provides a disruption to a continuous through movement.

Due to their geometry (staggered kerb extensions / blisters), slow points provide an opportunity for landscaped treatments. This assists with driver visibility of the slow point, and also enhances the visual appearance of the treatment.

However, there are a number of disadvantages in implementing a slow point. These treatments require a significant length of road to install, and the kerb extensions / blisters cannot be located such that they block any driveways or roads. Furthermore, there is a considerable impact to on-street kerbside parking, as it is restricted through and near a slow point to ensure that there is sufficient roadway width for the channelling movement.

Road Narrowing – Kerb extensions or blisters

Road or lane narrowing devices involve the narrowing of the trafficable roadway at a single point. This is generally achieved by extending the kerbs width or utilising kerb blisters. Blisters can be positioned with a gap from the kerb to allow uninterrupted drainage channels. When implemented, blisters can also protect on-street kerbside parking.

The installation of road narrowing devices reduces the available width of the road for traveling vehicles, but retains appropriate lane widths to allow for two-way traffic (or one-way traffic on one-way streets). Consequently, on bus routes, kerb blisters are less effective as a 3.5m wide travel lane must be maintained, which is not adequate narrowing to influence the speed of standard vehicles.

Road narrowing devices are often used in conjunction with other treatments such as the aforementioned entry thresholds and flat-top road humps to provide further traffic calming, enhanced visual demarcation of the devices, and to prevent drivers from navigating around the device.

10.3.2 Visual Devices

Edge and Centre Line Marking

The implementation of edge line marking provides a visual treatment to roadways where physical devices may not be appropriate, such as along bus routes, roads of relatively high traffic volumes, or where there are road geometry constraints.

Edge line marking can provide a visual narrowing of the roadway such that drivers perceive a narrower travel lane and adjust their driving behaviour accordingly. It also assists in delineating road components such as cycle lanes and kerbside parking.

Centre line marking can accompany edge line marking on two-way roads and is most suited around curves or bends in a roadway. By demarcating the centreline of the road, the marking provides a visual indication of the available space, and can result in drivers being less comfortable with driving partially within the other lane.

As it is not a physical device, edge line marking is not as intrusive as other treatments, and can be installed with relative ease without concerns on obstructing driveways or impacting parking.

However, a line marking treatment may not be suitable for overly wide roadways as it has an adverse effect by delineating a clear travel lane.

Line marking – contrasting pavement

Contrasting road marking will highlight the change in road conditions to drivers. This type of treatment is mostly used at the start of a high pedestrian activity area or areas of high bicycle traffic.

An example of this type of treatment is located on Campbell Parade in Bondi Beach. A yellow hexagonal pattern is imprinted across the roadway at the entries and exits to the Bondi Beach High Pedestrian Activity Area. This provides a visual and tactile warning of the new speed area and presence of pedestrians.

Other treatments include a pink paint/surface treatment as seen on road humps and raised entry thresholds throughout the Waverley LGA.

10.4 STANDARD TREATMENTS

A number of standard treatment options are proposed for installation across the study area. These traffic calming devices are identified as being appropriate for the context of the zone and can assist in creating a self-enforcing 40km/h speed environment. These are outlined in Table 10.1.

Table 10.1: Proposed Standard Traffic Calming Treatments

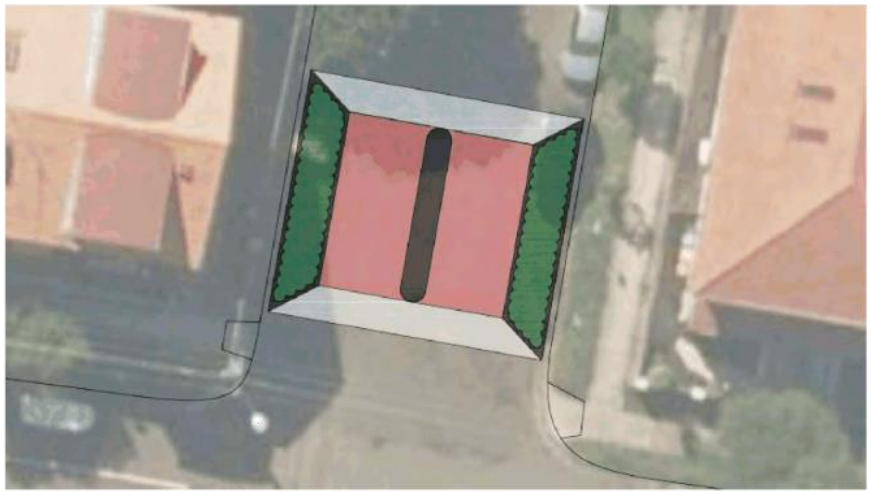
Infrastructure	ID	Description
Raised Entry Threshold	1	Standard raised entry threshold
	2	Entry threshold with centre median island and kerb blisters (landscaping)
	3	Entry threshold with cycle lane
Flat-top Road Hump	4	Standard flat top road hump
	5	Flat top road hump with pedestrian crossing (wombat crossing)
	6	Flat top road hump with cycle diversion (landscaping)
	7	Flat top road hump with centre median island and kerb blisters (landscaping)
Speed Cushion	8	Standard speed cushion(s)
Road Narrowing	9	Kerb blisters (landscaping)
Median Treatments	10	Pedestrian refuge
	11	Median / Splitter island
Slow Point	12	Chicane (landscaping)
Line marking	13	Edge line marking (with optional centre line marking)
Contrasting Threshold	14	Standard contrasting threshold

Each standard treatment is summarised with example concept designs in Table 10.2, with concept design plans presented in **Appendix D**

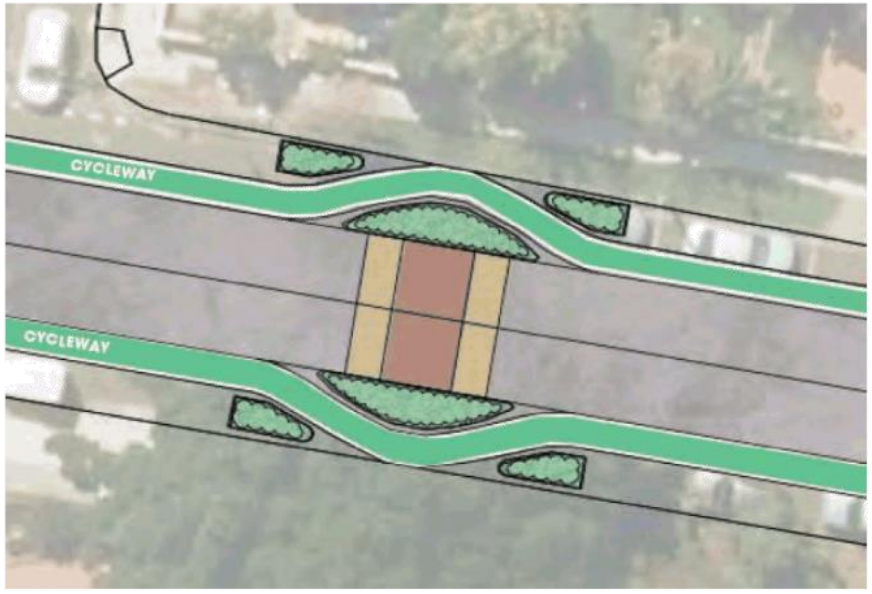
10.4.1 Design Notes

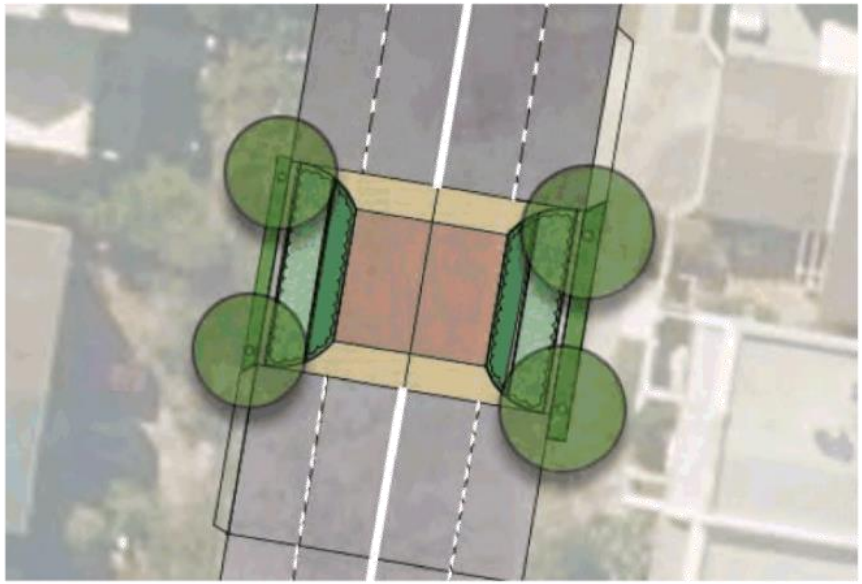
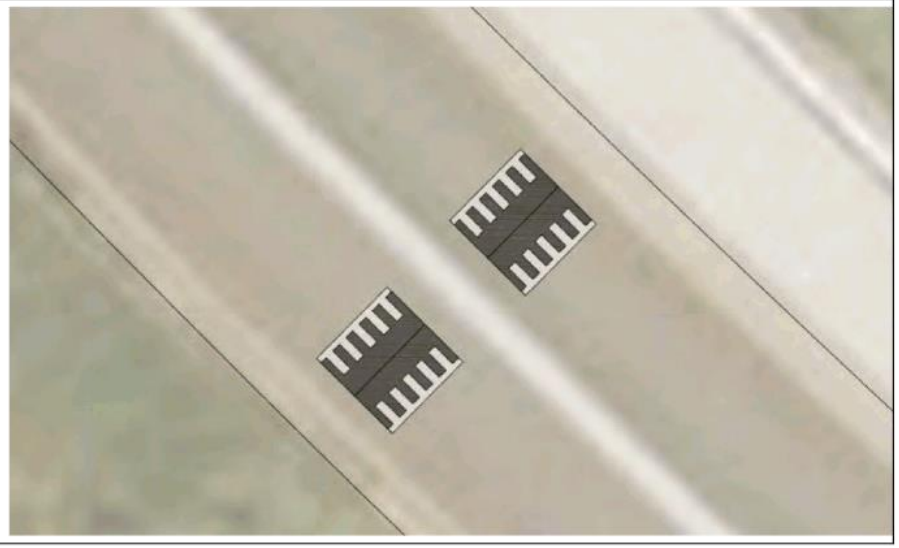
It should be noted that most of these devices are highly variable in dimension and shape and can therefore be adapted to the contextual surroundings to accommodate existing infrastructure at implementation sites.

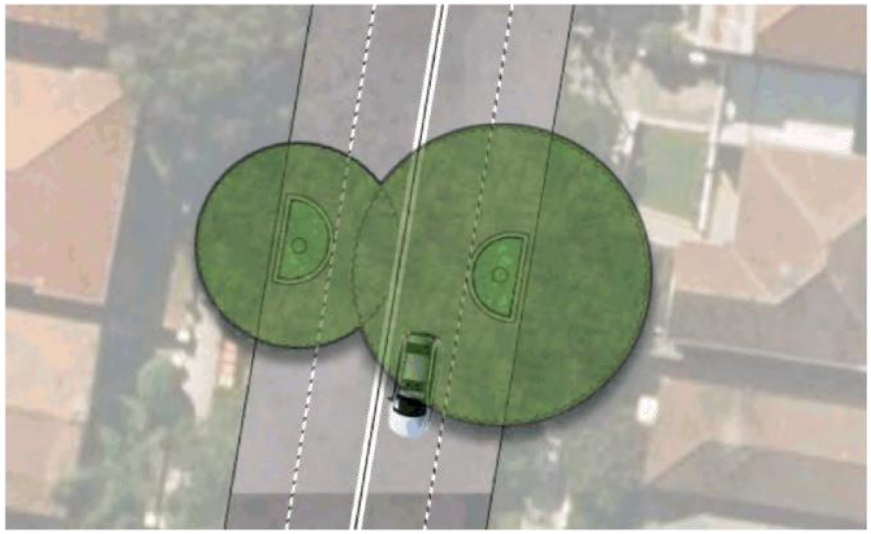
Table 10.2: Standard Road Treatments – Description and Concept Designs

Type	Description	Summary	Concept Plan
Raised Entry Threshold	**Standard Treatment 1** Standard raised entry threshold	This proposed treatment is the basic entry treatment, featuring a contrasting flat top road hump located towards the end of a local street. It does not feature kerb blisters or a median element and is preferred to be used on narrow local streets.	
	Standard Treatment 2 Entry threshold with centre median island and kerb blisters (landscaping)	This treatment takes the standard entry threshold treatment and adds the following items: ▪ Kerb blisters with landscaped elements ▪ Landscaped or concrete median where width allows. The landscaped elements increase the effectiveness of slowing vehicles by further narrowing the roadway. They also prevent pedestrians crossing on the platform, improve the local streetscape and enhance the gateway-like treatment to a local street.	

Type	Description	Summary	Concept Plan
	Standard Treatment 3 Entry threshold with cycle lane	This treatment is a variant on the standard entry threshold treatment with the following elements: ▪ Road level cycle lanes ▪ Kerb separation between the cycle lane and traffic lane. This design takes cyclists into consideration, allowing bicycles to continue travel without traversing the platform (deflecting upwards). The kerb separator increases cycling safety by deterring vehicles to use the cycle lane to go around the platform. This design can be similarly used mid-block on a street with a cycle lane.)	
Flat-top Road Hump	**Standard Treatment 4** Standard flat top road hump	This proposed treatment is the basic road hump treatment, featuring a contrasting raised platform spanning the width of the roadway. It does not feature kerb blisters or a median element and is preferred to be used on narrow local streets or where kerbside parking is to be maintained. This treatment can be designed to incorporate buses where necessary.	

Type	Description	Summary	Concept Plan
	Standard Treatment 5 Flat top road hump with pedestrian crossing (wombat crossing)	This proposed treatment features a pedestrian crossing on a raised platform, similar to the standard flat top road hump. This treatment is proposed to be installed at existing crossing locations to increase pedestrian safety and slow traffic. This treatment can be designed to incorporate buses where necessary.	
	Standard Treatment 6 Flat top road hump with cycle diversion (landscaping)	This treatment is a variant on the flat top road hump treatment with blisters, adding the following elements: ▪ Road level cycle lanes around the platform ▪ Blister separation between the cycle lane and traffic lane. This design takes cyclists into consideration, allowing bicycles to continue travel without traversing the platform (deflecting upwards). The blister separator increases cycling safety by physically separating vehicles and preventing vehicles to divert around the platform into the cycle lane. Landscaped elements also enhance the local streetscape.	

Type	Description	Summary	Concept Plan
	Standard Treatment 7 Flat top road hump with centre median island and kerb blisters (landscaping)	This treatment takes the standard flat top road hump and adds the following elements: ▪ Kerb blisters with landscaped elements ▪ Landscaped or concrete median where width allows. The landscaped elements increase the effectiveness of slowing vehicles by further narrowing the roadway. They also prevent pedestrians crossing on the platform, improve the local streetscape. Additional landscaping on the kerbside is optional.	
Speed Cushion	**Standard Treatment 8** Standard speed cushion(s)	This treatment involves the installation of plastic speed cushions within each travel lane. It primarily targets light vehicles. Vehicles with wide tracks (such as buses) may traverse the cushions with little deflection. Where possible, a median kerb should be incorporated to deter vehicles from crossing the centreline to avoid the cushions. Additional cushions may be placed in kerbside parking lanes where parking is to be maintained.	

Type	Description	Summary	Concept Plan
Road Narrowing	**Standard Treatment 9** Kerb blisters (landscaping)	This treatment slows traffic by reducing the allowable travel width of the roadway. Kerb blisters are to be offset from the kerb line to allow for drainage. It is preferred to incorporate landscape elements to deter pedestrians from using the narrow point as a crossing. Where possible, existing trees should be incorporated to minimise impact to parking. The shape and size of blisters around trees may be modified with advice by an Arborist.	
Median Treatments	**Standard Treatment 10** Pedestrian refuge	This treatment features a concrete median island with a gap to allow for pedestrians crossing the road. It should be implemented where pedestrian crossing movements are to be accommodated. Design of refuge islands will be required to conform to Roads and Maritime guidelines.	

Type	Description	Summary	Concept Plan
	Standard Treatment 11 Median / Splitter island	This treatment features a concrete median island on the approach to an intersection with the objective of creating a horizontal deflection. Splitter islands may also be used mid-block.	
Slow Point	**Standard Treatment 12** Chicane (landscaping)	This treatment features a series of kerb blisters and a median to slow down traffic. The staggered landscaped elements divert the flow of traffic, forcing drivers to navigate through the slow point at lower vehicle speeds. This option will impact kerbside parking and is not preferred on high volume streets	

Type	Description	Summary	Concept Plan
Line Marking	**Standard Treatment 13** Edge line marking (with optional centre line marking)	This treatment provides a visual narrowing of the roadway by implementation of white edge line marking between the kerbside parking lane and travel lanes. It may be used in conjunction with a centreline where width allows, however may not be as effective. Edge line marking is typically 150mm in width. This treatment may also assist in delineating kerbside parking.	
Contrasting Threshold	**Standard Treatment 14** Standard contrasting threshold	This treatment provides a contrasting visual (and/or tactile) alert to drivers entering a particular road environment, such as a high activity area. It aims to highlight a change in conditions to the driver. Visual treatment may include a painted road surface spanning the width of the roadway. A patterned surface treatment (e.g. hexagonal imprint) will provide a tactile and audio warning to drivers by creating a slight rumble.	

11. TREATMENT CRITERIA

11.1 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 11.1.

Table 11.1: Austroads LATM Toolkit

Measure		Reduce speeds	Reduce traffic volume	Reduce crash risk	Increase pedestrian safety	Increase bicycle safety
Vertical deflection devices (Section 7.2)	Road humps	✓	✓	✓	–	–
	Road cushions	✓	✓	✓	–	✓
	Flat-top road humps	✓	✓	✓	–	✓
	Wombat crossings	✓	✓	✓	✓	✓
	Raised pavements	✓	✓	✓	–	✓
Horizontal deflection devices (Section 7.3)	Lane narrowings/kerb extensions	✓	–	–	✓	–
	Slow points	✓	✓	–	–	–
	Centre blister islands	✓	✓	–	✓	–
	Driveway links	✓	✓	–	✓	✓
	Mid-block median treatments	✓	–	✓	✓	✓
	Roundabouts	✓	✓	✓	–	–
Diversion devices (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 (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	–	✓	–	–	–

11.2 TREATMENT CRITERIA

The information presented within the Austroads LATM selection toolkit and consideration of other road environment elements was used to develop a treatment selection criteria and is presented in Table 11.2.

The criteria includes considerations of the following:

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

Table 11.2: Proposed Treatment Selection Criteria

Number	Type	Details	Reduce Speed	Reduce Traffic Volumes	Reduce Crash Risk	Suitable for High Traffic Volumes	Accommodate Pedestrians	Bicycle Friendly	Bus Route friendly	Parking friendly	Noise Considerations	Wide Road required	Other remarks
1	Entry Threshold	Entry threshold	Yes	Yes	Yes	No	No	-	No	Yes	Yes[16]	No	Basic entry treatment to local road
2		Entry threshold with centre median island and kerb blisters (landscaping)	Yes	Yes	Yes	No	No	-	No	No[9]	Yes[16]	Yes[11]	Opportunity to introduce landscaped elements to enhance streetscape.
3		Entry threshold with cycle lane	Yes	Yes	Yes	No	No	Yes	No	No[9]	Yes[16]	Yes[12]	For roads with existing cycle lanes. Example: Bourke Street, Queens Park
4	Road hump	Flat top road hump	Yes	Yes	Yes	Yes	No	Yes[4]	Yes[6]	Yes	Yes	No	Preferred for lower traffic volumes
5		Flat top road hump with pedestrian Crossing (Wombat Crossing)	Yes	Yes[2]	Yes	Yes	Yes	Yes[4]	Yes[6]	No	Yes	No[13]	Preferred for lower traffic volumes
6		Flat top road hump with cycle diversion (landscaping)	Yes	Yes	Yes	Yes	No	Yes	Yes[6]	No	Yes	Yes[12]	Preferred for lower traffic volumes
7		Flat top road hump with centre median island and kerb blisters (landscaping)	Yes	Yes	Yes	Yes	No	No	Yes[6]	No	Yes	Yes[11]	Preferred for lower traffic volumes
8	Speed Cushion	Speed Cushion	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes[10]	Yes	No[14]	Preferred for lower traffic volumes
9	Road narrowing	Kerb blisters (landscaping)	Yes	No	No	Yes	No	No	No[7]	No	No	Yes	Not to be used on bus routes on a one-way street
10	Median Treatment	Pedestrian Refuge	Yes	No	Yes	Yes	Yes	No[5]	Yes[8]	No	No	Yes	Must conform to Roads and Maritime standards
11		Median/Splitter Island	Yes	No	No	Yes	No	Yes	Yes[8]	Yes	No	Yes	

Number	Type	Details	Reduce Speed	Reduce Traffic Volumes	Reduce Crash Risk	Suitable for High Traffic Volumes	Accommodate Pedestrians	Bicycle Friendly	Bus Route friendly	Parking friendly	Noise Considerations	Wide Road required	Other remarks
12	Slow point	Chicane (landscaping)	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Preferred for lower traffic volumes
13	Line-Marking	Edge line marking (with optional centre line marking)	Yes[1]	No	Yes[3]	Yes	-	-	Yes	Yes	No	Yes[15]	Parking lane width may vary
14	Contrasting Threshold	Contrasting Road Surface Treatment	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	No	Generally to be used for HPAA

Notes:

1. *If travel lane is sufficiently narrowed*
2. *May not be effective at reducing volumes at upgrades to existing crossings*
3. *May effectively reduce kerbside crashes*
4. *Ramps can be designed to be bicycle friendly*
5. *medians/refuges that narrow the roadway are not bicycle friendly*
6. *Flat top road humps can be designed to bus friendly specifications (ref. STA guidelines)*
7. *Bus routes require 3.2m to 3.5m wide travel lane, which will not be an effective road narrowing for regular traffic*
8. *If 3.5m travel lane is maintained*
9. *Entry threshold generally located within no stopping zone. May affect some parking.*
10. *Parking may not be necessarily removed but may make parking difficult where installed kerbside*
11. *Kerb blisters and median are optional where width is sufficient*
12. *Road must be wide enough to include marked cycle lanes*
13. *Crossings may only be placed across two travel lanes, otherwise blisters/kerb extensions required*
14. *More effective on narrow roads. Installation on bus routes require 3.5m travel lane*
15. *Generally applied to wide road*
16. *Treatment located near intersection which may already create an amount of road noise*

12. PROPOSED TREATMENTS AND LOCATION

12.1 PRELIMINARY RECOMMENDATION

A detailed assessment of traffic calming infrastructure and the study area was undertaken to position specific types of treatments at the locations identified in the preliminary investigation (Section 9.3). Appropriate treatment types were selected to fit the road environment at each location via the selection criteria presented in Table 11.2. As a part of this, the recommended locations were re-assessed in terms of required calming, with the key and problematic locations prioritised for treatments.

The preliminary recommended treatments were presented to Council and other stakeholders (representatives from NSW Police Department, Roads and Maritime Services and State Transit Authority) in a meeting during January 2019. Feedback from all parties were taken under consideration to further develop the proposed strategy.

12.2 FINAL PROPOSED TREATMENTS

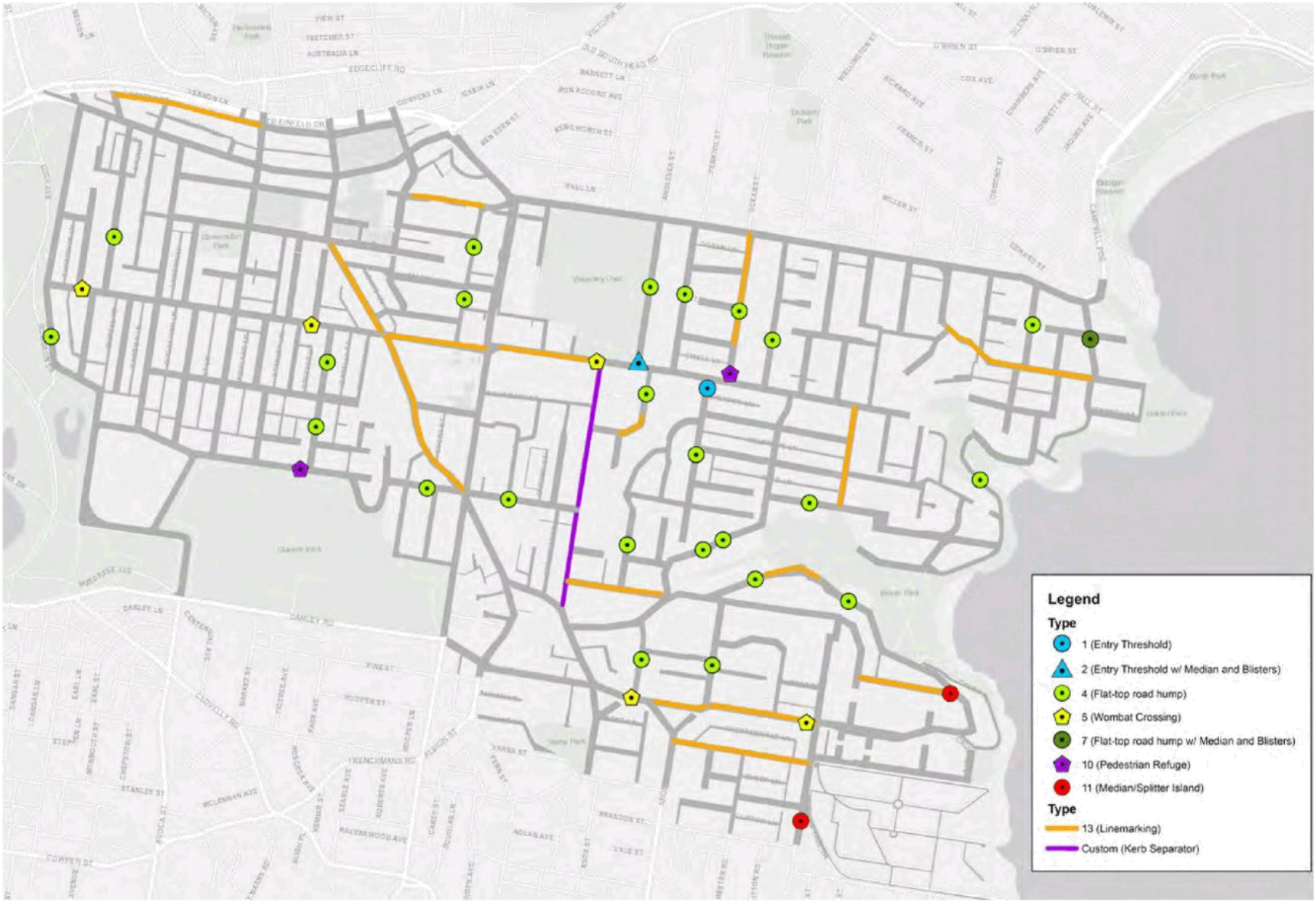
An overview map of the proposed treatments and their locations is shown in Figure 12.1. A detailed zone-by-zone breakdown of the recommended provision is outlined in the following sections.

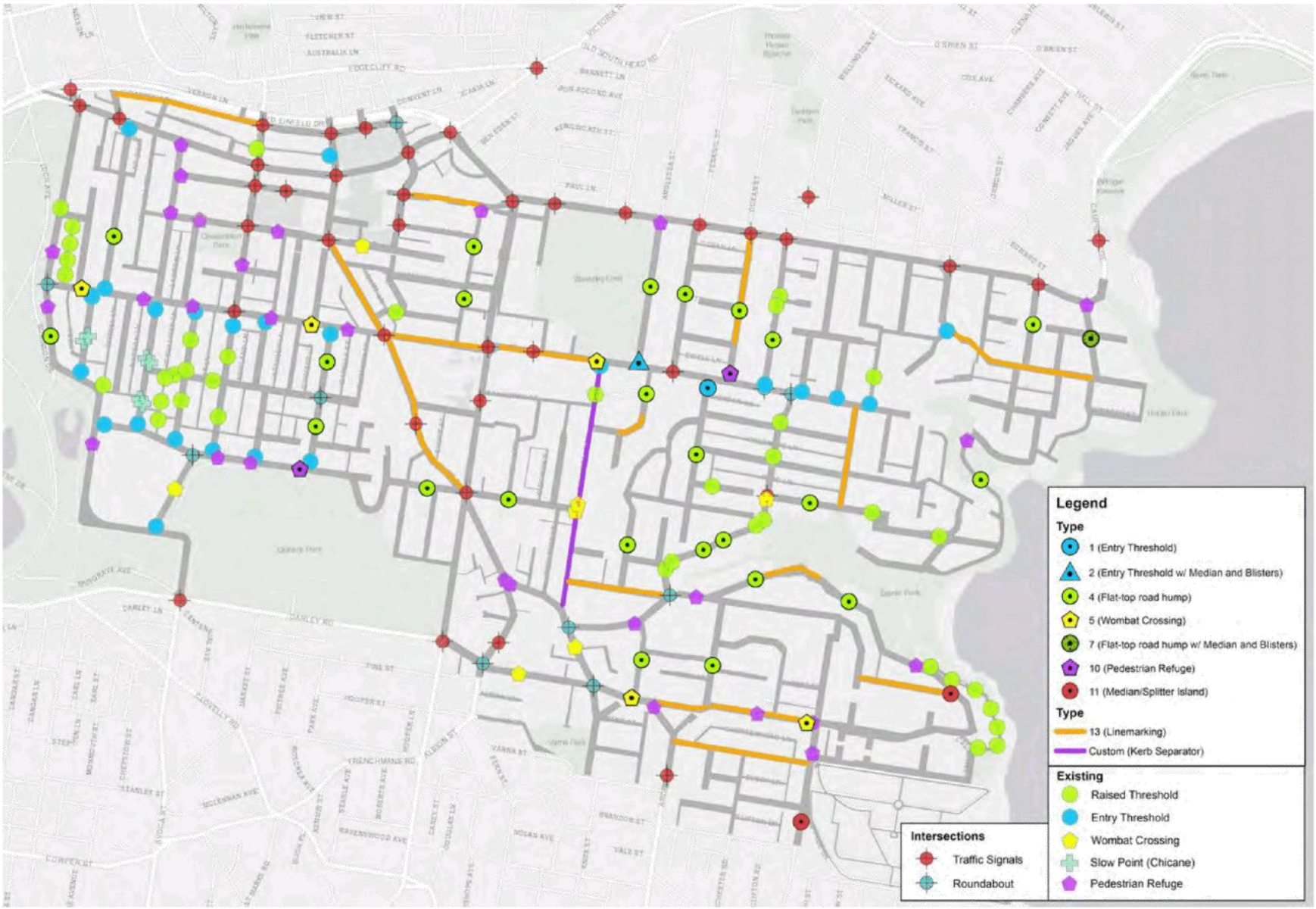
A treatment rationalisation table detailing the proposed treatments, location and rationale for their selection is included in **Appendix E.**

12.3 EXISTING AND PROPOSED TRAFFIC CALMING TREATMENTS

The proposed treatments were overlaid onto the map of existing traffic calming infrastructure within the study area to show the ultimate map of treatments. This demonstrates the comprehensive provision and spacing of treatments throughout the area, as a means of effecting an area-wide calming of traffic speeds. The relevant intersection types (traffic signals and roundabouts) were also identified to show the relative spacing. This map is shown in Figure 12.2.

Detailed treatment maps for each zone and overall are located in **Appendix F.**


Legend
Type
1 (Entry Threshold)
2 (Entry Threshold w/ Median and Blisters)
4 (Flat-top road hump)
5 (Wombat Crossing)
7 (Flat-top road hump w/ Median and Blisters)
10 (Pedestrian Refuge)
11 (Median/Splitter Island)
Type
13 (Linemarking)
Custom (Kerb Separator)


Legend
Type
1 (Entry Threshold)
2 (Entry Threshold w/ Median and Blisters)
4 (Flat-top road hump)
5 (Wombat Crossing)
7 (Flat-top road hump w/ Median and Blisters)
10 (Pedestrian Refuge)
11 (Median/Splitter Island)
Type
13 (Linemarking)
Custom (Kerb Separator)
Existing
Raised Threshold
Entry Threshold
Wombat Crossing
Slow Point (Chicane)
Pedestrian Refuge
Intersections
Traffic Signals
Roundabout

12.3.1 Zone 1

Road treatments vary within Zone 1 due to the mix of local traffic streets near the built-up Bondi Junction CBD area. Existing treatments show a notable amount of pedestrian refuges throughout Bondi Junction and along Birrell Street, as well as entry thresholds on both ends of Ruthven Street. Thompson Lane also has a number of raised concrete thresholds.

A summary of proposed treatments in Zone 1 is as follows:

- Elevation of existing pedestrian crossings to raised pedestrian crossings at two locations: one west of Ruthven Street and one at Brisbane Street
- Flat top road humps mid-block on Ruthven Street and Botany street, to slow down drivers on the long and straight roadways
- Edge line marking where physical treatments were deemed unsuitable, including along Grafton Street, Waverley Street and Bronte Road
- Impacts to on-street parking have been minimised (where possible) where alternative off-street parking may not be readily available.

Treatment types and locations in Zone 1 are shown in Figure 12.3.

Figure 12.3: Treatment Locations – Zone 1

12.3.2 Zone 2

Zone 2 features the existing 40km/h Local Traffic Area (signed as *Zone*), which is accompanied by a significant amount of traffic calming infrastructure. This includes a large number of raised thresholds throughout the area, chicane slow points on Denison Street, and raised entry thresholds on a number of the larger local side streets where they interface with Birrell Street and Queens Park Road. As such, there are only a few proposed treatments in Zone 2, acting to supplement the existing provision.

A summary of proposed treatments in Zone 2 is as follows

- Two (2) new flat top road humps on Bourke Street, at mid-point locations between Queens Park Road / Birrell Street and the Cuthbert Street roundabout
- A flat top road hump on York Road between the road bend and the Birrell Street roundabout to assist with controlling vehicle speeds in the area
- Edge line marking of Bronte Road between Birrell Street and Victoria Street
- A flat top road hump on Victoria Street to slow vehicles on the straight prior to the descent to Queens Park Road (westbound).

Proposed treatment types and locations in Zone 2 are shown in Figure 12.4.

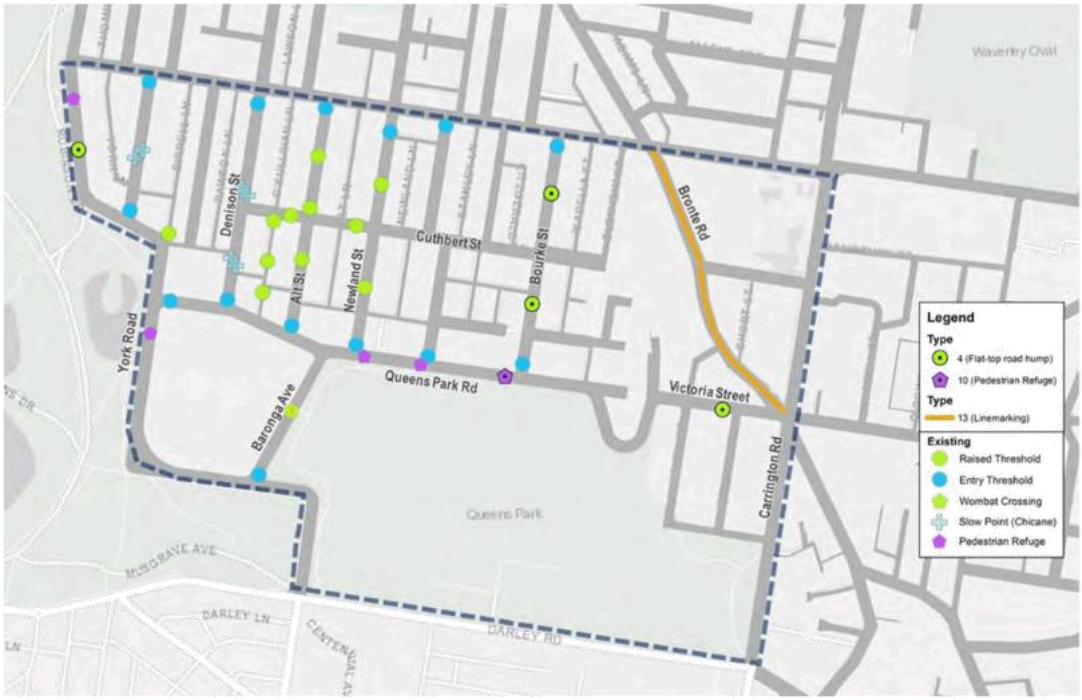


Figure 12.4: Treatment Locations – Zone 2

12.3.3 Zone 3

Road treatments in Zone 3 are primarily applied to local streets connecting Bondi Road and Birrell Street. Entry thresholds are not implemented adjacent to Bondi Road due to the number of signalised intersections.

The existing treatments in Zone 3 primarily comprise of entry thresholds to most side streets interfacing with Birrell Street. There are some exceptions to this, including Park Parade, Bennett Street (traffic signals) and Ocean Street.

A summary of proposed treatments in Zone 3 is as follows:

- A raised entry threshold with median and blisters on Park Parade at Birrell Street
- A pedestrian refuge crossing Ocean Street at Birrell Street
- Flat-top road humps at mid-block locations along the more highly trafficked side streets, including Park Parade, Bennett Street, Ocean Street and Watson Street
- Dudley Street and Sandridge Street are also proposed to be provided with a flat-top road hump to control vehicle speeds, with the latter treatment being a more developed option with kerb blisters and median due to the wider street environment
- Edge line and some centreline marking along Fletcher Street due to road geometry unsuitable for other physical treatments
- Additional edge line marking along Ocean Street and Birrell Street between Carrington Road and Henrietta Road.

It should be noted that Bondi Road has been removed from the scope of this study (see Section 7.2.1). Furthermore, as it is a State classified road, any treatments along Bondi Road will require the explicit approval of Roads and Maritime.

Proposed treatment types and locations in Zone 3 are shown in Figure 12.5.

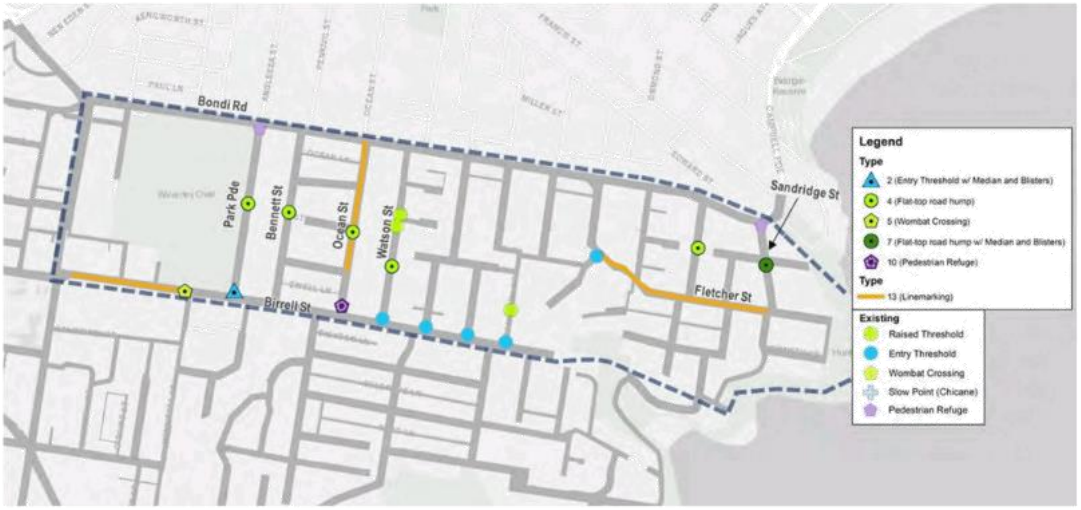


Figure 12.5: Treatment Locations – Zone 3

12.3.4 Zone 4

Road treatments in Zone 4 are located on a number of local streets, with some main collector roads also featuring traffic calming measures.

The existing treatments in Zone 4 are primarily comprised of a number of flat top road humps along Murray Street and Hewlett Street. There are also a number of raised pedestrian crossings, including two on Henrietta Street where the one-way sections meet at Victoria Street.

A summary of proposed treatments in Zone 4 is as follows:

- Flat-top road humps installed at key locations along routes through the zone, including:
  - Local streets such as Victoria Street east of Carrington Road, Langlee Avenue, Brown Street, Dickson Street and Hewlett Street
  - On Murray Street, for increased emphasis on traffic calming due to recorded speeding issues in the area
  - On Tamarama Marine Drive adjacent to the Coastal Walkway.
- A kerb separator along Henrietta Street (both north and south of Victoria Street) to slow traffic and assist in separating contraflow cyclists from the main traffic flow (Council has previously expressed interest in this option)
- An entry threshold on Dickson Street where it interfaces with Birrell Street
- Edge line marking on Langlee Avenue, Alfred Street and Gipps Street due to unfavourable geometry for other treatments.

Proposed treatment types and locations in Zone 4 are shown in Figure 12.6.

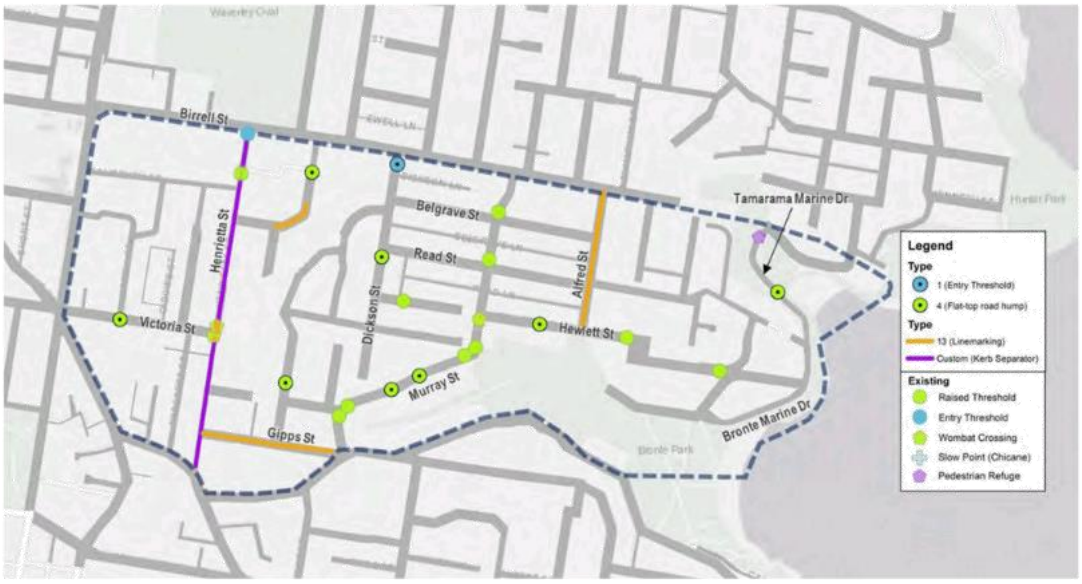


Figure 12.6: Proposed Treatments and Locations – Zone 4

12.3.5 Zone 5

The proposed road treatments in Zone 5 are primarily located along Macpherson Street and Bronte Road, the main collector roads within Bronte.

Existing treatments in Zone 5 include a large number of pedestrian refuges across the zone, including locations on Bronte Road, Macpherson Street and St Thomas Street. A pair of existing pedestrian crossings are also raised. Calga Place (Bronte Cutting) is noted to be provided with a series of raised thresholds for the purpose of slowing vehicles through the car parking and pedestrian walking area.

A summary of proposed treatments in Zone 5 is as follows:

- Upgrade of existing crossings on Macpherson Street to raised pedestrian crossings, including one at St Thomas Street and one at Lugar Street
- Mixture of edge line, centreline and road hump treatments along Bronte Road on approach to Bronte Park (east bound)
- Median treatments on Pacific Street at Bronte Road and St Thomas Street south of Busby Parade
- Flat-top road hump treatments on Lugar Street and Evans Street, which are side roads connecting Macpherson Street and Murray Street, to slow and deter traffic.

It should be noted any treatments along Bronte Road between Pacific Street and Nelson Avenue are subject to the current traffic study at Bronte Village.

Proposed treatment types and locations in Zone 5 are shown in Figure 12.7.

Figure 12.7: Proposed Treatments and Locations – Zone 5

12.4 LOCAL STREETSCAPE CONTEXT

The proposed designs were developed to perform traffic calming functions as well as enhancing the local street environment or blend in with the surrounding streetscape. By providing aesthetically contextual designs, these road treatments would more acceptable to local residents and road users.

As part of the treatment designs, a number of concepts were developed by Group GSA to include landscaped features. The ultimate height of a mature plant controls the appropriateness of use on or near landscaped traffic calming treatments. Aspects which must be taken into consideration when selecting plant species include maintaining clear driver sight lines and overhead obstructions (power lines).

As a part of the development of the landscaped treatment concept designs, Group GSA has reviewed Waverley Council's 'Planting a Footpath Garden Planting List' for the preparation of the Indicative Planting Schedule, to ensure that any species introduced are reflective of the contextual natural life in the area.

A selection of designs has been included in this report to illustrate the treatments and their surrounding street environment. An example of the treatment concept designs at street level are shown in Figure 12.8 and Figure 12.9. The developed concepts are located in **Appendix G.**

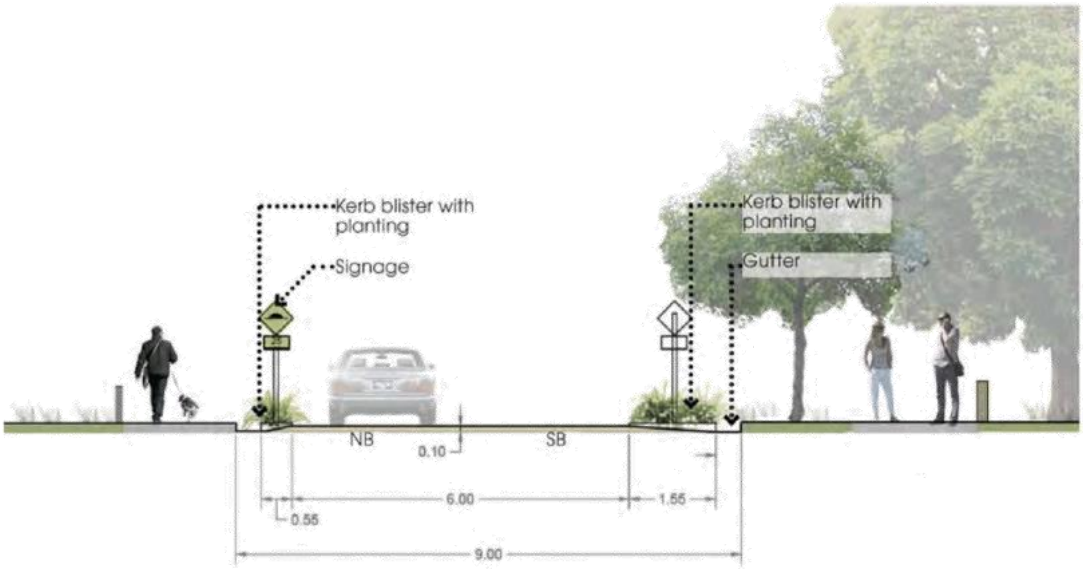


Figure 12.8: Entry Threshold with Landscaped Blisters – Short Section

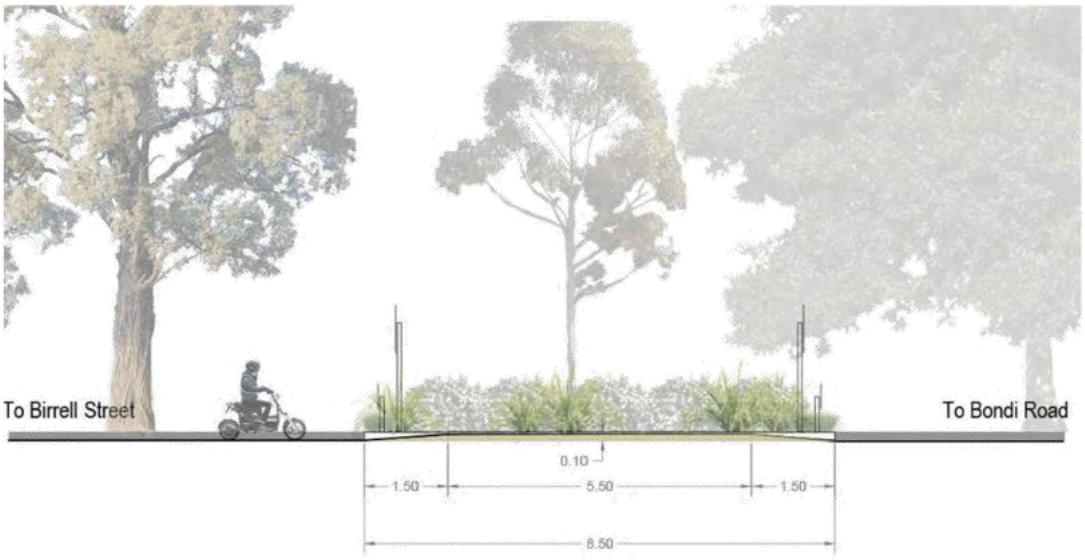


Figure 12.9: Flat Top Road Hump with Landscaped Blisters – Long Section

12.5 IMPACTS TO TRAFFIC

The impacts of each road treatment may vary from location to location, depending on the nature of the roadway. Impacts to traffic may include:

- **Slower speed environments:** This is the primary objective of the traffic calming measures by the creation of self-enforcing slower speed limit streets
- **Travel times of local traffic:** as a result of creating a self-enforcing lower speed limit, travel times across the area may increase as vehicles will be effectively driving slower
- **Re-distribution of local traffic**: drivers who may regularly use local streets as a short-cut or rat-run may no longer prefer to use these streets, reducing the number of vehicles on local residential streets
- **Travel times of buses**: local buses may be delayed or have increased travel times as a result of traffic calming measures along bus routes
- **Cyclist Safety**: certain treatments which narrow the roadway can restrict cycling routes and force merging movements with vehicle traffic, which can be avoided by treatment design
- **Pedestrian Safety:** standard treatments like the flat-top road hump may lead to potential pedestrian conflicts due to them being incorrectly perceived as a crossing device – at locations where this will be an issue, the detailed design should include facilities to restrict pedestrian movement (including pedestrian fencing, kerb blisters, kerbside garden beds, etc.).

Key impacts to bus and cycle routes are further investigated in the sections below.

12.6 BUS ROUTES

Due to the extensive scope of bus routes through the study area, impacts to buses were considered when proposing traffic calming infrastructure. Figure 12.10 below highlights the proposed new treatments which are located on bus routes. Both public and school buses were taken into account when developing the route map.

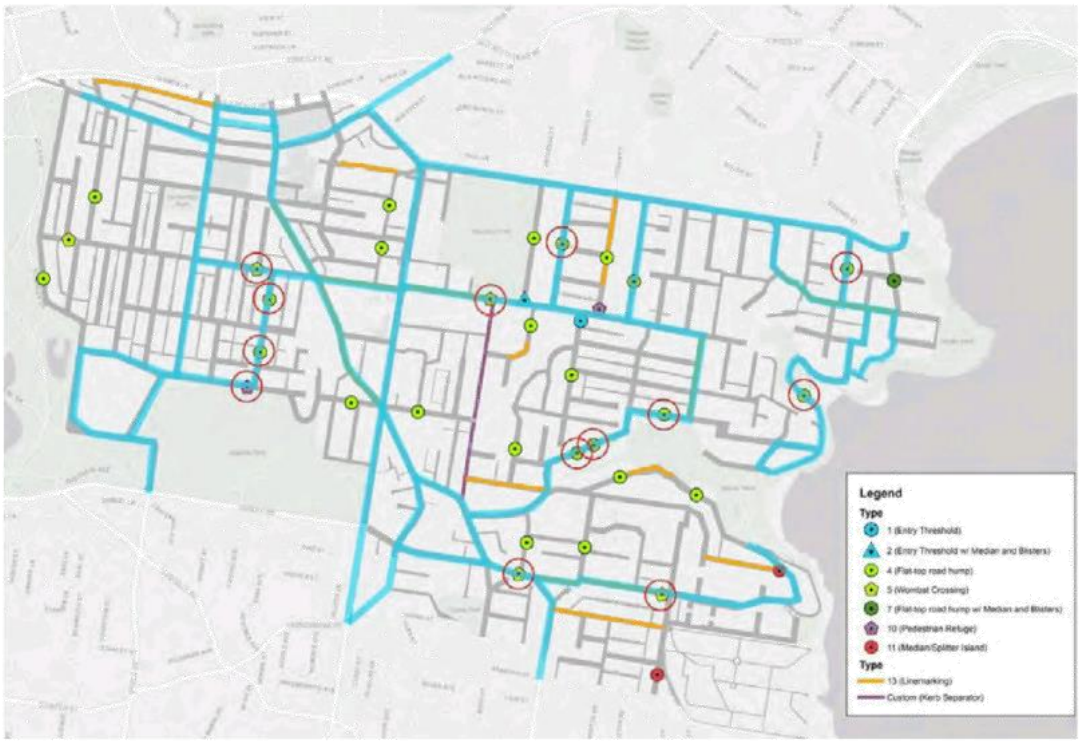


Figure 12.10: Proposed Treatments on Bus Routes

Of the proposed physical treatments, a total of 13 treatments lie on bus routes. These include:

- Eight (8) flat-top road humps
- Four (4) raised pedestrian crossings
- One (1) pedestrian refuge

All flat-top road humps on bus routes must be designed to accommodate bus movements over the platform to satisfy STA Bus Infrastructure Guidelines (see Section 9.2.3), including a shallower rise (maximum 75mm) and maximum platform length of 5.5m. A similar consideration should be applied for raised pedestrian crossings on bus routes.

Pedestrian refuges should not narrow the roadway to less than a 3.5m travel lane. The pedestrian refuge proposed on Queens Park Road is feasible due to available road width and would include a diversion of the cycle lane and minor extensions to No Stopping zones.

12.7 CYCLING

A number of cycling routes were identified through the study area based on existing cycling infrastructure. Infrastructure comprised of on-street cycle lanes and mixed traffic bicycle road symbols. Regardless, it is recognised that cyclists are permitted to ride on all roads. The main on-road cycling routes through the study area were supplemented through review of the Cycling in Woollahra & Waverley cycle maps.

Figure 12.11 highlights the proposed treatments on cycling routes.

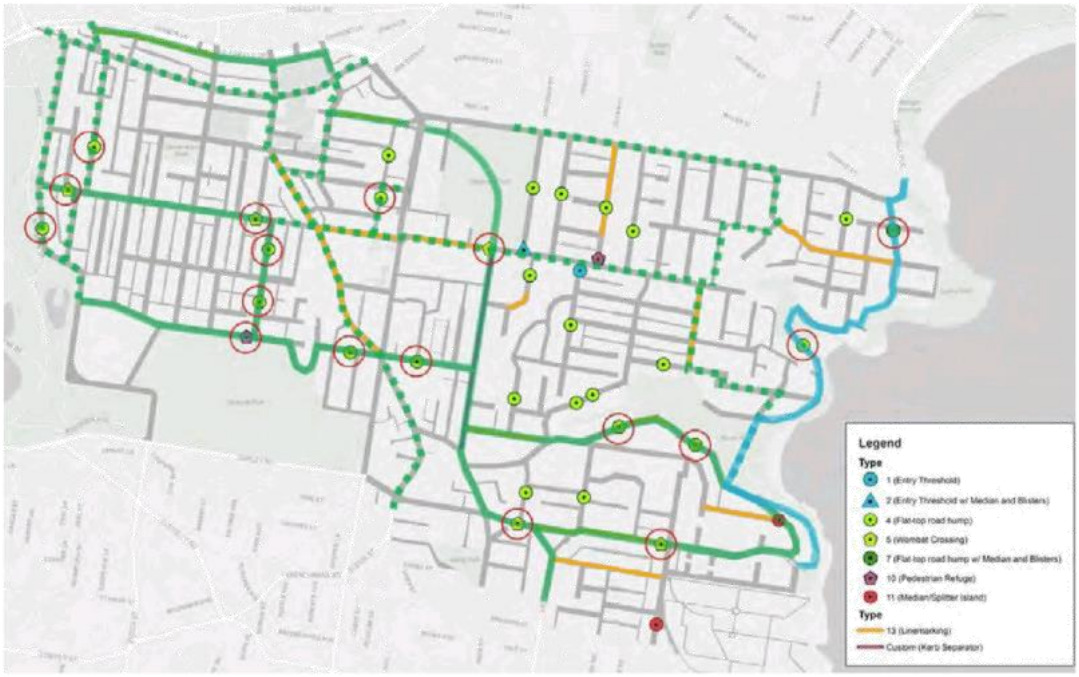


Figure 12.11: Proposed Treatments on Bus Routes

Of the proposed physical treatments, a total of 17 treatments lie on cycling routes. These include:

- Eleven (11) flat-top road humps
- Five (5) raised pedestrian crossings
- One (1) pedestrian refuge

The introduction of traffic calming measures can be both beneficial and detrimental to cyclists. The resulting forced reduction in vehicle speeds can both shift drivers to other modes of transport and reduce the likelihood of crashes and crash severity. However, if treatments along cycle routes are not designed to accommodate cyclists, they can create pinch points in the traffic flow where cyclists are forced to interface with vehicular traffic. This can include lane narrowing treatments (kerb blisters in the shoulder), median treatments which restrict travel lanes or deflections of cyclists into vehicle travel paths.

Therefore, at all locations where a new treatment is proposed along an existing cycling route, minimising cycling impact was adopted as a core tenet of the treatment rationalisation. This can be achieved through bike-friendly variants of the standard treatments which incorporate cyclists into their design by providing cyclists a dedicated separation from motor vehicles (diversion of cycle path around any raised platforms, separating kerbs, etc.).

13. SIGNAGE TREATMENT

13.1 40KM/H SPEED ZONES

For 40km/h speed limits to be legally enforced, speed limit signage is required at all locations where there is a change in speed limit along a section of road. Furthermore, changes between the different types of speed zones are required to be demarcated via the corresponding zone's sign to clarify the changing road environment. The type of signage required will depend on the specific speed zone environment.

Based on NSW Speed Zoning Guidelines, the relevant zones suitable for a 40km/h speed limit include:

- School Zones
- Local Traffic Areas
- High Pedestrian Activity Areas (HPAA).

A description of each type of zone is detailed below.

13.1.1 School Zones

40km/h School Zones are temporary speed limits applied to the road network near a school facility. The objective of this type of speed limit is to improve pedestrian and children safety during the start and end of school times. On school days, these times include:

- 8:00am - 9:30am
- 2:30pm - 4:00pm.

The 40km/h speed limit is enforceable during the outlined times above. Outside of the school zone periods, the speed limit remains as posted before the school zone.

School zones are marked by a start sign and end sign. The end signage also displays the existing or new speed limit along the road outside of the school zone.

13.1.2 Local Traffic Area

Local Traffic Areas are primarily composed of self-contained residential precincts. Within these areas, the street network is used mainly for local access, rather than through traffic. Consequently, traffic volumes in Local Traffic Areas are typically lower than standard streets (generally less than 5000 vehicles AADT). Due to their residential nature, local traffic areas may see an increased presence of vulnerable road users (pedestrians and/or children).

The Roads and Maritime guidelines indicate that signs informing drivers entering the Local Traffic Area and exiting the area need to be clearly signposted. Local Traffic Areas are designated by R4-240 'Local Traffic Area (40)' regulatory speed limit signs at all precinct entry points or individual streets. These signs alert drivers to the change in roadside conditions, highlighting the local and residential nature of the street. At the precinct exit points, the end of the local traffic area is designated by an R4-241 'End Local Traffic Area' sign and a speed limit sign to indicate the speed limit that applies beyond the zone.

While Local Traffic Areas can have 50km/h speed limits (which can often result in no change in speed limit upon entering the zone), they may also be suitable for 40km/h speed conditions. These areas often have physical devices or treatments to help establish a self-enforcing 40km/h speed environment.

13.1.3 High Pedestrian Activity Areas

High Pedestrian Activity Areas (HPAAs), as named, are areas which experience high volumes of pedestrians and other vulnerable road users. These are typically found in areas such as:

- Central business district areas
- Suburban shopping strips
- Areas where land use or facilities generate significant pedestrian traffic (e.g. beach side/park-side reserves)

- Business areas generating significant pedestrian traffic such as medical centres, hospitals, and Government service agencies.

40km/h speed limits are implemented within HPAAs as a means of reducing the risk of pedestrian-vehicle conflicts. Similar to Local Traffic Areas, HPAAs should feature physical devices or treatments to reinforce a self-regulating lower speed limit.

Treatments used at the entrance to a high pedestrian activity area include:

- The standard speed sign R4-236 High Pedestrian Activity 40 Area sign
- A contrasting threshold treatment to visually reinforce the change in traffic conditions within the HPAA.

The standard 40km/h speed sign (R4-236 40km/h High Pedestrian Activity) should be implemented as a repeater sign at appropriate intervals for HPAAs which are of sufficient length to merit reinforcement of the speed limit area or which interface with a number of side streets.

Speed Limited Areas

A speed-limited area is a network of roads in an area that all adhere to the same speed limit. These areas are delineated with:

- An area speed-limit sign on each road into the area, indicating the same speed
- An end area speed-limit sign on each road out of the area.

Examples of speed-limited areas include the 40km/h high pedestrian activity areas and local traffic areas, as described above.

At present, permanent 40km/h area-wide speed limits are not generally implemented or supported outside of these two types. Furthermore, 40km/h Area signage (Sign R4-10) is no longer used in New South Wales and is, therefore, not proposed as part of the signage treatment scheme.

13.2 PROPOSED SIGNAGE

13.2.1 Signage Types

Table 13.1 shows the speed limit signage relevant to the 40km/h speed limit treatment.

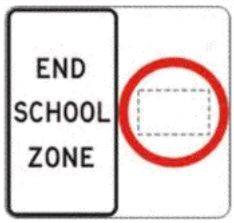
13.2.2 Road Marking

Road marking can be used to help reinforce the speed limit and heighten driver awareness of the change in speed limit. This includes large numerals '40' painted onto the roadway in the direction of travel.

Locations where road marking is generally recommended include:

- Roadways that interface with a road of different speed limit (i.e. 50kmh or 60km/h)
- Entry to streets or roads with relatively high traffic volumes
- Streets with a history of excessive vehicle speeds (identified in previous assessment)
- At repeating sign locations on collector roads
- Start of high pedestrian activity areas.

Table 13.1: 40km/h Speed Limit Signage

Image	Signage Type	Sign Code	Use
	40km/h Speed Limit	R4-1	At start of new speed zone and repeating signage along speed zone.
	40km/h Speed Limit, Local traffic Area	R4-240	At start of Local Traffic Areas (i.e. at entry of streets adjoining a collector road)
	End Local Traffic Area	R4-241	At end of Local Traffic Areas (i.e. at exit of streets adjoining a collector road)
	End 40 Area	R4-11	At end of High Pedestrian Activity Area onto road with speed limit other than 40km/h.
	End School Zone	R4-231	At end of School Zone. The speed shown indicates the existing or new speed limit of the roadway. Limits that may apply include 40km/h, 50km/h and 60km/h.
	High Pedestrian Activity Area (40)	R4-236	On the entries to a High Pedestrian Activity Area (i.e. commercial areas, shopping strip)
	High Pedestrian Activity (40)	R4-237	Repeater sign within High Pedestrian Activity Areas

13.2.3 Locations of New Speed Signage

The *NSW Speed Zoning Guidelines* outlines signage requirements and locations. The relevant guidelines are outlined below:

- at any change in speed limit, two (2) speed limit signs are to be installed, ideally on both sides of the carriageway
- for urban environments (which comprises the majority of the study area):
  - the vertical clearance between the ground and the base of a sign should ideally be at minimum 2.5m
  - the lateral clearance between the edge line of the travel lane and the nearest edge of the sign should ideally be at minimum 0.6m
  - the lateral clearance between the centre of the left (kerbside) travel lane and the edge of the sign should ideally not exceed 6.6m
- speed limit signs at intersections of major and minor roads should be:
  - On the major road, located 20-50m up to a maximum of 100m before and after the edge of the minor road
  - On the minor road, located 20-50m up to a maximum of 100m before and after the edge of the major road.
  - See Figure 13.1 below for a diagram of these sign locations.
- any exceptions to the clearances (potentially necessary due to site constraints) are subject to approval by the Regional Manager.

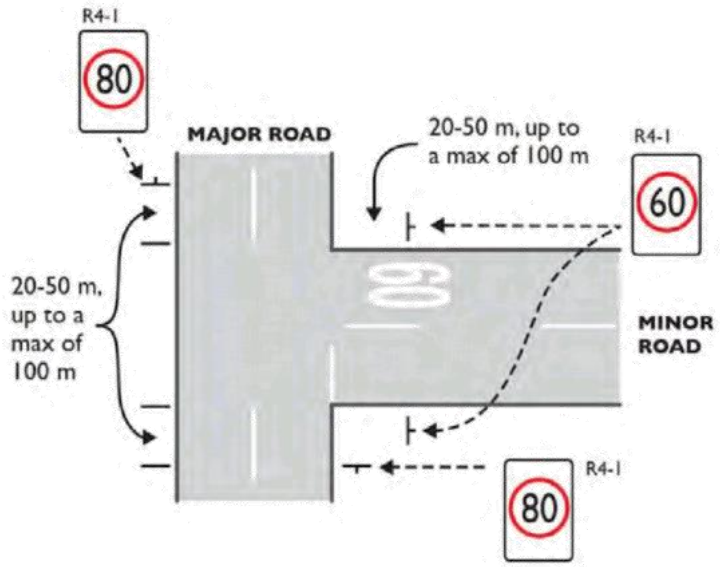


Figure 13.1: Typical Positioning of Speed Signs at Intersections

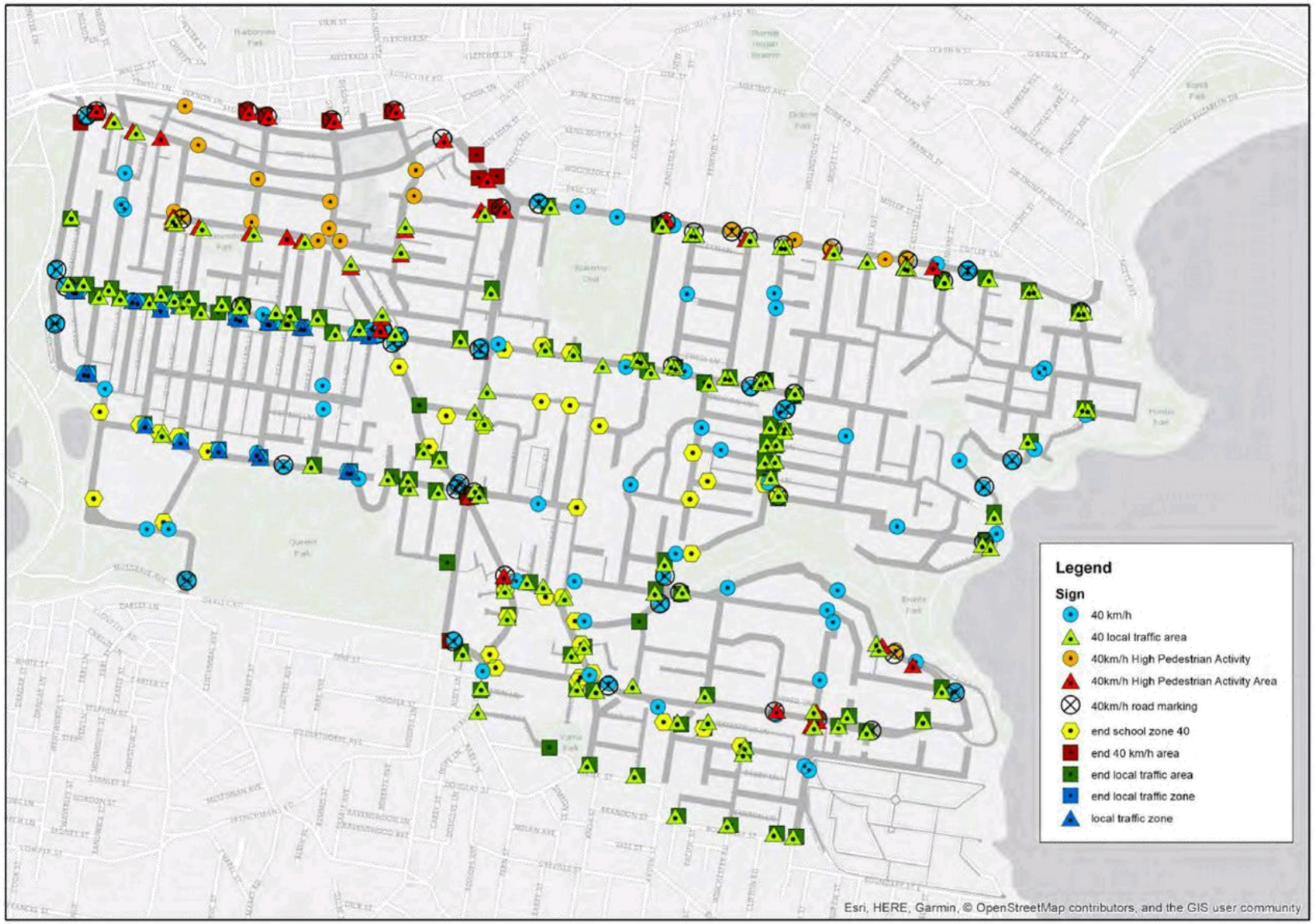
Signage mapping undertaken as a part of this study primarily aims to identify the signage required throughout the study area to accompany the implementation of a 40km/h speed limit. The locations of the signs are indicative only. Due to the variance in road environments and existing signage, proposed signage locations are to be determined on a site-by-site basis and subject to detailed design.

13.3 PROPOSED SIGNAGE

An overview map of the proposed signage treatment and locations of different types of signage required to implement the 40km/h speed limit is shown in Figure 13.2.

Detailed signage maps are located in **Appendix H.**

It should be noted that these maps are indicative only, providing an approximate location relative to the road way and local roads. Implementation and installation are to refer to the guidelines referred to in Section 13.2.3.


Legend
Sign
40 km/h
40 local traffic area
40km/h High Pedestrian Activity
40km/h High Pedestrian Activity Area
40km/h road marking
end school zone 40
end 40 km/h area
end local traffic area
end local traffic zone
local traffic zone
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community

13.3.1 Proposed Signage Principles

The principles adopted in assessing the signage requirements are outlined below:

- Existing "Local Traffic Area 50km/h" signs and single 50km/h signs were replaced with the corresponding 40km/h Local Traffic Area and single repeater signs
- Existing "End School Zone 50km/h" signs were replaced with "End of School Zone 40km/h signs" where the street has been proposed to be 40km/h (exceptions along Carrington Road / Council Street)
- Existing "50" pavement markings were replaced with corresponding "40" markings within the study area
- New streets designated as Local Traffic Areas were provided with "Local Traffic Area 40km/h" signs on entry to the street where interfacing with a collector road (Birrell Street, Queens Park Road, etc.)
- At interfaces between new streets designated as Local Traffic Areas and collector roads (Birrell Street, Queens Park Road), the following setup was adopted:
  - A "Local Traffic Area 40km/h" sign on entry to the street (min. one on the left side of the road)
  - A "End Local Traffic Area" sign on exit to the street (min. one on the left side of the road)
- For the new proposed High Pedestrian Activity Areas:
  - At the start of the area, a "High Pedestrian Activity 40km/h Area" sign was provided
  - At the end of the area, a "40km/h" speed sign to represent the change in traffic conditions. Alternatively replaced by a "Local Traffic Area 40km/h" or "End School Zone 40km/h" where road continues into the corresponding zone.
  - Contrasting thresholds at the area boundaries were decided against at this stage – while providing benefit in highlighting the edges of the HPAA, they require additional consideration due to potential usage by pedestrians with the misconception of a pedestrian-priority crossing device.
- Repeater signs at mid-block locations according to the recommended spacing
- At the edges of the study area boundary, an "End 40km/h Area" sign was provided.

13.3.2 Existing 40km/h Signage

It should be noted that the existing 40km/h Local Traffic Area in Queens Park is signposted using signs R4-208 (Local Traffic Zone) and R4-209 (End Local Traffic Zone) which have since been superseded by the use of Local Traffic Area signs presented in Table 13.1. These existing signs have been included in the proposed signage treatment with the intention of retaining the signs, as the associated 40km/h speed sign enforces the speed limit along these streets.

14. CONCLUSION

A successful implementation of a 40km/h speed zone should create a self-enforcing 40km/h speed environment. Stage 1 of this speed review undertook a comprehensive analysis of traffic speed behaviour across the study area. In doing so, certain streets within the study area were identified as recording 85th percentile traffic speeds in excess of 43km/h, up to over 50km/h.

These streets were noted to have environments which allowed drivers to travel at speeds in excess of the limit. It was determined that for these locations, to ensure a self-regulating speed environment, traffic management devices should be installed to provide a calming effect on traffic speeds.

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

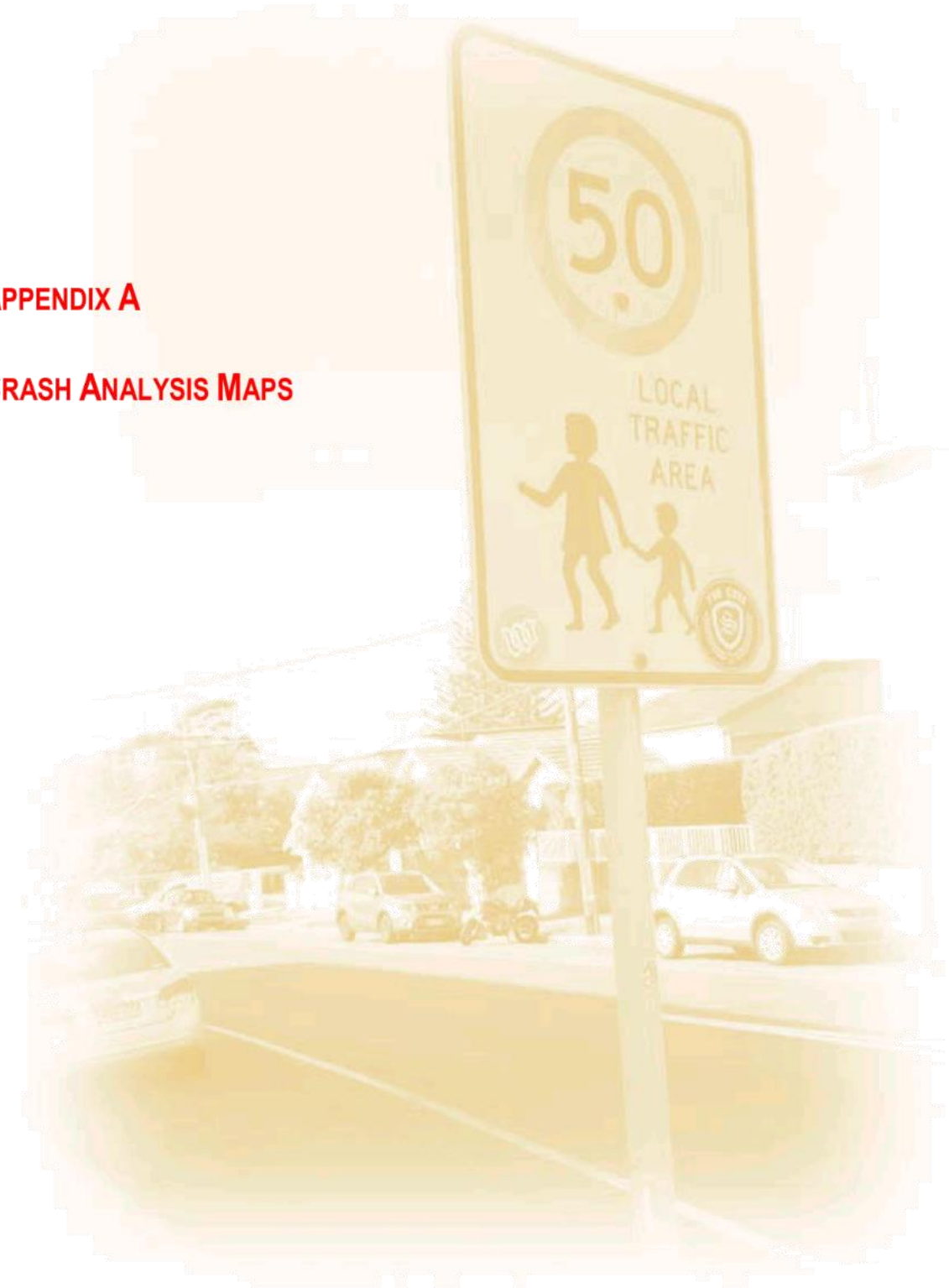
- Appropriate locations of treatments on key roads were identified through an assessment of the local street environment, land usage and site visits
- The different types of 40km/h speed zones outlined in the *NSW Speed Zoning Guidelines* were reviewed, along with their accompanying signage requirements
- These speed zones include:
  - School zones (changes to existing school zones not assessed as part of this study)
  - Local Traffic Areas
  - High Pedestrian Activity Areas.
- A range of standard road treatments were developed, including:
  - Basic entry threshold
  - Entry threshold with blisters and/or median (landscape option)
  - Entry threshold with cycle lanes
  - Basic flat top road hump
  - Flat top road hump with pedestrian crossing (wombat crossing)
  - Flat top road hump with cycle diversion (landscape option)
  - Flat top road hump with centre median island and kerb blisters (landscape option)
  - Standard speed cushion(s)
  - Road narrowing / Kerb blisters (landscape option)
  - Pedestrian refuges
  - Median / Splitter island
  - Chicane / slow point (landscape option)
  - Edge line marking (with optional centre line marking)
  - Contrasting thresholds.
- The road treatment designs were primarily based on existing traffic calming devices and LATM schemes found within the Waverley LGA, to ensure a consistency of infrastructure
- Where necessary due to road usage, certain treatments were designed to be compliant with *Bus Infrastructure Guidelines* and took into consideration the safety of pedestrians and cyclists
- A selection criteria was developed based upon the LATM Toolkit provided in *Austroads Guide to Traffic Management Part 8: Local Area Traffic Management* (see Table 11.1) as a means of allocating a specific type of standard treatment to each identified location
- Landscaped concept designs were developed to create visually attractive treatments which enhance or blend in to the local street environment
- A preliminary proposal was presented to Waverley Council and other stakeholders during January 2019, and an updated proposal was prepared taking into consideration stakeholder feedback from the meeting
- Maps of the final proposed treatments recommended to be installed across the study area were produced to show types and approximate locations
- Proposed signs to accompany the implementation of the various 40km/h speed limit areas were identified, including new signage and replacements of existing signs (e.g. existing 50km/h repeater speed signs changed to 40km/h speed limit signs)
- Maps of the proposed signs were produced to show approximate locations of new signs.

The signs and treatments to accompany the reduction of speed limits within the study area to 40km/h have been identified and presented. The proposed area-wide provision of traffic calming measures, in combination with existing infrastructure and intersections, is considered suitable in enabling the new road environment to self-regulate the lower speed limit.

Due to the variability in street conditions, the specific designs and locations of both proposed signage and treatments are to be determined on a site-by-site basis, subject to detailed design.

APPENDIX A

CRASH ANALYSIS MAPS



P3792 Waverley 40K Speed Review

Crash Analysis - Count Summary

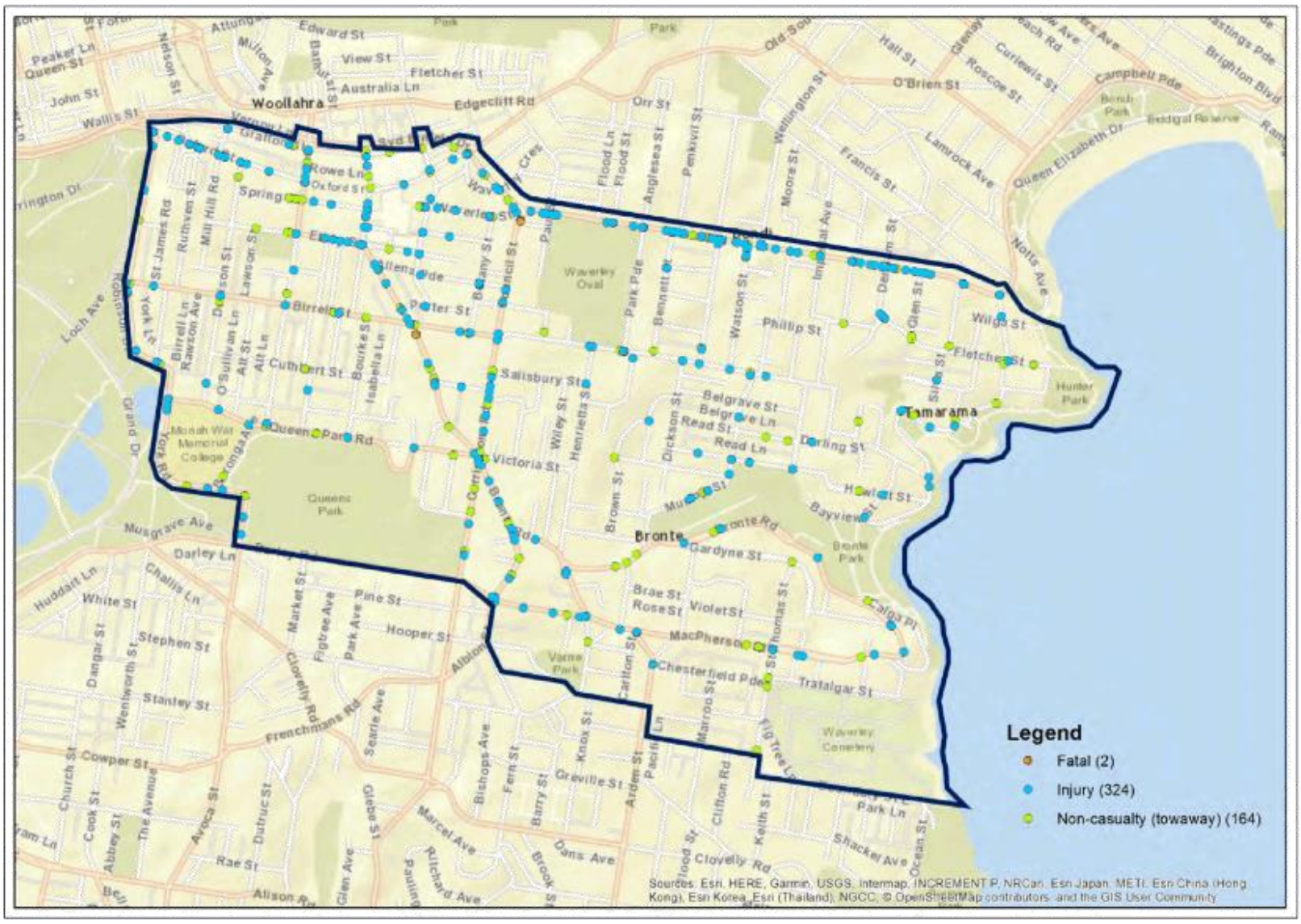
Sorted by Total Crashes

	Crashes					
Road	2013	2014	2015	2016	2017	Grand Total
BONDI RD	28	26	19	14	19	106
BRONTE RD	19	17	10	5	6	57
MACPHERSON ST	8	8	6	6	3	31
YORK RD	7	6	7	5	5	30
BIRRELL ST	6	10	6	3	5	30
CARRINGTON RD	9	5	5	5	3	27
NEWLAND ST	5	5	5			15
EBLEY ST	3	2	7	1	1	14
OXFORD ST	4	3		2	3	12
HOLLYWOOD AVE	1	3	4	1	2	11
GRAFTON ST	3	1	2	3	2	11
ALLENS PDE	2	4	3			9
MURRAY ST	2	2	2	1	2	9
DENISON ST	1	1	2	1	2	7
WAVERLEY ST	3		1	2		6
COUNCIL RD	2	2	1			5
SYD EINFELD DR	1	2		1	1	5
PACIFIC AVE	1	1	1	1	1	5
HEWLETT ST	3		1	1		5
ALBION ST	3		1		1	5
WATSON ST	1	1		3		5
ARDEN ST	2			1	1	4
SPRING ST	1		2	1		4
GROSVENOR ST		2	1	1		4
FLETCHER ST	2	1	1			4
LEICHHARDT ST	1			1	1	3
COUNCIL ST	3					3
ST THOMAS ST	2	1				3
NELSON ST			1		2	3
DENHAM ST	3					3
OCEAN ST		2		1		3
BENNETT ST		1		1		2
READ ST	1		1			2
TAMARAMA MARINE DR			2			2
BARONGA AVE				1	1	2
VICTORIA ST	1	1				2
LESWELL ST				1	1	2
ALEXANDER ST		1	1			2
ADELAIDE ST		1	1			2
WAVERLEY RD	1					1

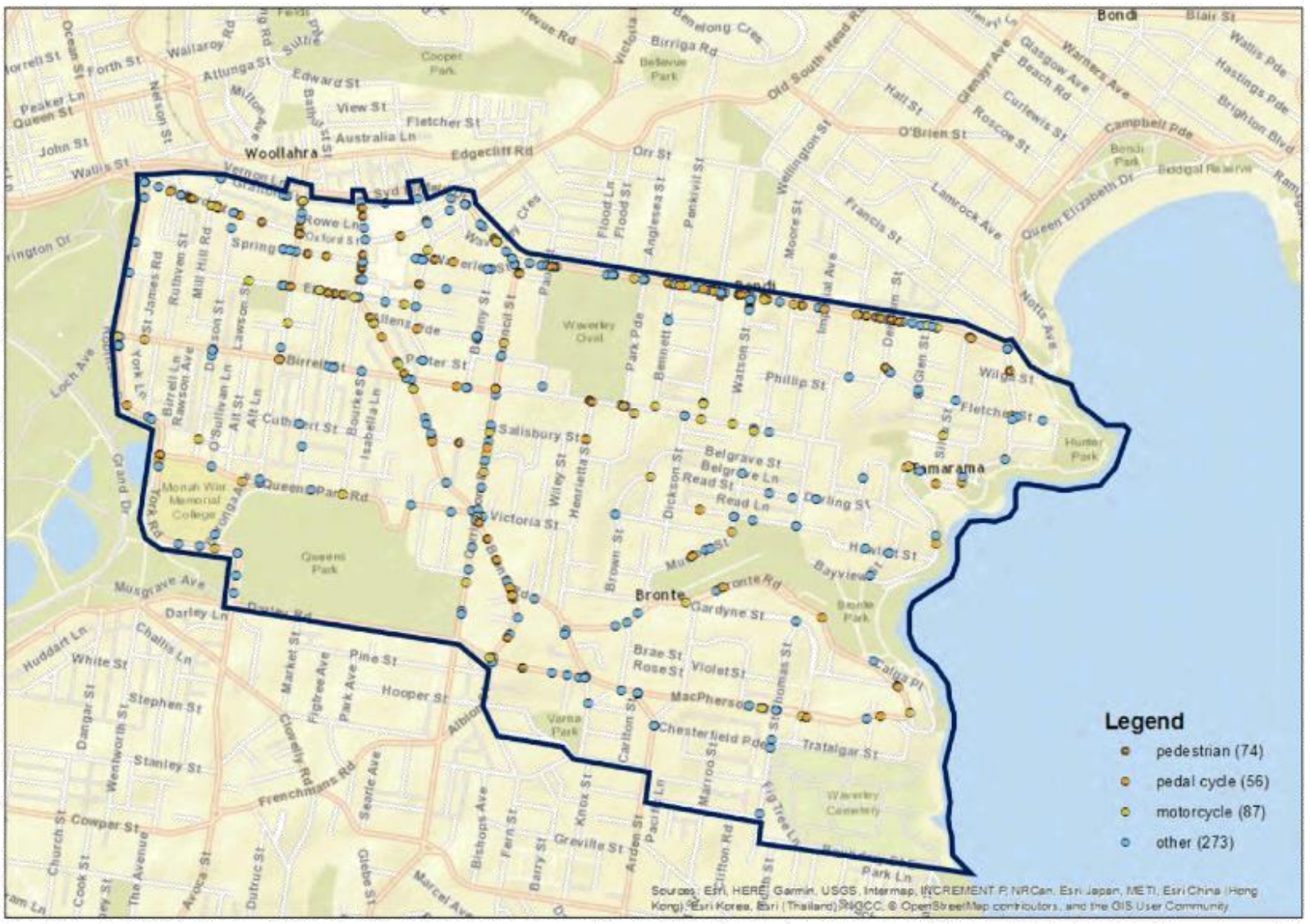
	Crashes					
Road	2013	2014	2015	2016	2017	Grand Total
SILVA ST				1		1
ASHLEY ST	1					1
GRAY ST					1	1
GAERLOCH AVE				1		1
BROWN ST		1				1
O'SULLIVAN LANE			1			1
HENRIETTA ST	1					1
DUDLEY ST	1					1
CALGA PL			1			1
EDMUND ST			1			1
CAMPBELL PDE	1					1
WALTER ST		1				1
LANGLEE AVE	1					1
WELLINGTON ST					1	1
BAYVIEW ST	1					1
BLANDFORD AVE	1					1
CHURCH ST	1					1
QUEENS PARK RD		1				1
LLANDAFF ST		1				1
SANDRIDGE ST	1					1
ANN ST					1	1
BOONARA AVE				1		1
MANNING ST				1		1
BOTANY ST		1				1
ALFRED ST			1			1
BOURKE ST				1		1
CUTHBERT ST	1					1
GLEN ST		1				1
DARLING ST	1					1
GOLDIE AVE		1				1
DELLVIEW ST					1	1
ALLENS RD	1					1
OLD SOUTH HEAD RD		1				1
GARDYNE ST				1		1
Grand Total	**141**	**117**	**97**	**69**	**66**	**490**

STUDY AREA – CRASH MAPS

Crashes by Severity

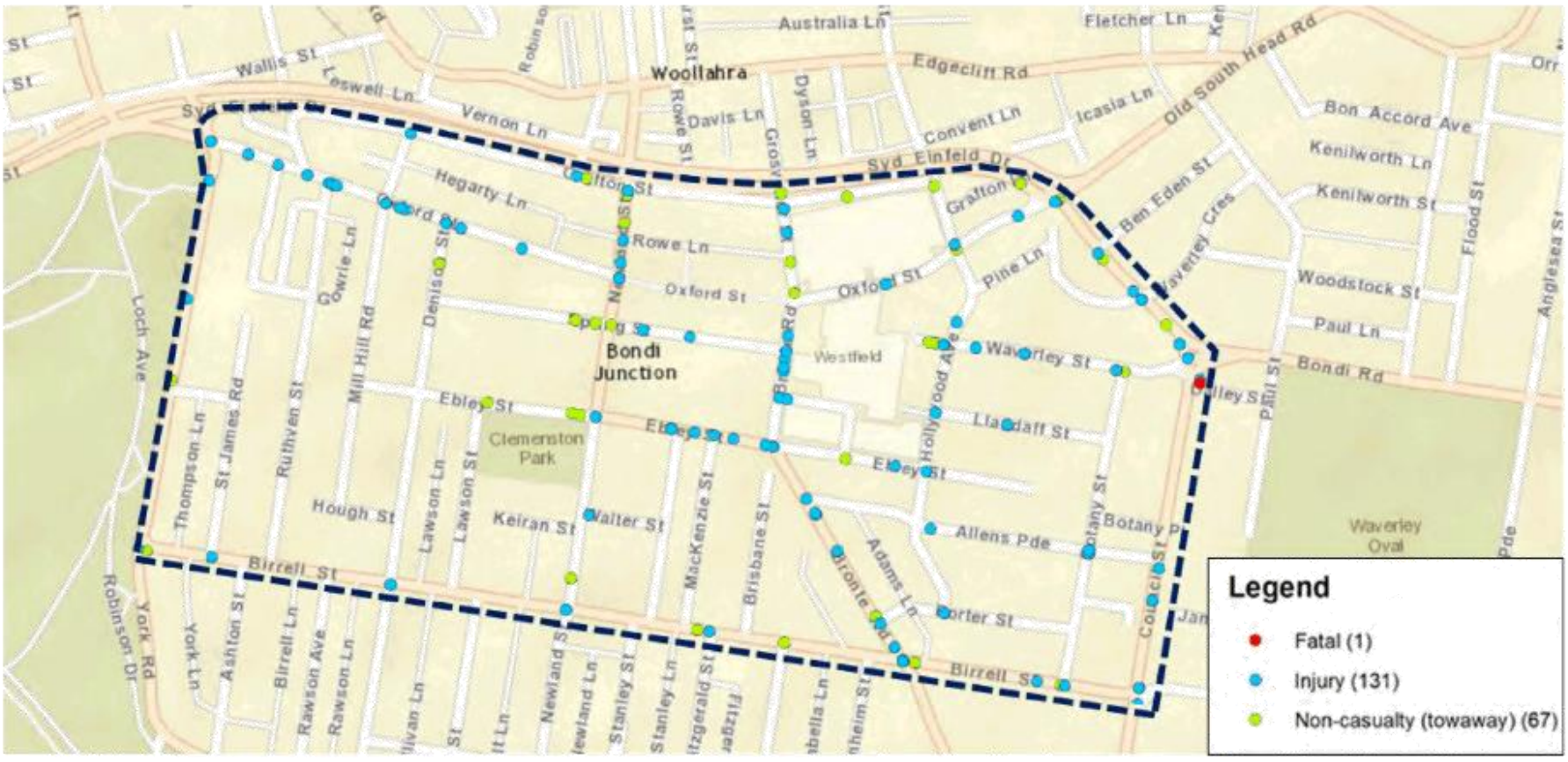


Crashes involving Vulnerable Road Users

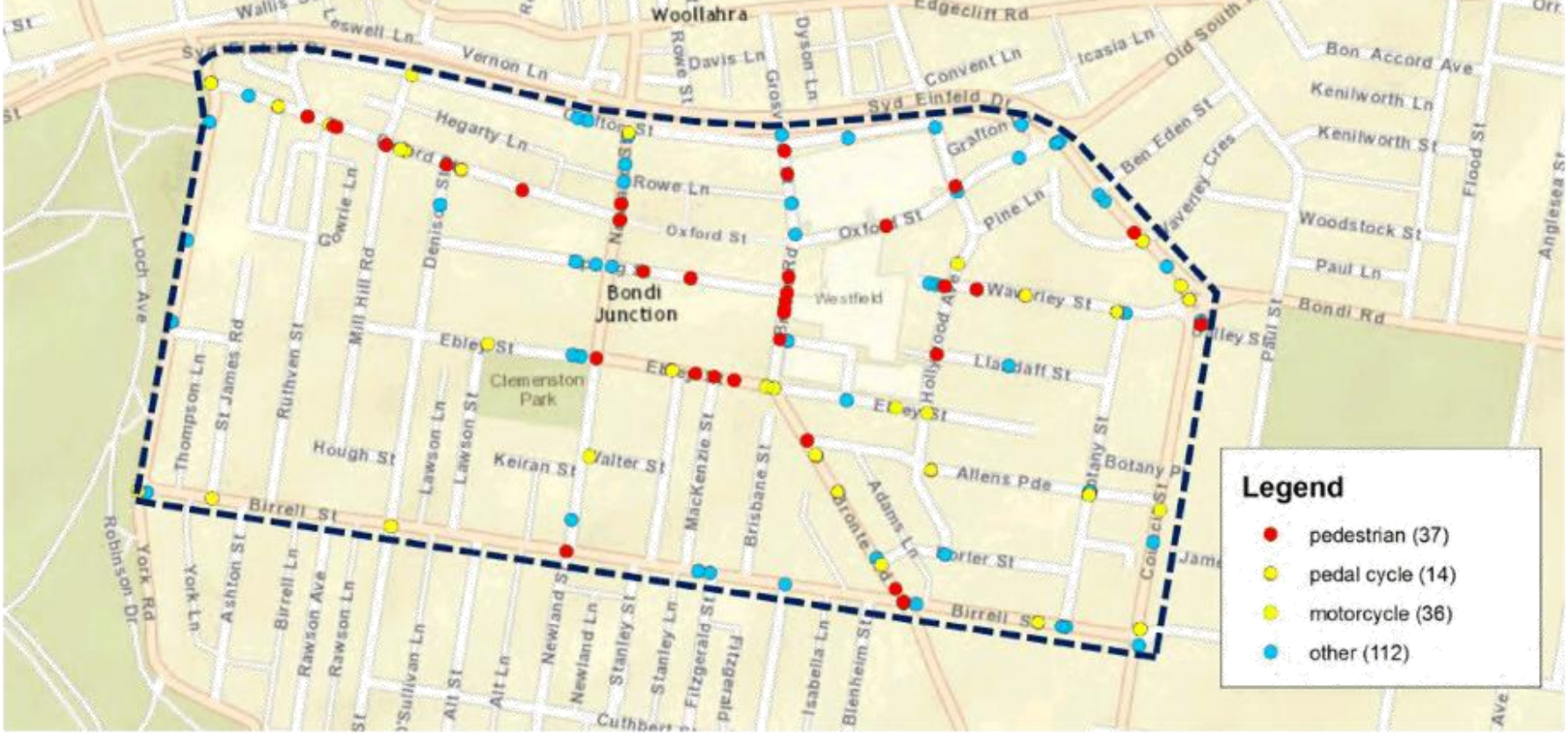


ZONE 1 – CRASH MAPS

Crashes by Severity

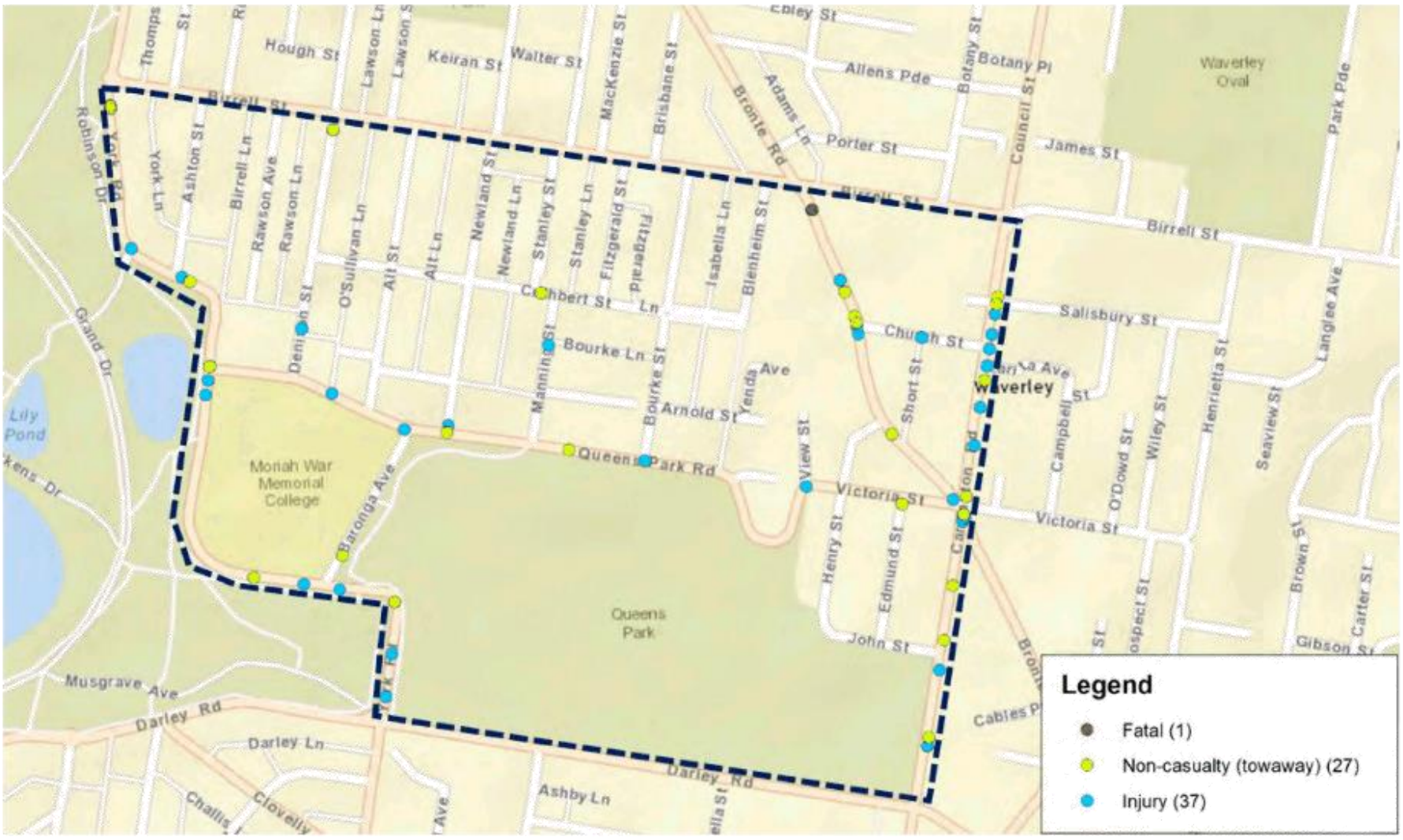


Crashes involving Vulnerable Road Users

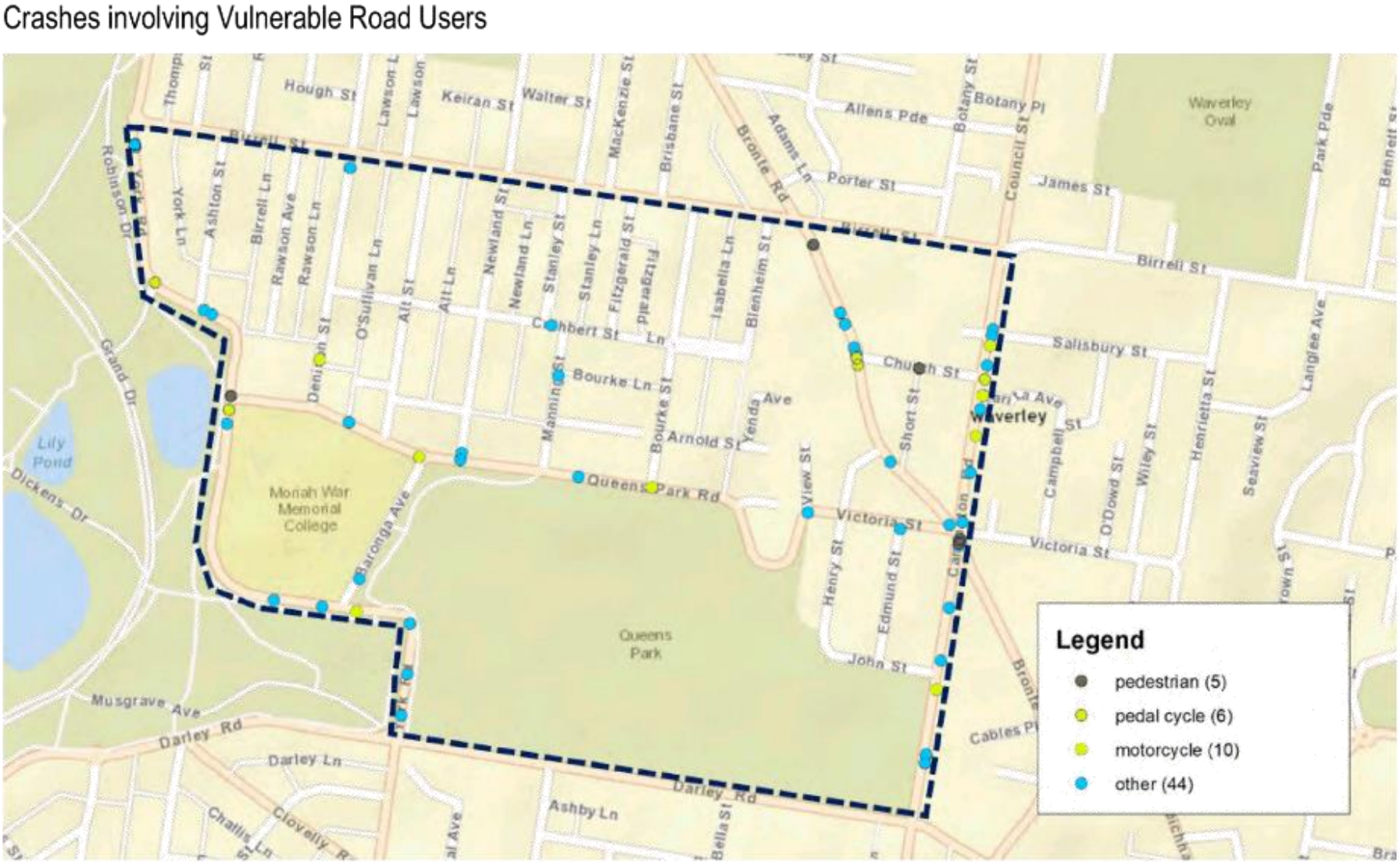


ZONE 2 – CRASH MAPS

Crashes by Severity

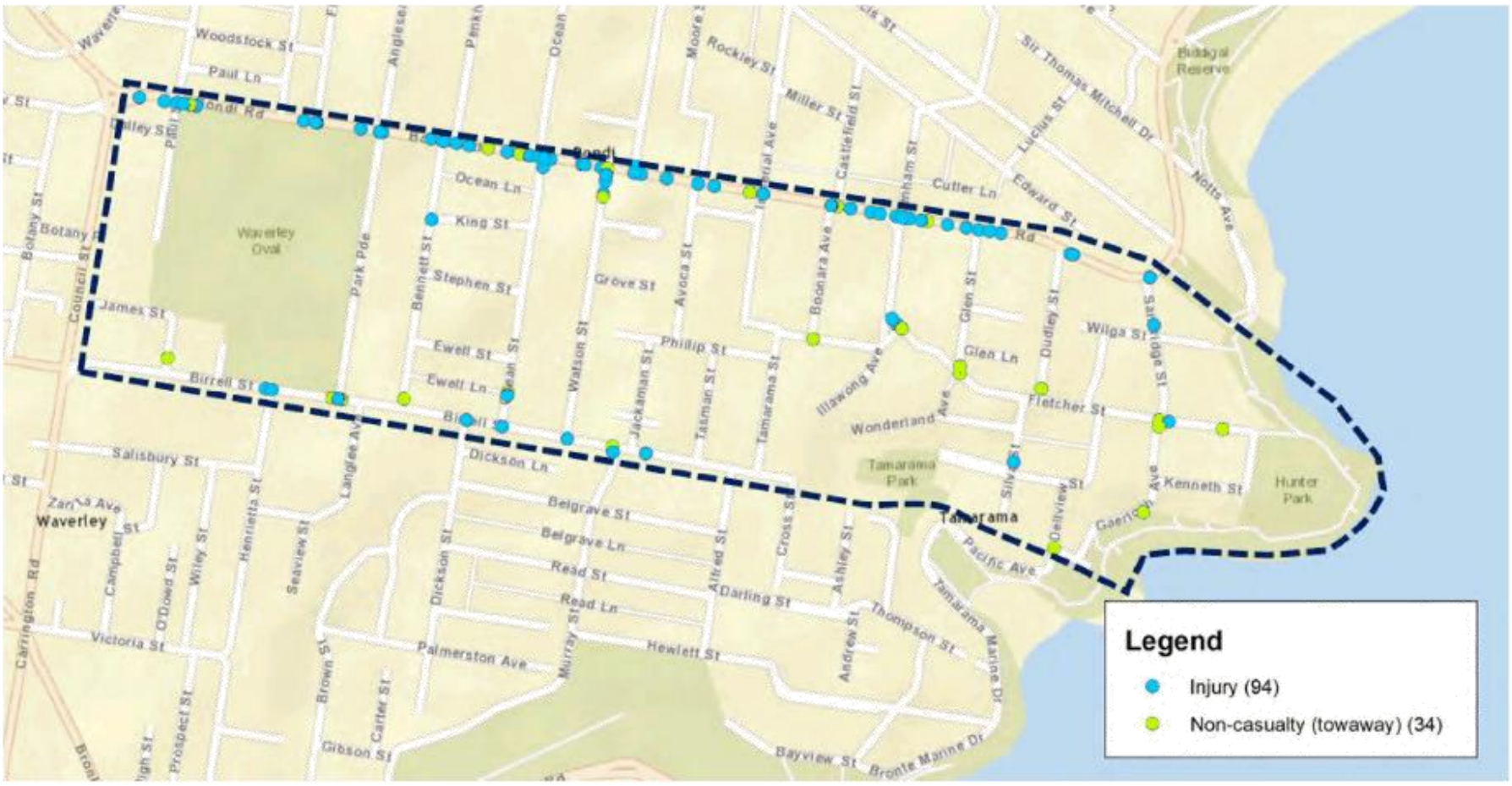


Crashes involving Vulnerable Road Users

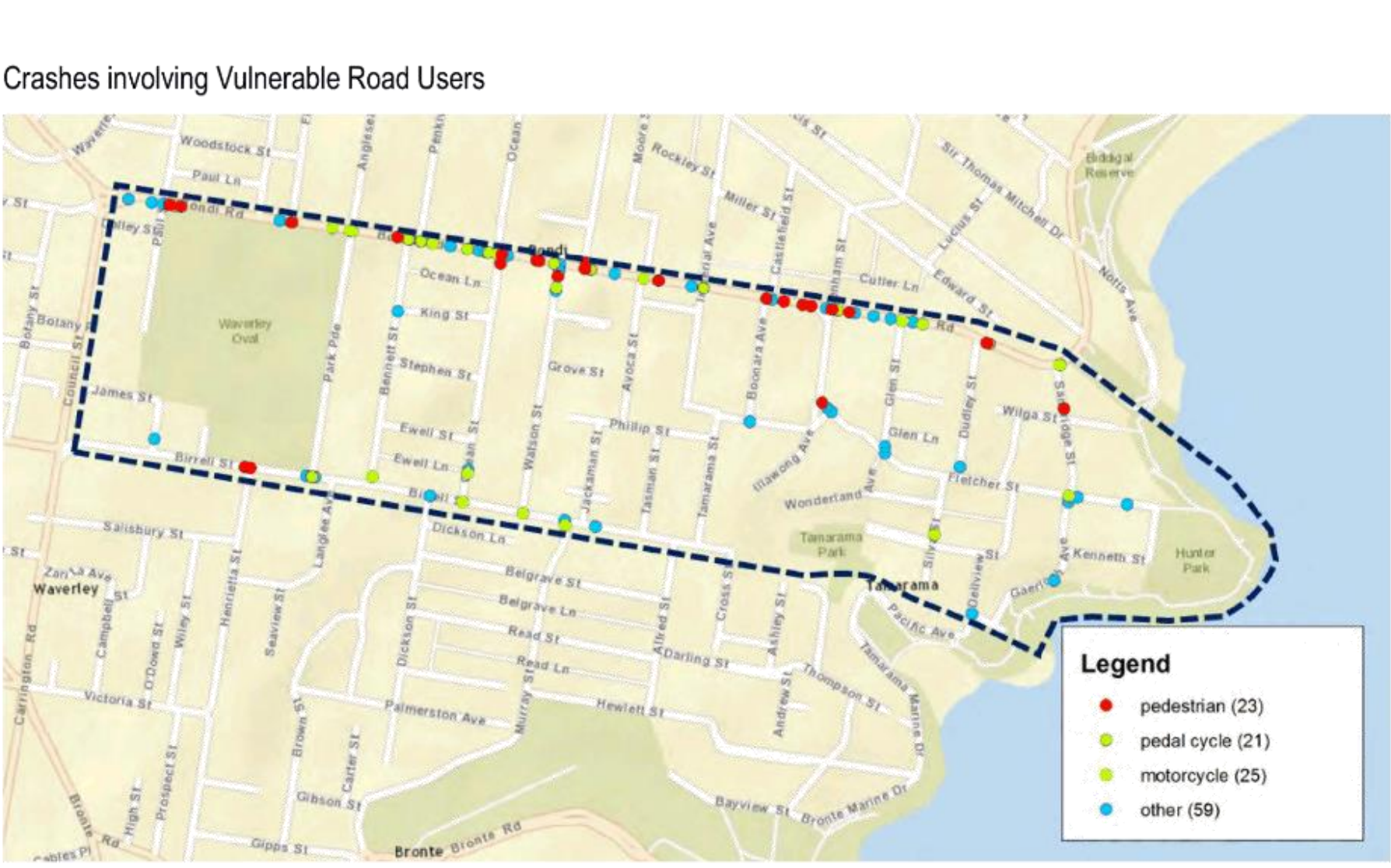


ZONE 3 – CRASH MAPS

Crashes by Severity

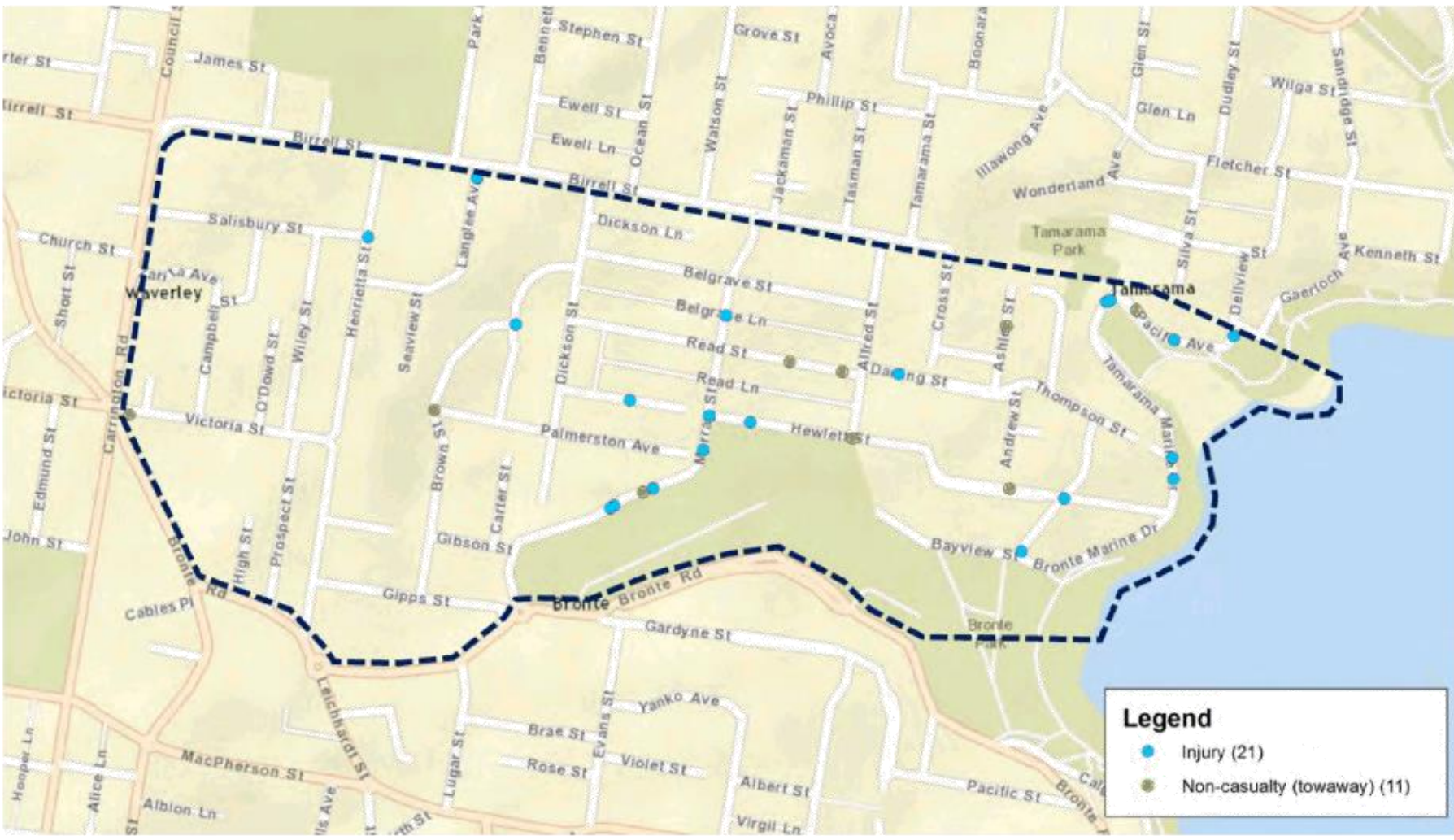


Crashes involving Vulnerable Road Users

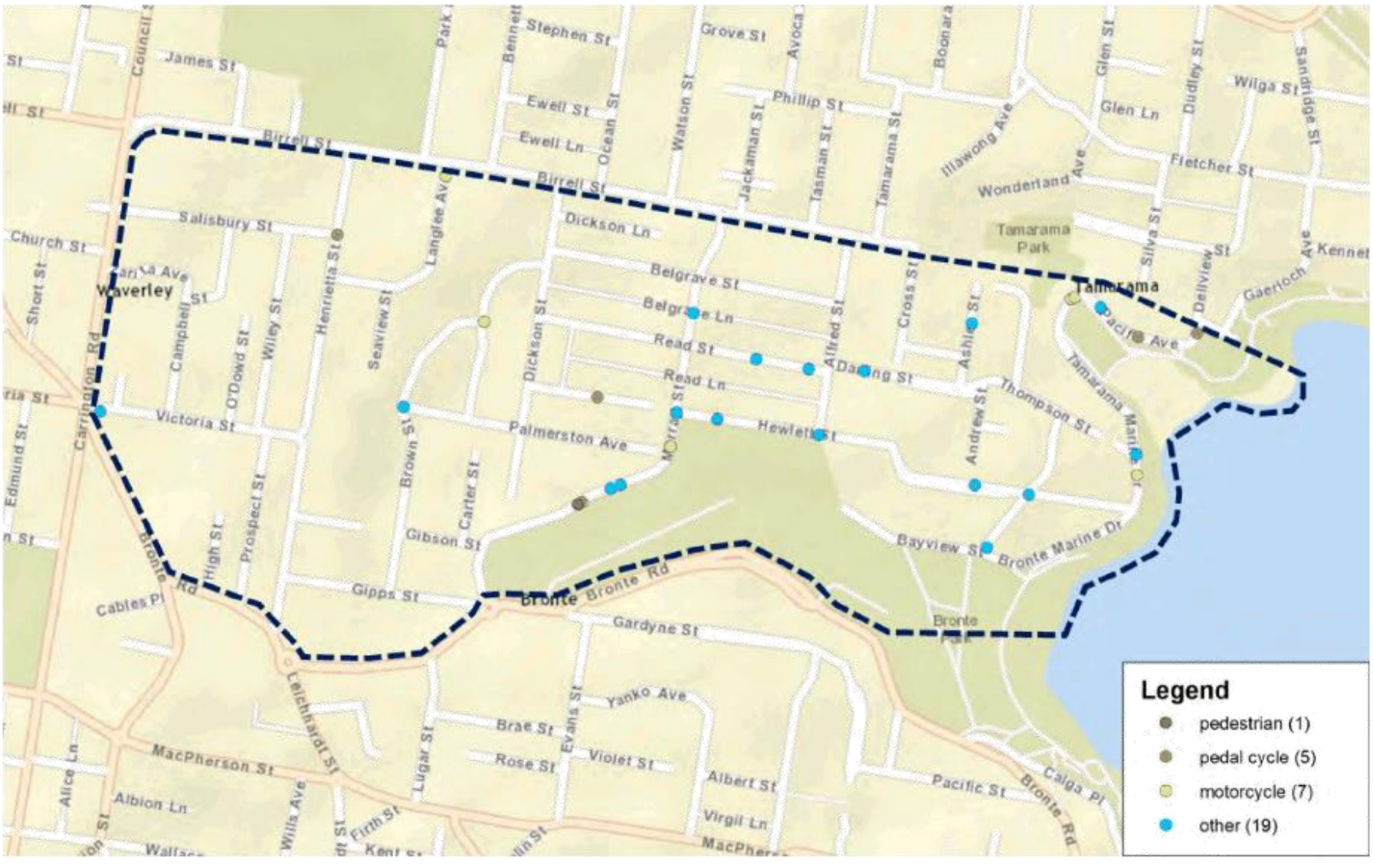


ZONE 4 – CRASH MAPS

Crashes by Severity

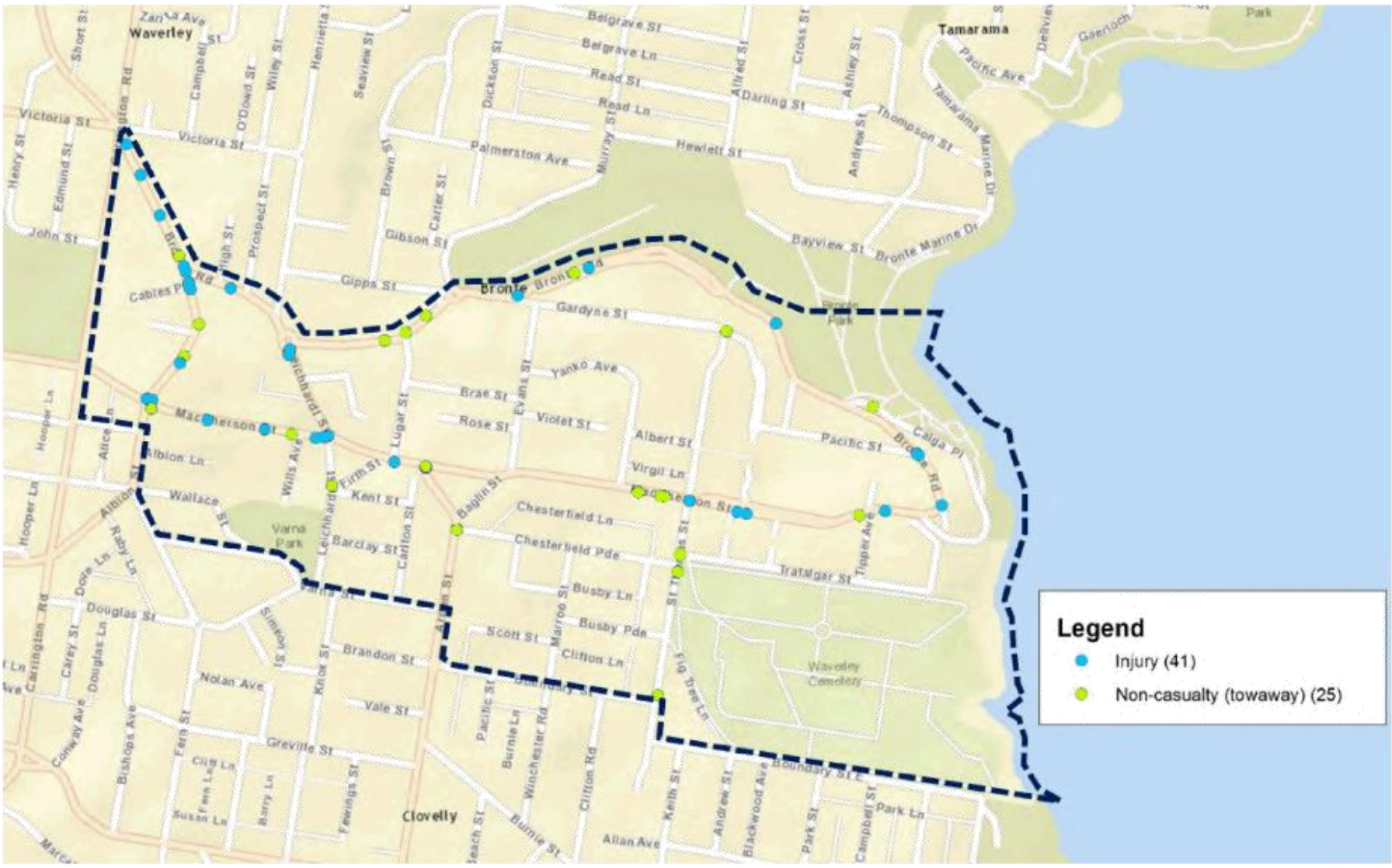


Crashes involving Vulnerable Road Users

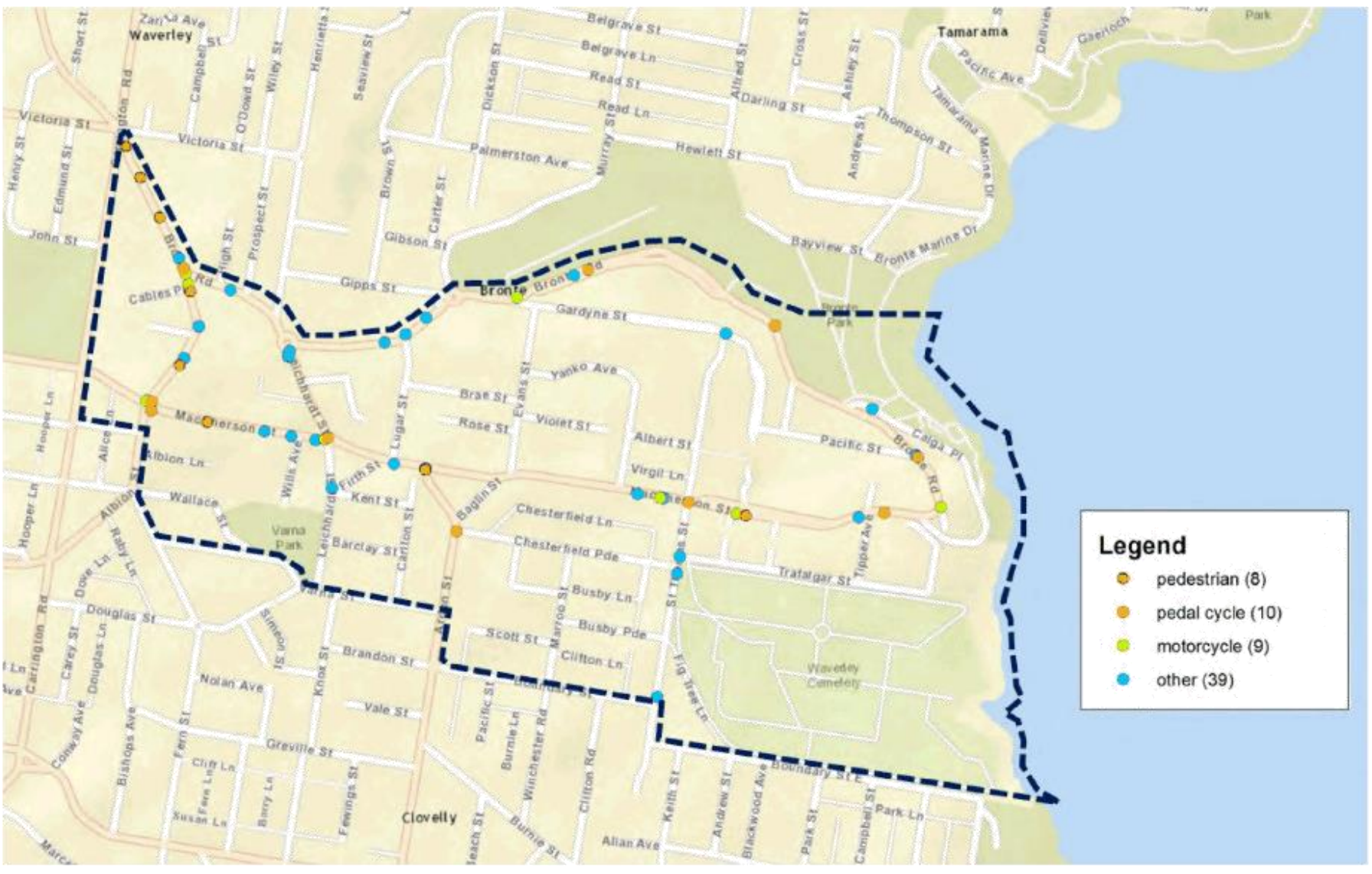


ZONE 5 – CRASH MAPS

Crashes by Severity

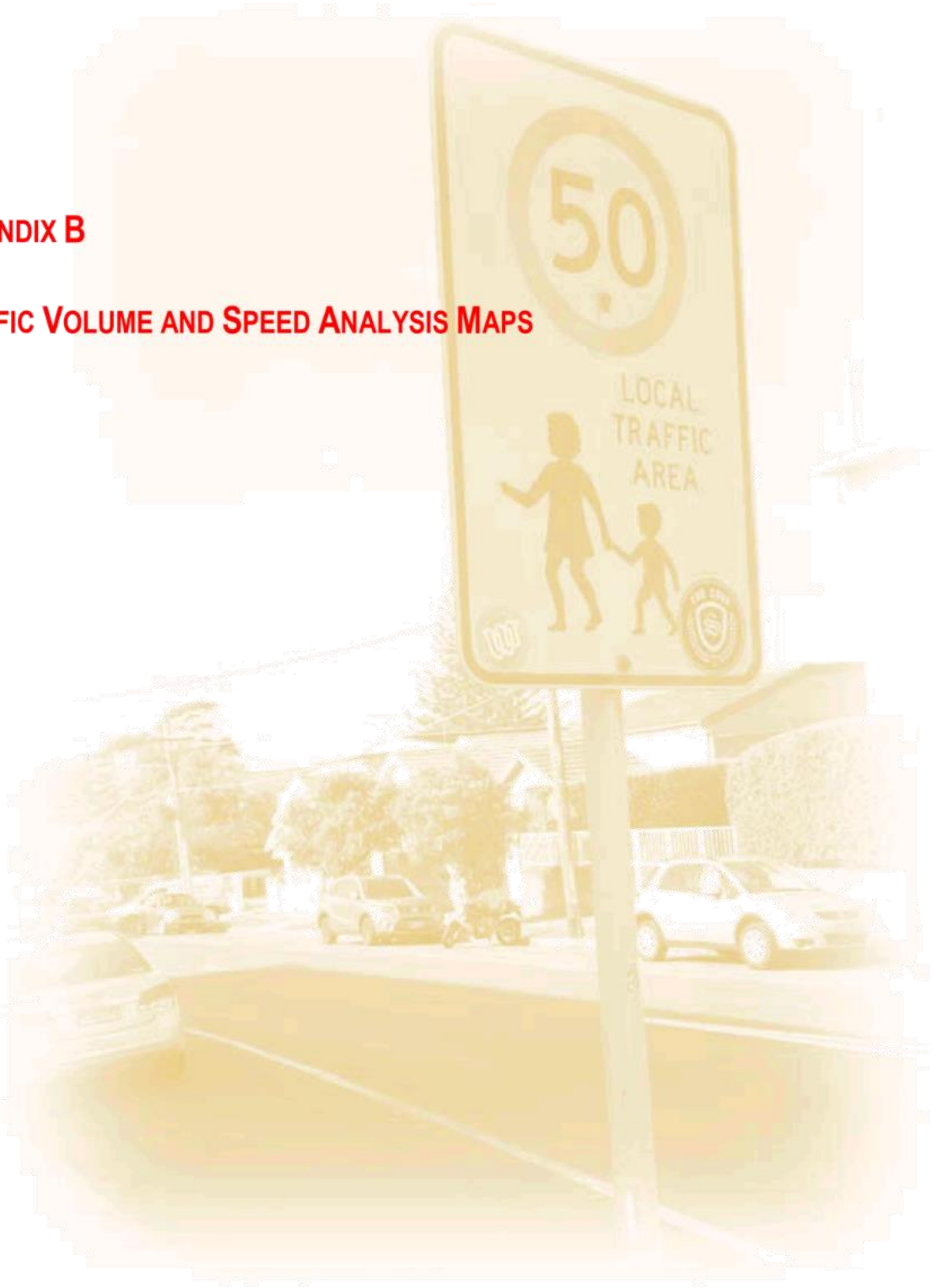


Crashes involving Vulnerable Road Users



APPENDIX B

TRAFFIC VOLUME AND SPEED ANALYSIS MAPS



Summary of Speed Survey Data

P3792 Waverley 40K Speed Review

Traffic Speed and Volume Summary

Zone	Street	Location	Direction	Date Collected	AADT	Posted Limit	Speed			
							Mean	85th%	%>10km/h	%>20km/h
1	Allens Parade	outside 39 Allens Parade (stop sign)	Bidirectional	27/07/2016	1287	50	20	27	0.0%	0.0%
1	Birrell Street	Btwn Rawson Ave & Birrell Lane	Eastbound	20/09/2018	3925	50	40.9	48	0.42%	0.06%
1	Birrell Street	Btwn Rawson Ave & Birrell Lane	Westbound	20/09/2018	4448	50	44.3	51	1.63%	0.18%
1	Botany Street	side of 35 Allens Parade (no stopping sign)	Bidirectional	27/07/2016	2453	50	37	48	0.7%	0.1%
1	Bronte Road	Btwn Ebley St & Birrell St outside no.100	Northbound	20/09/2018	7280	50	40.2	48	0.70%	0.15%
1	Denison Street	75m South of Ebley St outside no. 99	Northbound	20/09/2018	1238	50	35.5	43	0.26%	0.07%
1	Denison Street	75m South of Ebley St outside no. 99	Southbound	20/09/2018	1742	50	36.4	44	0.36%	0.09%
1	Lawson Street	120m South of Ebley St outside no.35	Northbound	20/09/2018	382	50	39	49	1.93%	0.32%
1	Lawson Street	120m South of Ebley St outside no.35	Southbound	20/09/2018	536	50	37.7	46	0.26%	0.00%
1	Ruthven Street	No 87 Ruthven Street	Bidirectional	11/03/2014	1687	50	46	56	-	-
1	Ruthven Street	125m South Gowrie St outside no.81	Northbound	20/09/2018	690	50	45.7	55	4.89%	0.44%
1	Ruthven Street	125m South Gowrie St outside no.81	Southbound	20/09/2018	654	50	44.4	53	2.28%	0.51%
1	Waverley Street	140m East Of Hollywood Avenue outside no.38	Eastbound	20/09/2018	4511	50	41.2	49	1.08%	0.17%
1	Waverley Street	140m East Of Hollywood Avenue outside no.38	Westbound	20/09/2018	4024	50	38	45	0.33%	0.05%
2	Alt Lane	opposite rear of 8 Alt Street - SY23111	North	12/05/2016	100	40	23	30	-	-
2	Alt Street	No 61 Alt Street	Bidirectional	15/10/2013	620	40	26	35	-	-
2	Alt Street	No 34 Alt Street	Bidirectional	22/05/2014	666	40	29	38	-	-
2	Ashton Street	near Ashton Lane	Bidirectional	4/08/2017	499	40	33	41	-	-
2	Ashton Street	outside No 20 Ashton Street	Bidirectional	4/08/2017	517	40	35	42	-	-
2	Baronga Avenue	ELP - SY19272	Bidirectional	15/10/2013	13166	50	34	40	-	-
2	Bourke Street	No 44 Bourke Street	Bidirectional	15/10/2013	2360	50	42	49	-	-
2	Denison Street	No 203 Denison Street	Bidirectional	15/10/2013	2270	40	38	47	-	-
2	Denison Street	150 Denison Street (ELP - SY18684)	Bidirectional	12/05/2016	2326	40	44	50	15.7%	1.5%
2	Denison Street	177 Denison Street (ELP - SY18690)	Bidirectional	4/05/2016	2474	40	32	39	0.1%	0.1%
2	Mannning Street	No 13 Manning Street	Bidirectional	15/10/2013	406	40	32	40	-	-
2	Newland Street	No 163 Newland Street	Bidirectional	15/10/2013	9714	50	38	47	-	-
2	Queens Park Road	No 20 Queens Park Road	Bidirectional	15/10/2013	2473	50	37	46	-	-
2	Queens Park Road	0m South of Queens Park Rd Culdesac Adjacent to Victoria Par	Northbound	16/10/2018	1516	50	43.7	49	0.72%	0.09%
2	Queens Park Road	0m South of Queens Park Rd Culdesac Adjacent to Victoria Par	Southbound	16/10/2018	1259	50	47.7	53	1.28%	0.05%
2	Victoria Street	30m west of Edmun Street, outside No. 18	Eastbound	20/09/2018	1172	50	38.2	47	0.85%	0.12%
2	Victoria Street	30m west of Edmun Street, outside No. 18	Westbound	20/09/2018	1037	50	40.2	49	0.93%	0.08%
2	York Road	pedestrian refuge near Moriah College	Bidirectional	15/10/2013	13354	50	48	57	-	-

Summary of Speed Survey Data

P3792 Waverley 40K Speed Review

Traffic Speed and Volume Summary

Zone	Street	Location	Direction	Date Collected	AADT	Posted Limit	Speed			
							Mean	85th%	%>10km/h	%>20km/h
3	Bennett Street	85m south of King Street, outside No. 25	Northbound	20/09/2018	2986	50	43.5	51	1.37%	0.12%
3	Bennett Street	85m south of King Street, outside No. 25	Southbound	20/09/2018	2910	50	44.6	52	2.13%	0.26%
3	Birrell Street	near No 334 Birrell Street (ELP - SY05618)	Total	24/08/2016	6476	50	39	48	0.3%	0.1%
3	Birrell Street	near No 334 Birrell Street (ELP - SY05618)	Bidirectional	4/12/2013	7327	50	40	48	0.3%	0.1%
3	Bondi Road	between Boonara Ave & Imperial Ave	Eastbound	20/09/2018	8499	50	40.1	48	0.50%	0.06%
3	Bondi Road	between Boonara Ave & Imperial Ave	Westbound	20/09/2018	11076	50	38.1	48	0.63%	0.04%
3	Farrellys Avenue	Between Illawong and Boonara	East	5/12/2013	4960	50	32	39	-	-
3	Farrellys Avenue	Between Boonara and Tamarama	East	4/12/2013	5249	50	26	34	-	-
3	Fletcher Street	Between Silva and Glen	Bidirectional	12/05/2016	4856	50	44	50	-	-
3	Ocean Street	50m south of Stephen St, outside no.90	Northbound	20/09/2018	1067	50	44.3	53	3.75%	0.56%
3	Ocean Street	50m south of Stephen St, outside no.90	Southbound	20/09/2018	1827	50	45.8	54	4.73%	0.99%
3	Park Parade	130m north of Birrell Street, outside No. 33	Northbound	20/09/2018	1629	50	42.6	51	1.49%	0.22%
3	Park Parade	130m north of Birrell Street, outside No. 33	Southbound	20/09/2018	1994	50	41.9	51	1.95%	0.21%
3	Sandridge Street	30m south of Wilga Street, outside No. 18	Northbound	20/09/2018	2615	50	39.9	47	0.61%	0.03%
3	Sandridge Street	30m south of Wilga Street, outside No. 18	Southbound	20/09/2018	3363	50	40	47	0.36%	0.04%
3	Stephen Street	Between Ocean and Dead End	Bidirectional	13/06/2018	211	50	25	30	-	-
3	Watson Street	100m south of Grove Street, outside No. 54	Northbound	20/09/2018	3386	50	43.7	50	1.14%	0.13%
3	Watson Street	100m south of Grove Street, outside No. 54	Southbound	20/09/2018	4279	50	45.9	53	2.62%	0.28%

Summary of Speed Survey Data

P3792 Waverley 40K Speed Review

Traffic Speed and Volume Summary

Zone	Street	Location	Direction	Date Collected	AADT	Posted Limit	Speed			
							Mean	85th%	%>10km/h	%>20km/h
4	Alfred Street	Near Belgrave Lane	Northbound	20/09/2018	1124	50	36.9	46	0.63%	0.06%
4	Alfred Street	Near Belgrave Lane	Southbound	20/09/2018	733	50	35.8	44	0.13%	0.00%
4	Bayview Street	near 15 Bayview Street (ELP - SY19518)	Bidirectional	3/12/2013	545	50	23	32	-	-
4	Bronte Marine Drive	near No 12 Bronte Marine Drive (ELP - SY19608)	West	3/12/2013	1450	50	27	28	-	-
4	Henrietta Street	no parking sign, just south of 19 Henrietta Street	South	1/06/2017	1614	50	33	39	0.0%	0.0%
4	Henrietta Street	no parking sign, outside 38-40 Henrietta Street	South	1/06/2017	1890	50	36	46	0.2%	0.1%
4	Hewlett Street	near No 93 Hewlett Street	West	30/11/2013	157	50	24	36	-	-
4	Hewlett Street	near 146 Hewlett Street	Bidirectional	30/11/2013	5708	50	34	42	-	-
4	Hewlett Street	near No 132 Hewlett Street	Bidirectional	30/11/2013	6877	50	38	48	-	-
4	Hewlett Street	50m west of Alfred Street, outside No. 74	Eastbound	20/09/2018	2156	50	43	51	2.50%	0.43%
4	Hewlett Street	50m west of Alfred Street, outside No. 74	Westbound	20/09/2018	3381	50	41.9	50	1.34%	0.18%
4	Langlee Avenue	near No 7 Langlee Avenue (ELP - SY19673)	Bidirectional	13/12/2013	910	50	35	44	-	-
4	Langlee Avenue	near No 22 Langlee Avenue (ELP - SY19665)	Bidirectional	4/12/2013	1127	50	28	37	-	-
4	Langlee Avenue	near No 36 Langlee Avenue (ELP - SY19660)	Bidirectional	4/12/2013	1170	50	38	47	-	-
4	Murray Street	outside No 25 Murray Street	Bidirectional	25/05/2016	15263	50	46	55	2.4%	0.2%
4	Pacific Avenue	near No 7 Pacific Avenue	Bidirectional	30/11/2013	6357	50	37	45	-	-
4	Palmerston Avenue	no stopping sign, opposite No 9 Palmerston Avenue	Bidirectional	10/05/2017	717	50	32	42	0.1%	0.0%
4	Prospect Street	125m north of Bronte Rd outside no.15	Northbound	20/09/2018	734	50	36.8	46	0.65%	0.17%
4	Prospect Street	125m north of Bronte Rd outside no.15	Southbound	20/09/2018	9	50	26.8	44	6.98%	0.00%
4	Read Lane	rear No 42 Hewlett Street (no stopping sign)	Bidirectional	9/06/2015	143	50	22	28	0.0%	0.0%
4	Read Lane I	between Alfred and Murray Streets	Bidirectional	9/06/2015	126	50	17	25	0.0%	0.0%
4	Read Street	near 35 Read Street	Bidirectional	9/06/2015	331	50	16	21	0.0%	0.0%
4	Tamarama Marine Drive	rear of 23 Thompson Street (ELP - SY19631)	Bidirectional	30/11/2013	6299	50	43	49	-	-
4	Tamarama Marine Drive	near No 18 Tamarama Marine Drive	Bidirectional	30/11/2013	6317	50	35	42	-	-
4	Victoria Street	50m east of Campbell Street, outside No. 58	Eastbound	20/09/2018	374	50	35.7	44	0.21%	0.13%
4	Victoria Street	50m east of Campbell Street, outside No. 58	Westbound	20/09/2018	3142	50	39.6	48	0.69%	0.07%
4	Wiley Street	near 33 Wiley St	Northbound	20/09/2018	668	50	35.9	45	0.71%	0.16%
4	Wiley Street	near 33 Wiley St	Southbound	20/09/2018	171	50	28.9	39	0.00%	0.00%

Summary of Speed Survey Data

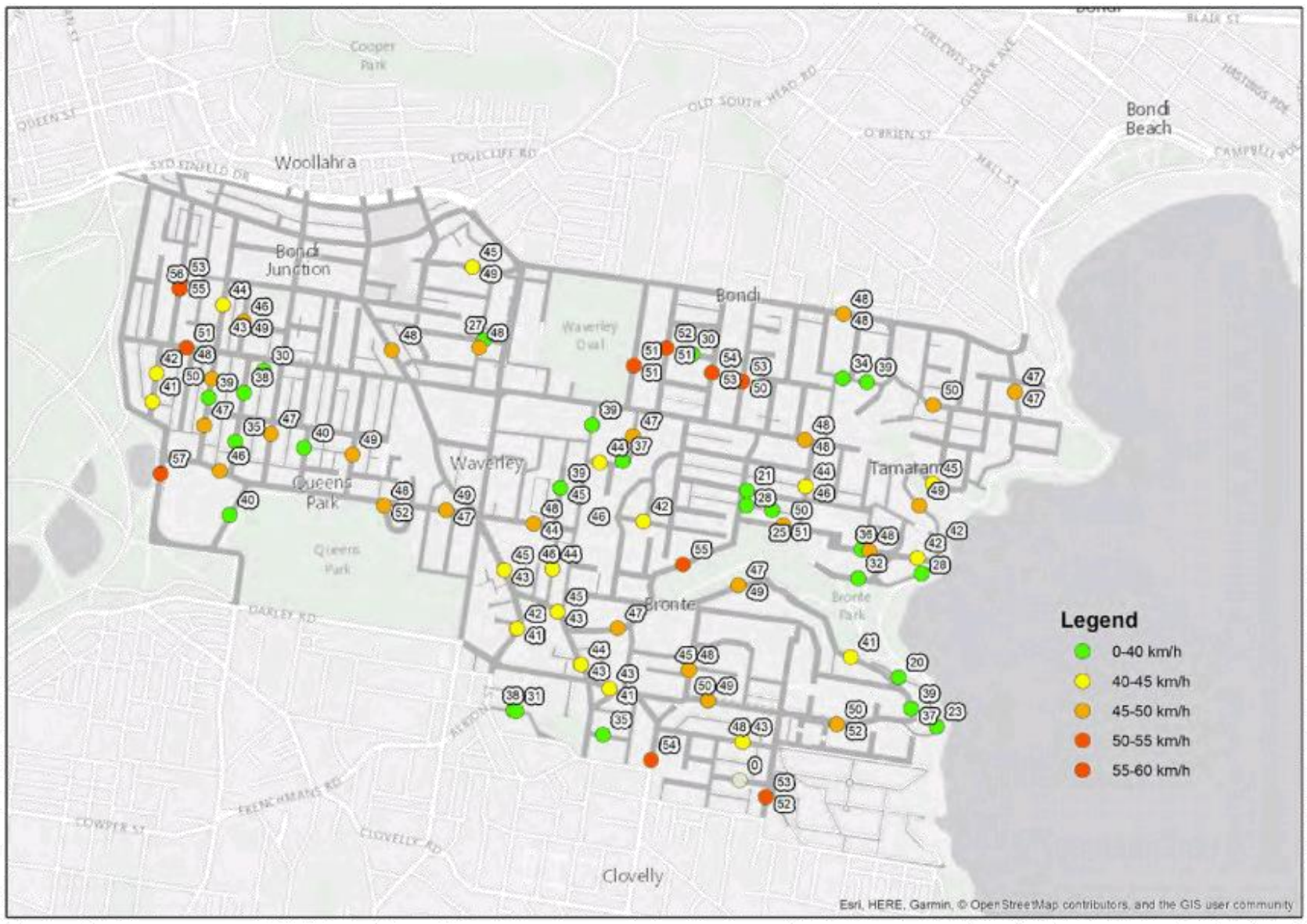
P3792 Waverley 40K Speed Review

Traffic Speed and Volume Summary

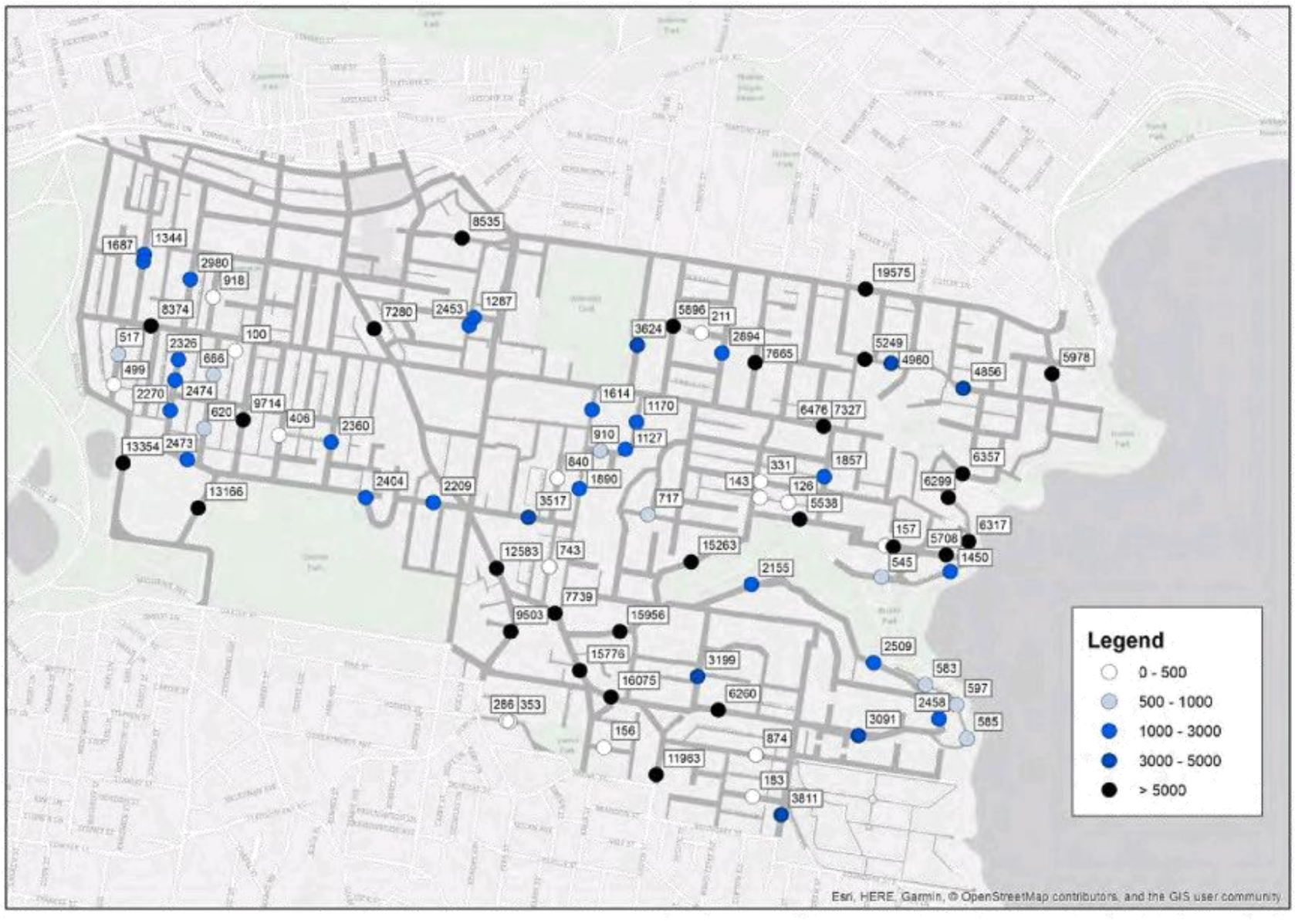
Zone	Street	Location	Direction	Date Collected	AADT	Posted Limit	Speed			
							Mean	85th%	%>10km/h	%>20km/h
5	Albion Street	South of Santa Marina Avenue, outside No. 41	Northbound	20/09/2018	5193	50	34.2	41	0.02%	0.00%
5	Albion Street	South of Santa Marina Avenue, outside No. 41	Southbound	20/09/2018	4310	50	35.2	42	0.06%	0.02%
5	Arden Street	outside 20a Arden Street	Bidirectional	18/11/2015	11963	50	44	54	2.2%	0.2%
5	Barclay Street	near No 12 Barclay Street	Bidirectional	4/12/2013	156	50	25	35	-	-
5	Bronte Cutting	near space no 125	South	25/03/2018	583	10	17	20	-	-
5	Bronte Cutting	near space no 90	South	25/03/2018	585	10	19	23	-	-
5	Bronte Cutting	near space no 107	South	25/03/2018	597	10	21	25	-	-
5	Bronte Road	near No 469 Btonte Road (at posting box)	Bidirectional	5/12/2013	2509	50	31	41	-	-
5	Bronte Road	outside No 347 Bronte Road	Bidirectional	13/02/2018	15956	50	41	47	-	-
5	Bronte Road	170m East of Gardyne Street, outside No. 468	Eastbound	20/09/2018	1052	50	40.8	49	0.92%	0.03%
5	Bronte Road	170m East of Gardyne Street, outside No. 468	Westbound	20/09/2018	1103	50	38.3	47	0.89%	0.09%
5	Bronte Road	East of Prospect Street, outside No. 352 WB	Eastbound	20/09/2018	4935	50	37	43	0.04%	0.01%
5	Bronte Road	East of Prospect Street, outside No. 352 WB	Westbound	20/09/2018	2803	50	37.8	45	0.14%	0.00%
5	Bronte Road	near no.505 Bronte Rd	Northbound	20/09/2018	1489	50	32.3	37	0.01%	0.00%
5	Bronte Road	near no.505 Bronte Rd	Southbound	20/09/2018	969	50	33	39	0.02%	0.00%
5	Bronte Road	near 306 Bronte Rd	Northbound	20/09/2018	5240	50	32	43	0.29%	0.05%
5	Bronte Road	near 306 Bronte Rd	Southbound	20/09/2018	7343	50	35.1	45	0.26%	0.04%
5	Busby Parade	Outside No. 24	Bidirectional	1/05/2018	183	50	0	0	-	-
5	Chesterfield Parade	near no.64 Chesterfield Pde	Eastbound	20/09/2018	428	50	38.1	48	0.83%	0.10%
5	Chesterfield Parade	near no.64 Chesterfield Pde	Westbound	20/09/2018	446	50	35.6	43	0.20%	0.00%
5	Evans Street	Between Brae Street and Rose Street	Northbound	20/09/2018	1829	50	37.9	45	0.25%	0.02%
5	Evans Street	Between Brae Street and Rose Street	Southbound	20/09/2018	1370	50	39.7	48	0.63%	0.05%
5	Leichhardt Street	near no.8 Leichhardt St	Northbound	20/09/2018	7542	50	37	43	0.14%	0.03%
5	Leichhardt Street	near no.8 Leichhardt St	Southbound	20/09/2018	8233	50	35.8	44	0.10%	0.05%
5	Macpherson Street	70m east of Leichardt Street roundabout, outside No. 38	Eastbound	20/09/2018	8552	50	33.6	41	0.03%	0.00%
5	Macpherson Street	70m east of Leichardt Street roundabout, outside No. 38	Westbound	20/09/2018	7523	50	35.3	43	0.17%	0.01%
5	Macpherson Street	70m east of Evans Street, outside No. 92	Eastbound	20/09/2018	3645	50	43.4	50	3.62%	2.08%
5	Macpherson Street	70m east of Evans Street, outside No. 92	Westbound	20/09/2018	2615	50	42.5	49	2.88%	1.96%
5	Macpherson Street	30m east of Collingwood Street, outside No. 159	Eastbound	20/09/2018	1494	50	45.3	52	1.64%	0.14%
5	Macpherson Street	30m east of Collingwood Street, outside No. 159	Westbound	20/09/2018	1597	50	42.5	50	1.67%	0.29%
5	St Thomas Street	40m south of Busby Parade, outside No. 61	Northbound	20/09/2018	1795	50	43.8	52	3.07%	0.51%
5	St Thomas Street	40m south of Busby Parade, outside No. 61	Southbound	20/09/2018	2016	50	45.1	53	2.97%	0.30%
5	Wallace Street	near No 12 Wallace Street	South East	6/08/2013	286	50	29	38	-	-
5	Wallace Street	outside No 14	East	11/05/2018	353	50	26	31	-	-

STUDY AREA – SPEED AND AADT MAPS

85th Percentile Speed



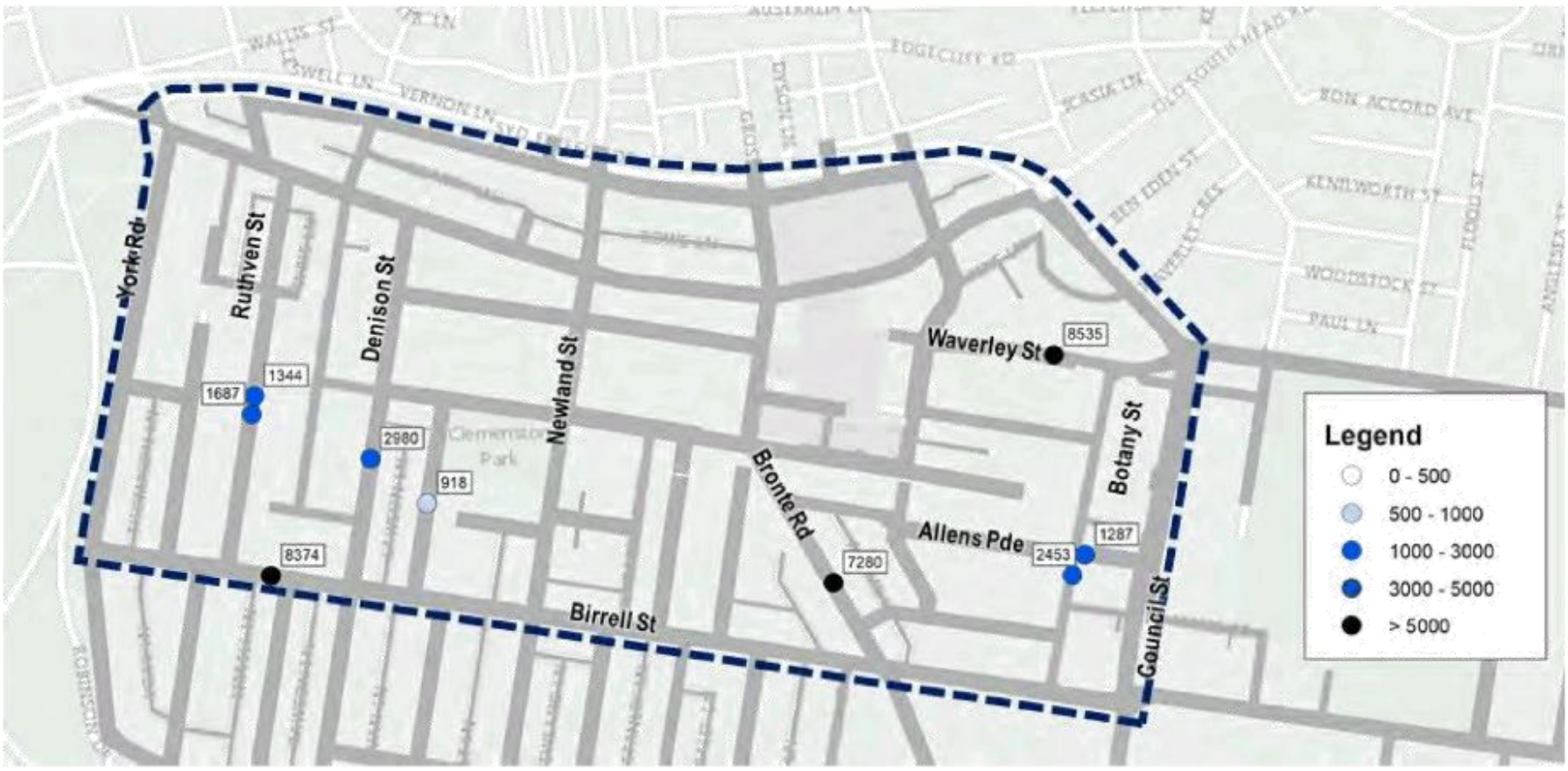
AADT



ZONE 1 – SPEED AND AADT MAPS

85th Percentile Speed

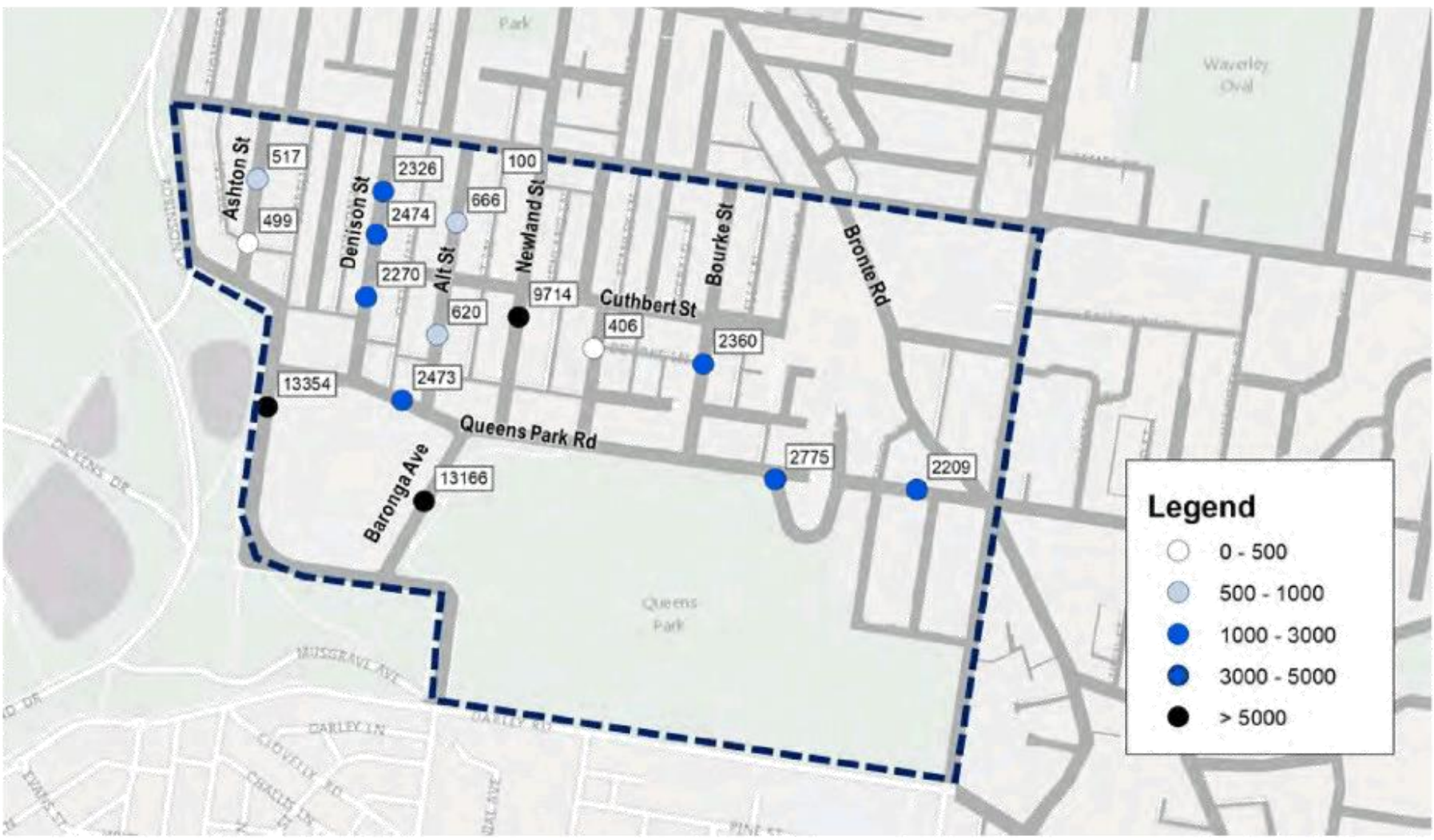
AADT



ZONE 2 – SPEED AND AADT MAPS

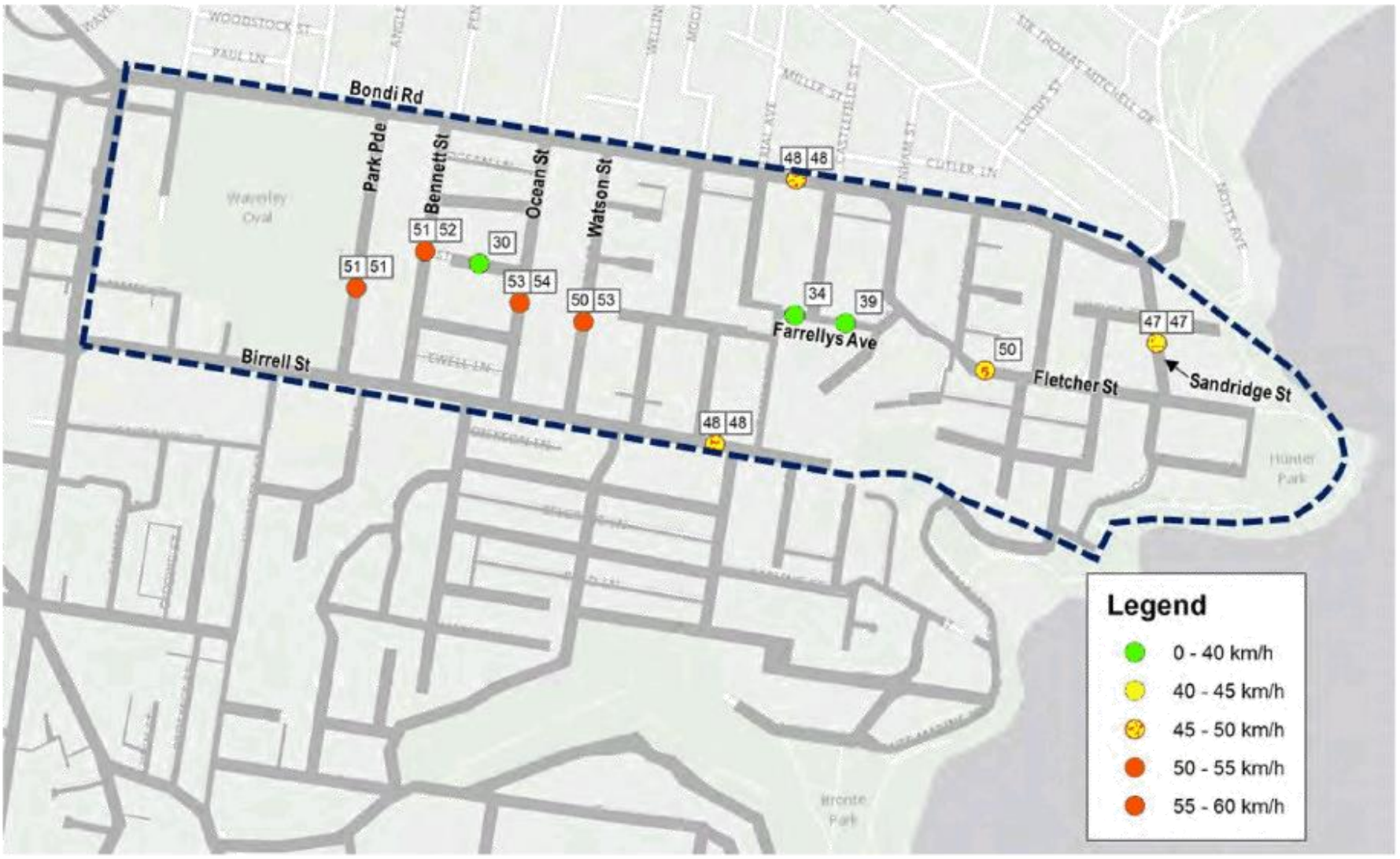
85th Percentile Speed

AADT



ZONE 3 – SPEED AND AADT MAPS

85th Percentile Speed



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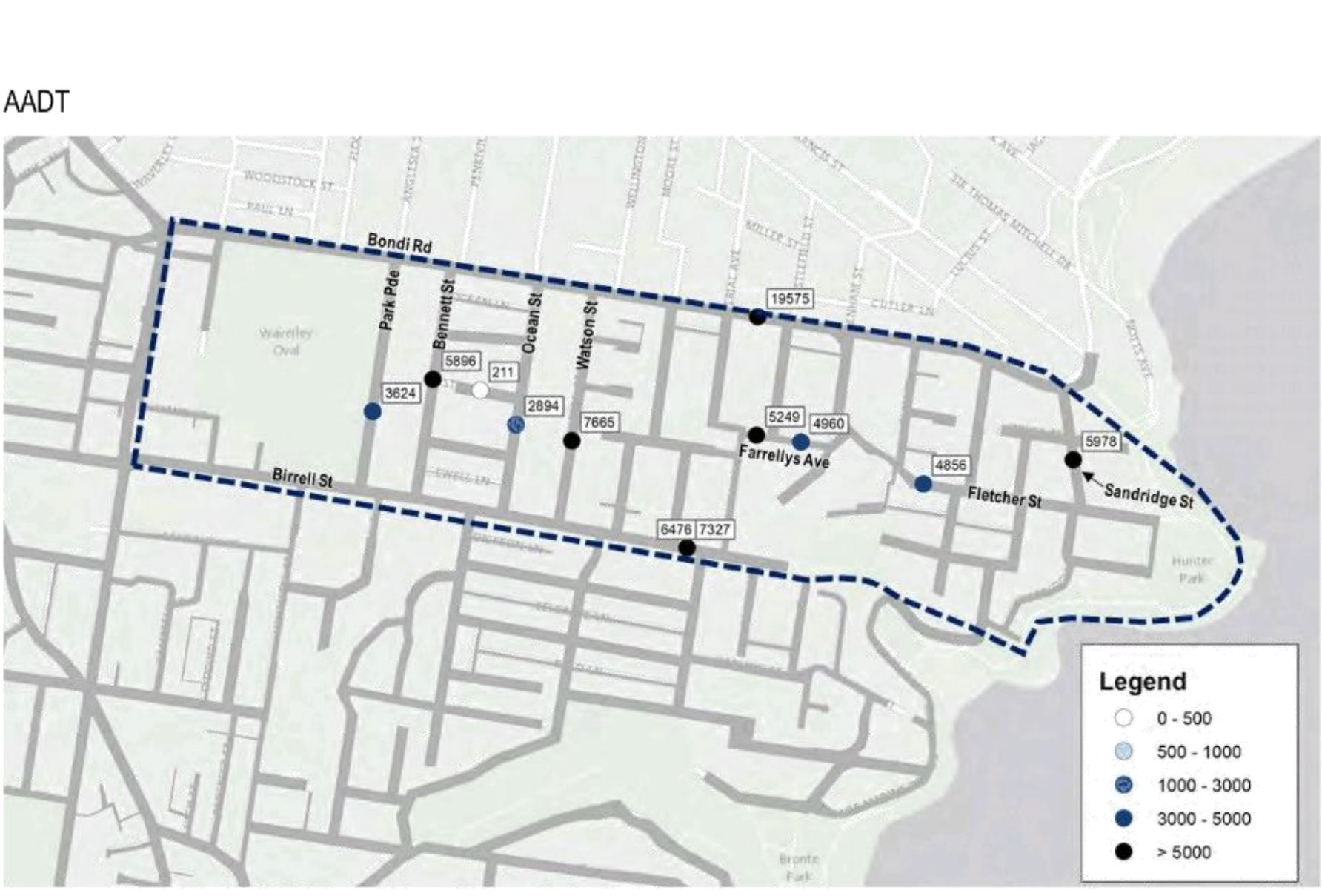
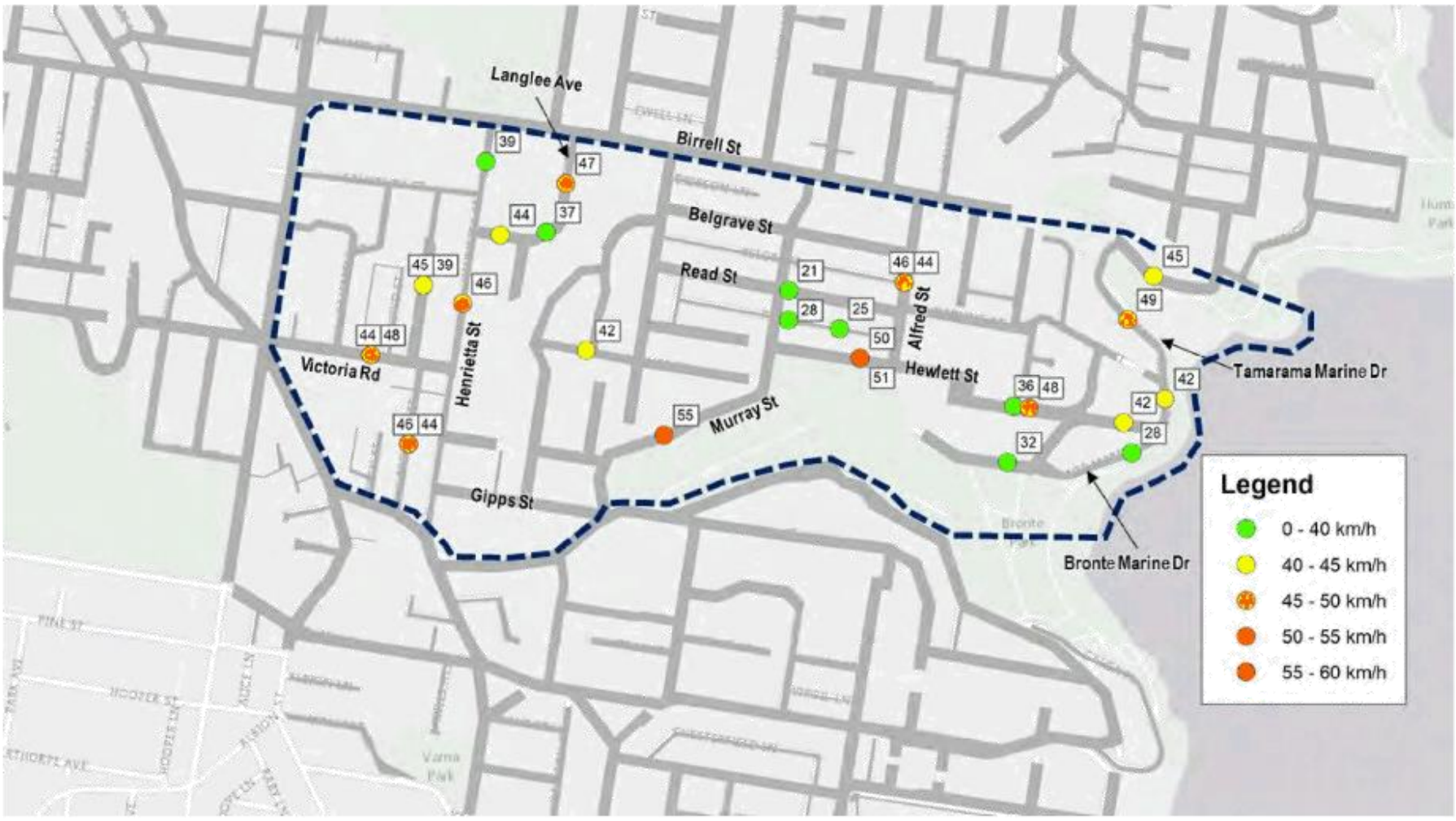
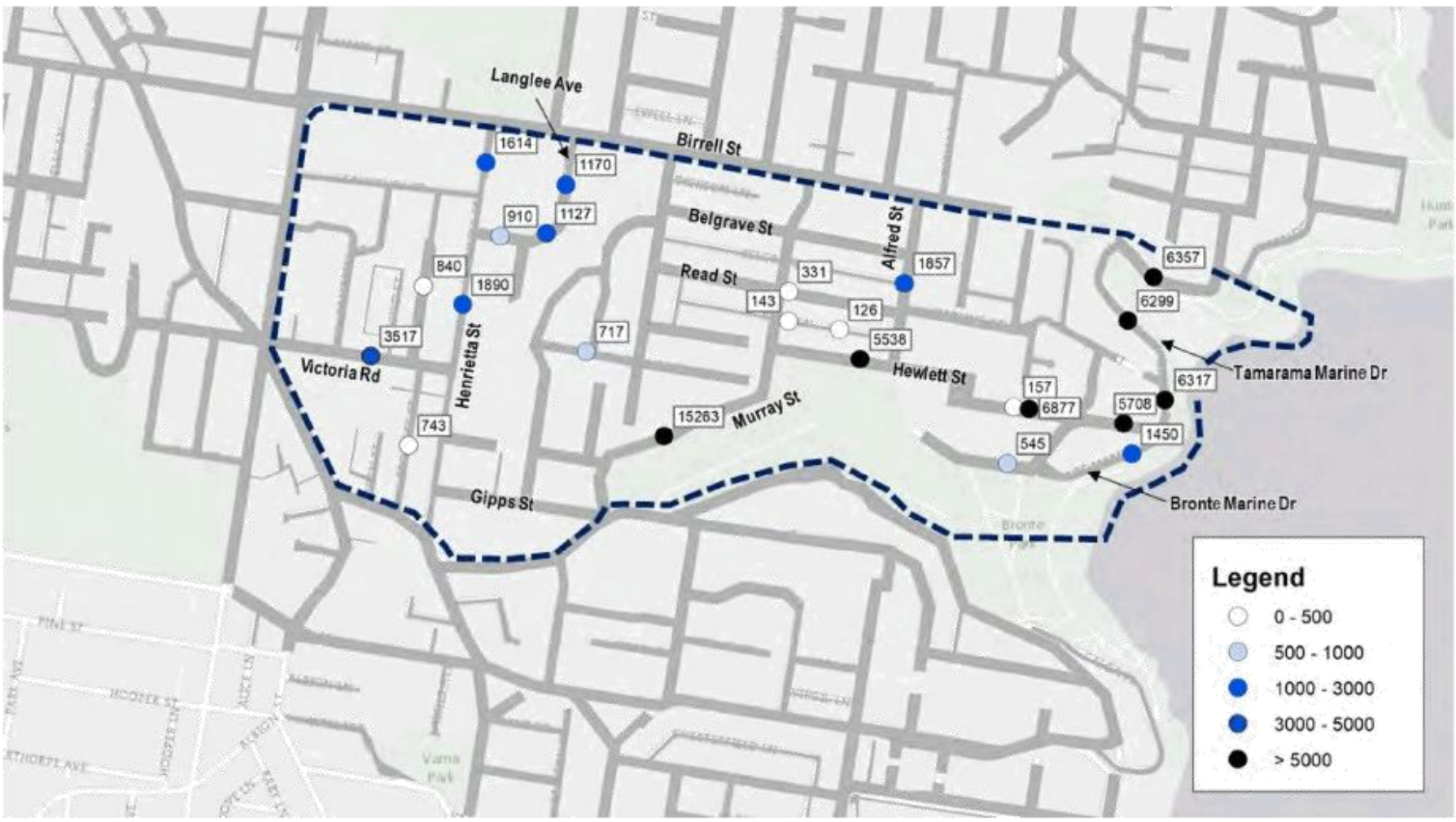


ZONE 4 – SPEED AND AADT MAPS

85th Percentile Speed



AADT



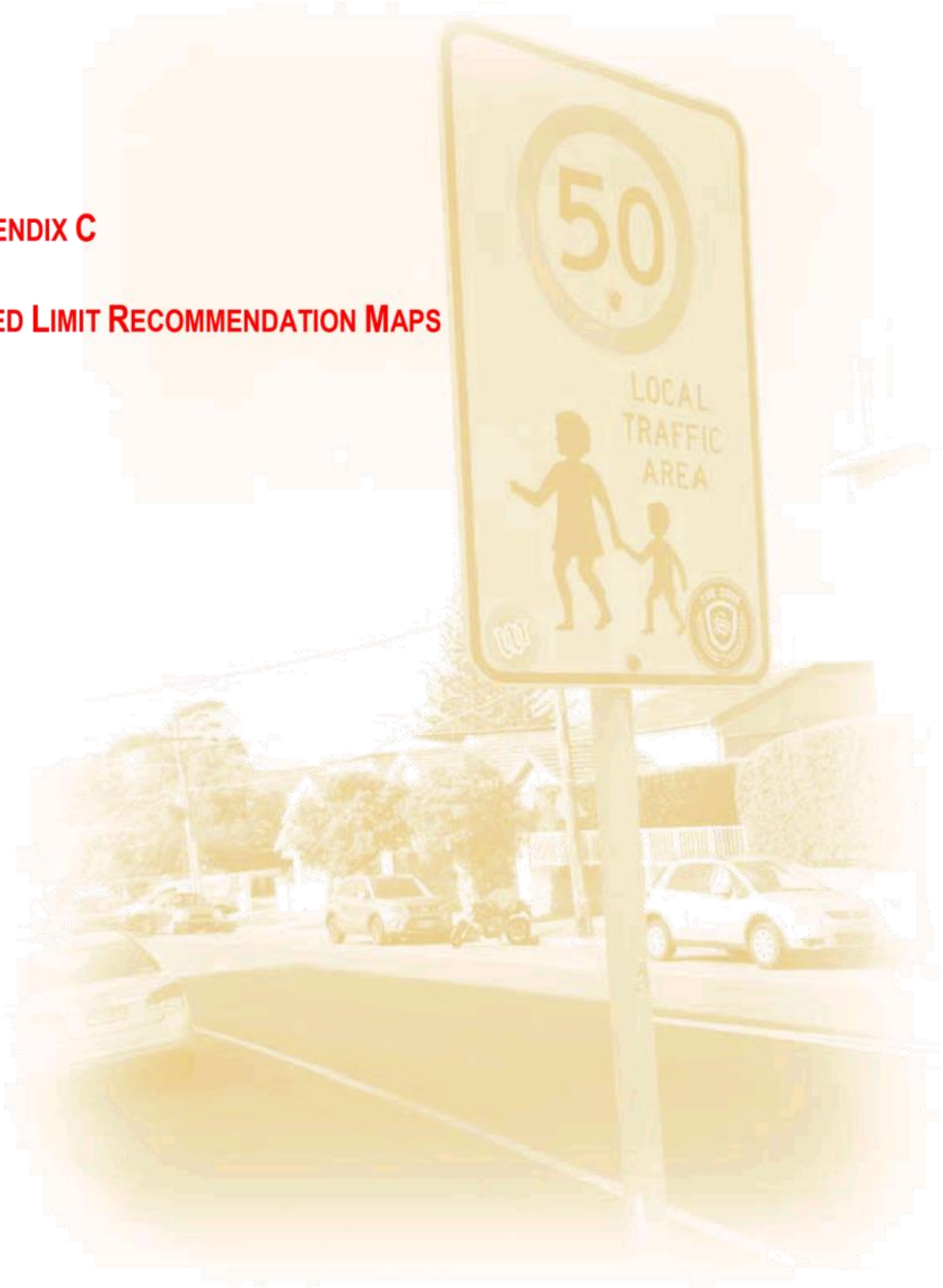
ZONE 5 – SPEED AND AADT MAPS

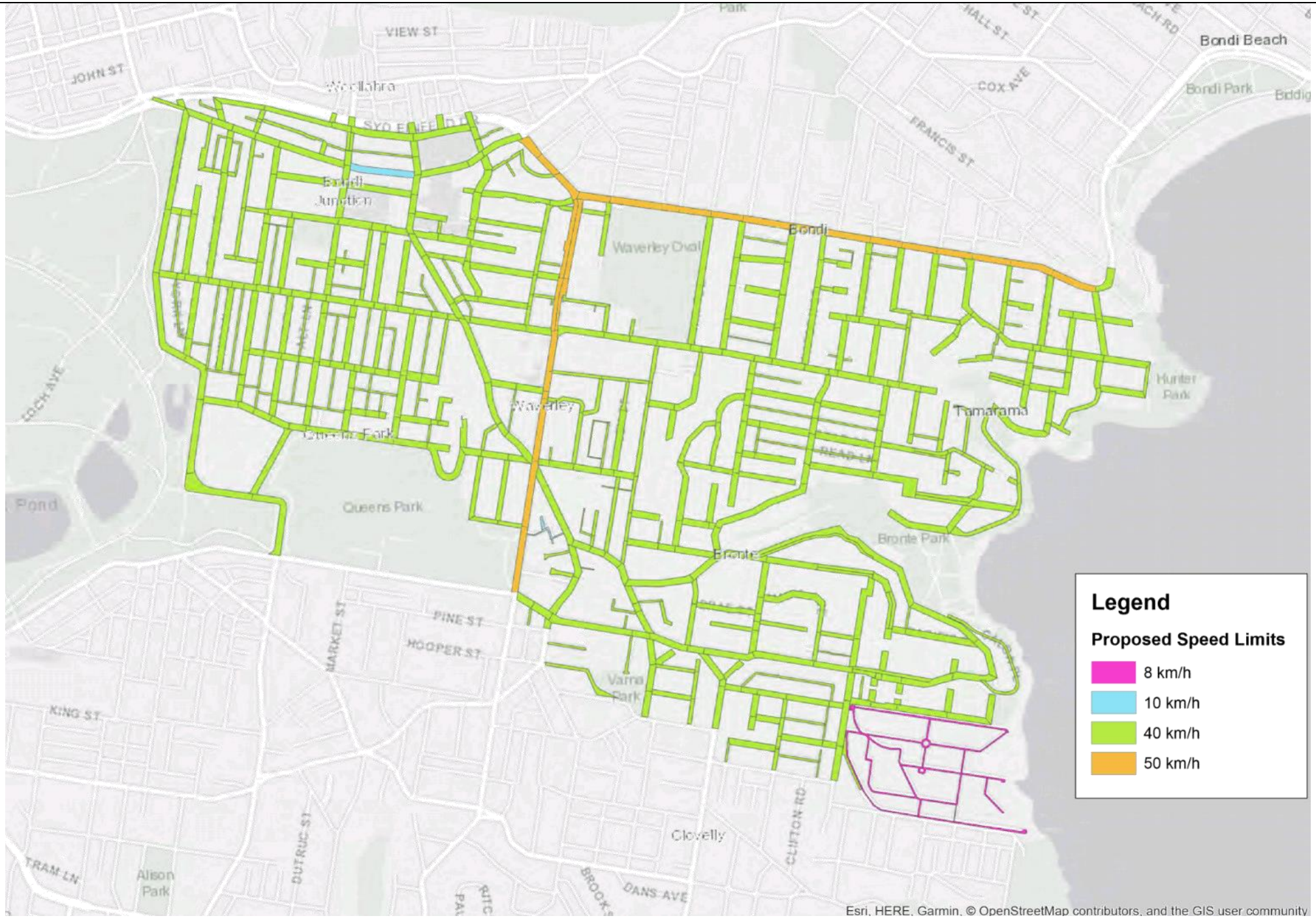
85th Percentile Speed

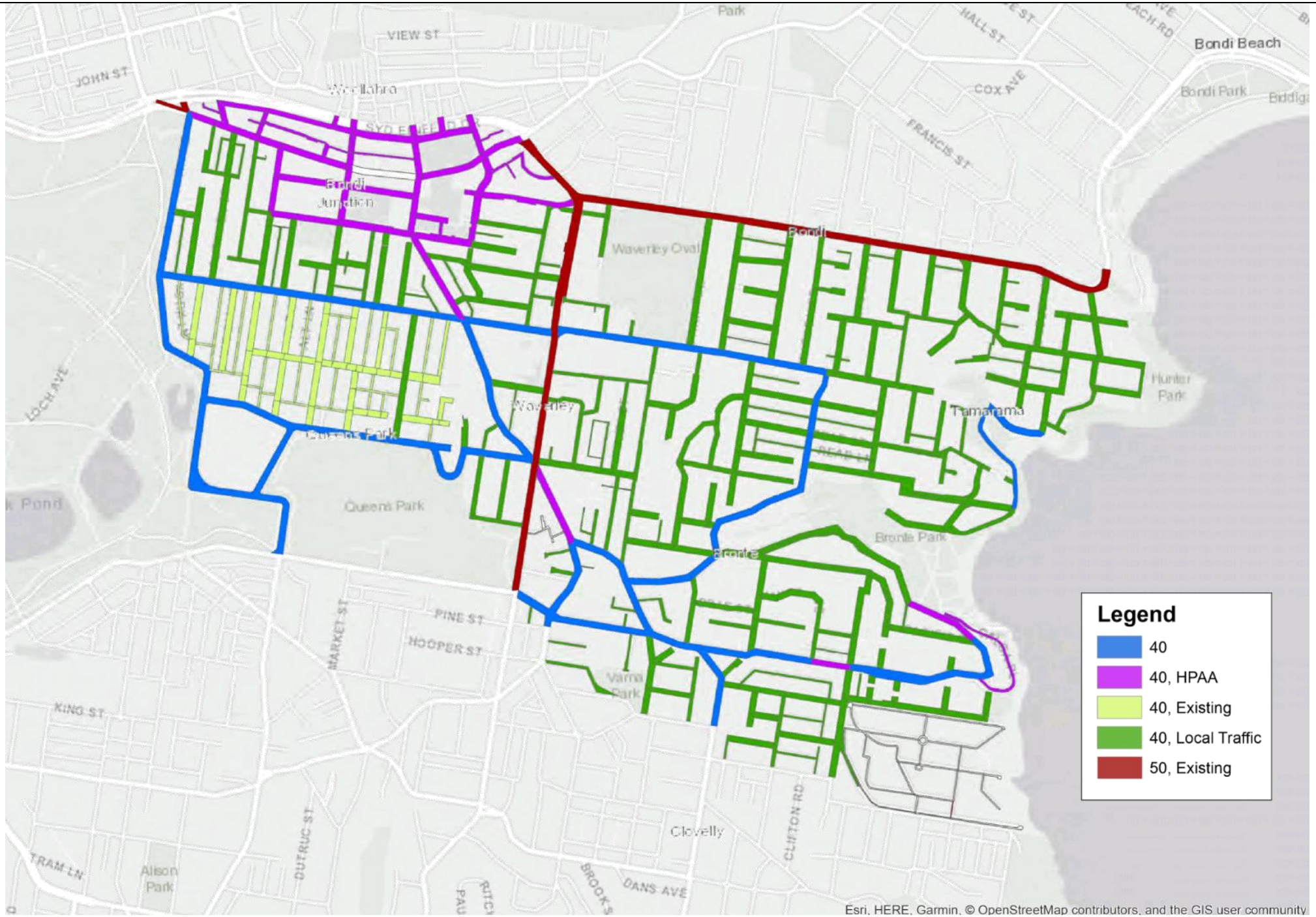
AADT

APPENDIX C

SPEED LIMIT RECOMMENDATION MAPS

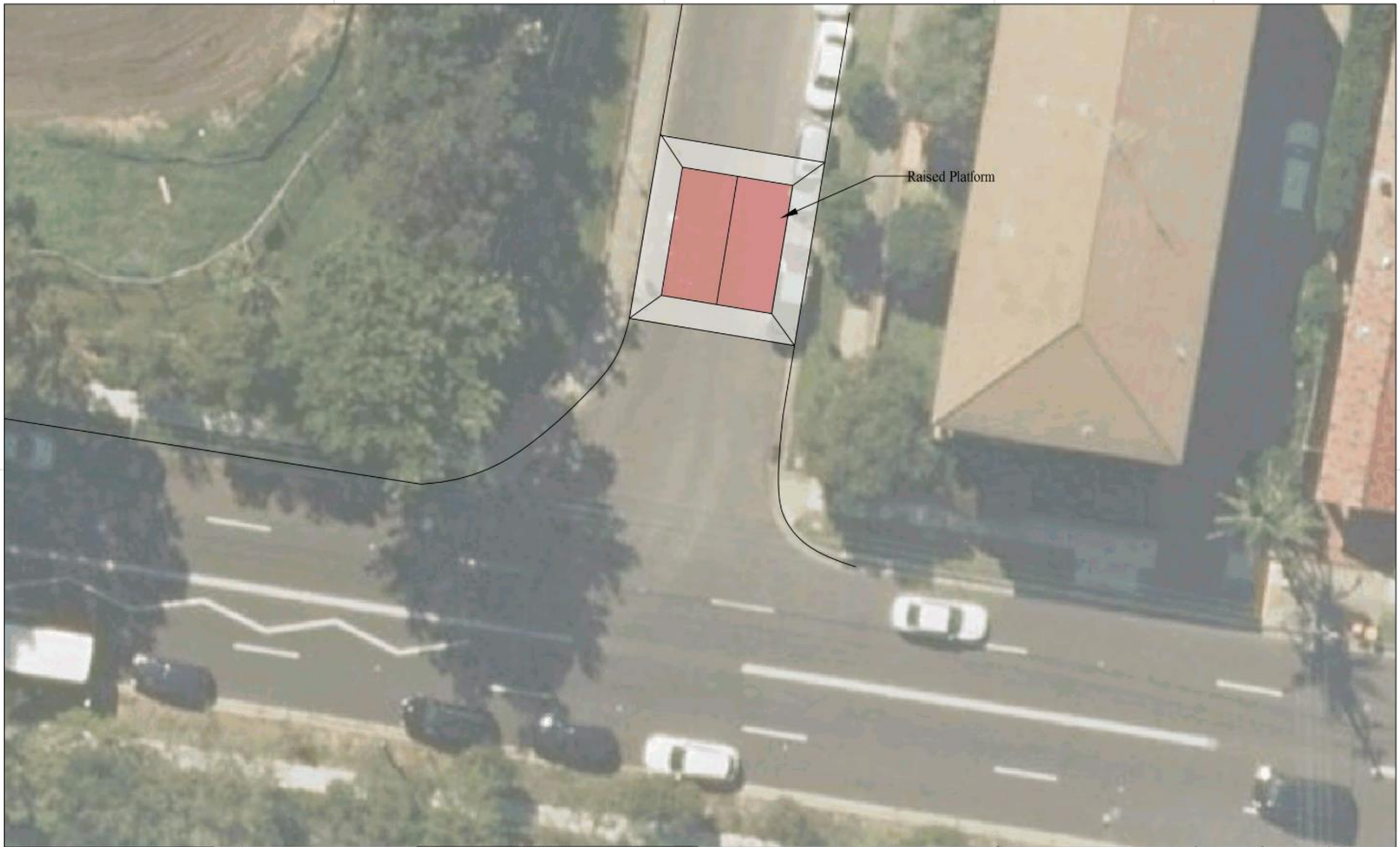



VIEW ST
JOHN ST
Woollahra
Bondi Beach
Bondi Park
COX AVE
FRANCIS ST
Bondi Junction
Bondi
Waverley Oval
Waverley
Tamarama
Hunter Park
Queens Park
Pond
Bronte
Bronte Park
PINE ST
HOOPER ST
MARKET ST
Varna Park
KING ST
Clovelly
CLIFTON RD
DUTRUC ST
TRAM LN
Alison Park
DANS AVE
Legend
Proposed Speed Limits
8 km/h
10 km/h
40 km/h
50 km/h
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community


Legend
40
40, HPAA
40, Existing
40, Local Traffic
50, Existing
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community

APPENDIX D

STANDARD TREATMENT CONCEPT DESIGNS



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project: Waverley 40km/h Zone 1 Speed Review	Design: J.Y	Drawn: J.Y	Checked: T.W
	FOR INFORMATION ONLY		Date: 16.11.2018
Title: Proposed Traffic Calming and Management Treatments Standard Entry Threshold	Project Number: P3792	Sheet Number: 1	Issue: 001

Entry Threshold + Median

1:200 @ A3

GROUPGSA

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project: Waverley 40km/h Zone 1 Speed Review

Title: Proposed Traffic Calming and Management Treatments Flat-top Road Hump with Adjacent Cycle Lanes

Design	Drawn	Checked
J.Y	J.Y	T.W
FOR INFORMATION ONLY		Date 16.11.2018
Project Number P3792	Sheet Number 3	Issue 001

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project: Waverley 40km/h Zone 1 Speed Review

Title: Proposed Traffic Calming and Management Treatments Flat-top Road Hump

Design	Drawn	Checked
J.Y	J.Y	T.W

FOR INFORMATION ONLY

Date: 16.11.2018

Project Number	Sheet Number	Issue
P3792	4	001

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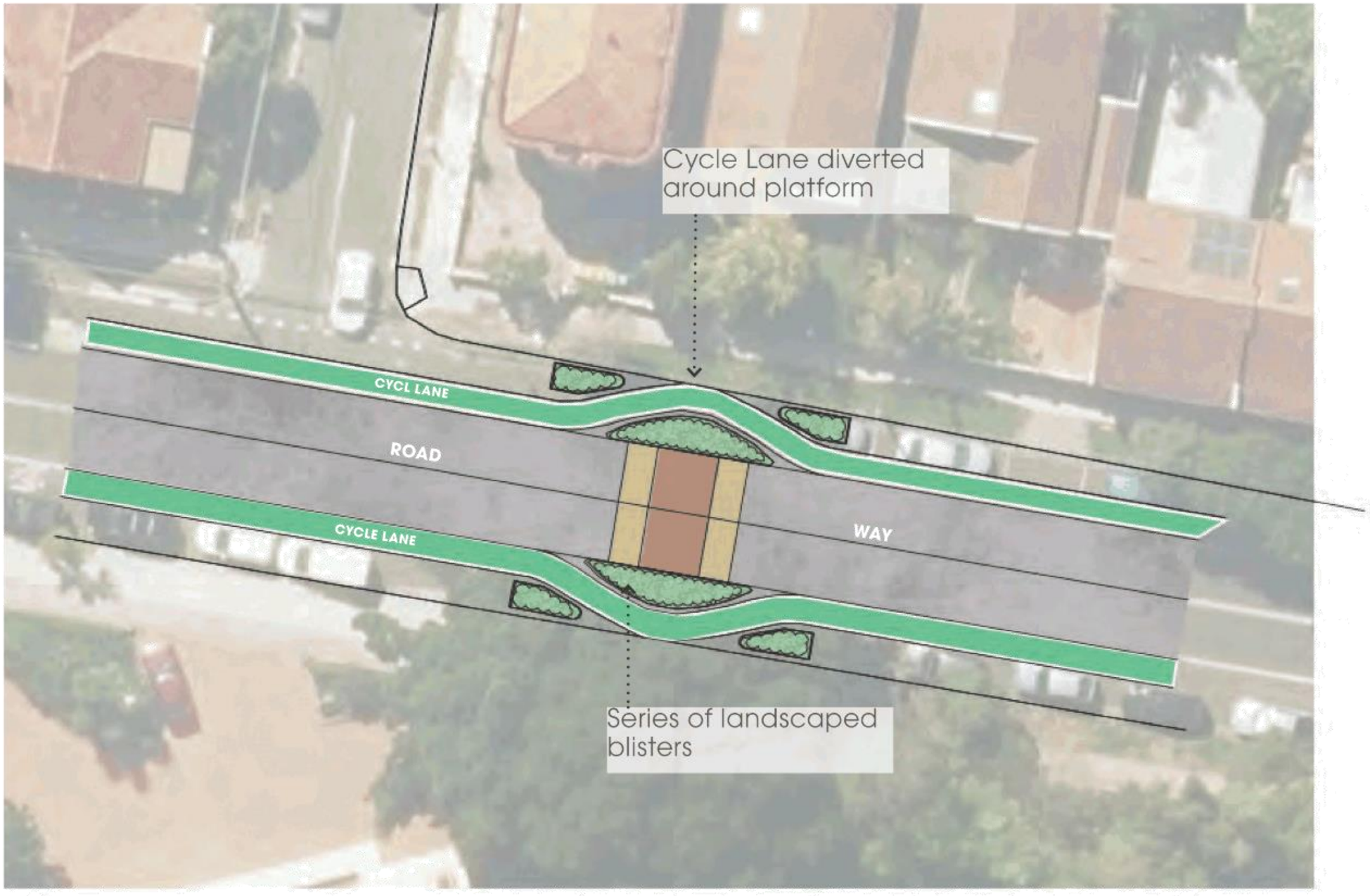
Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project	Waverley 40km/h Zone 1 Speed Review		
Title	Proposed Traffic Calming and Management Treatments Raised Pedestrian Crossing Wombat Crossing		
Design: J.Y	Drawn: J.Y	Checked: T.W	
FOR INFORMATION ONLY		Date: 16.11.2018	
Project Number: P3792	Sheet Number: 5	Issue: 001	

Flat Top With Cycleway



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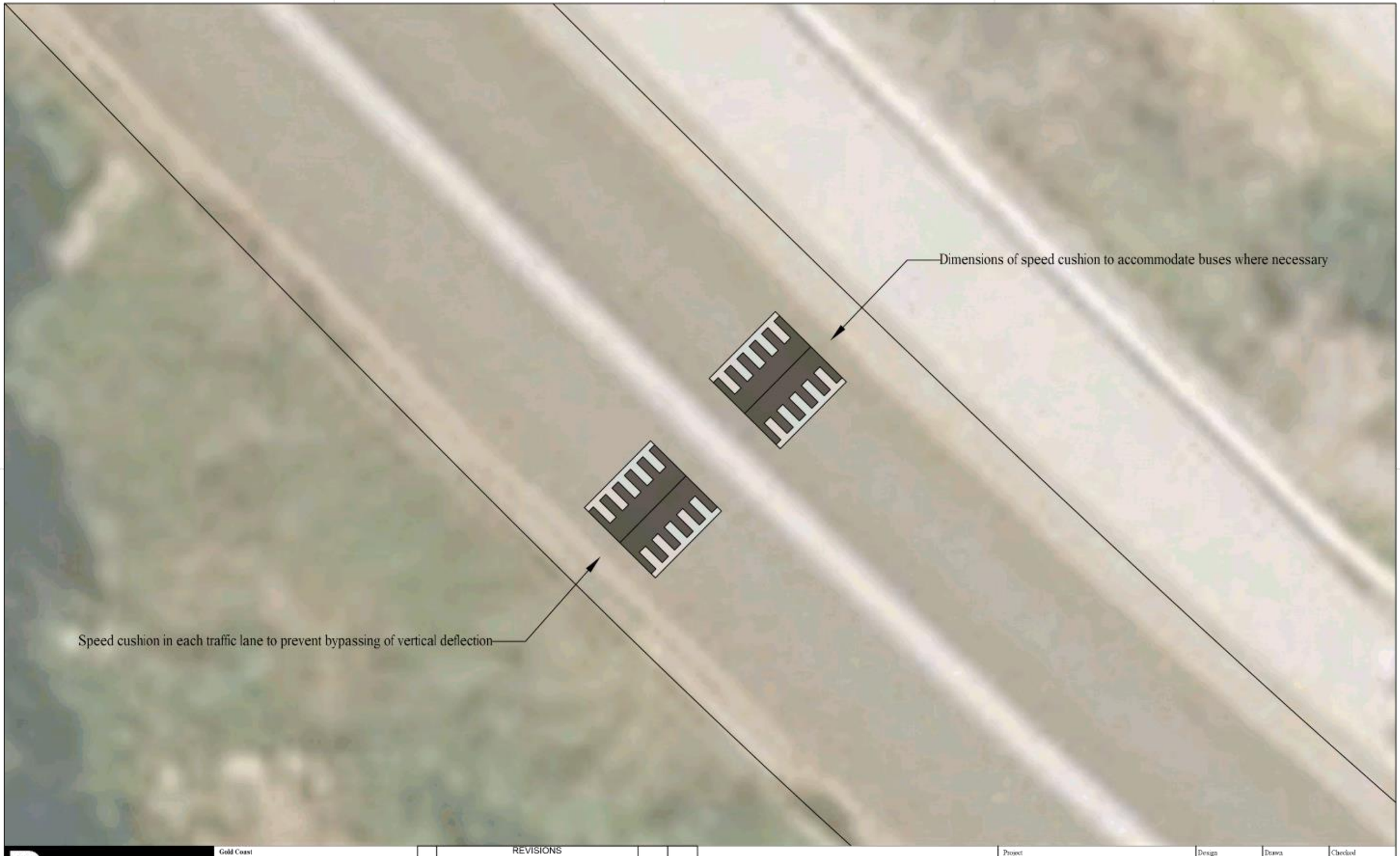
GROUPGSA

Flat Top Hump With Blisters

1:200 @ A3

GROUPGSA



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project: Waverley 40km/h Zone 1 Speed Review

Title: Proposed Traffic Calming and Management Treatments Speed Cushions Shorter cushions for bus routes

Design	Drawn	Checked
J.Y	J.Y	T.W

FOR INFORMATION ONLY

Date: 16.11.2018

Project Number	Sheet Number	Issue
P3792	8	001

Kerb Blisters Around Trees

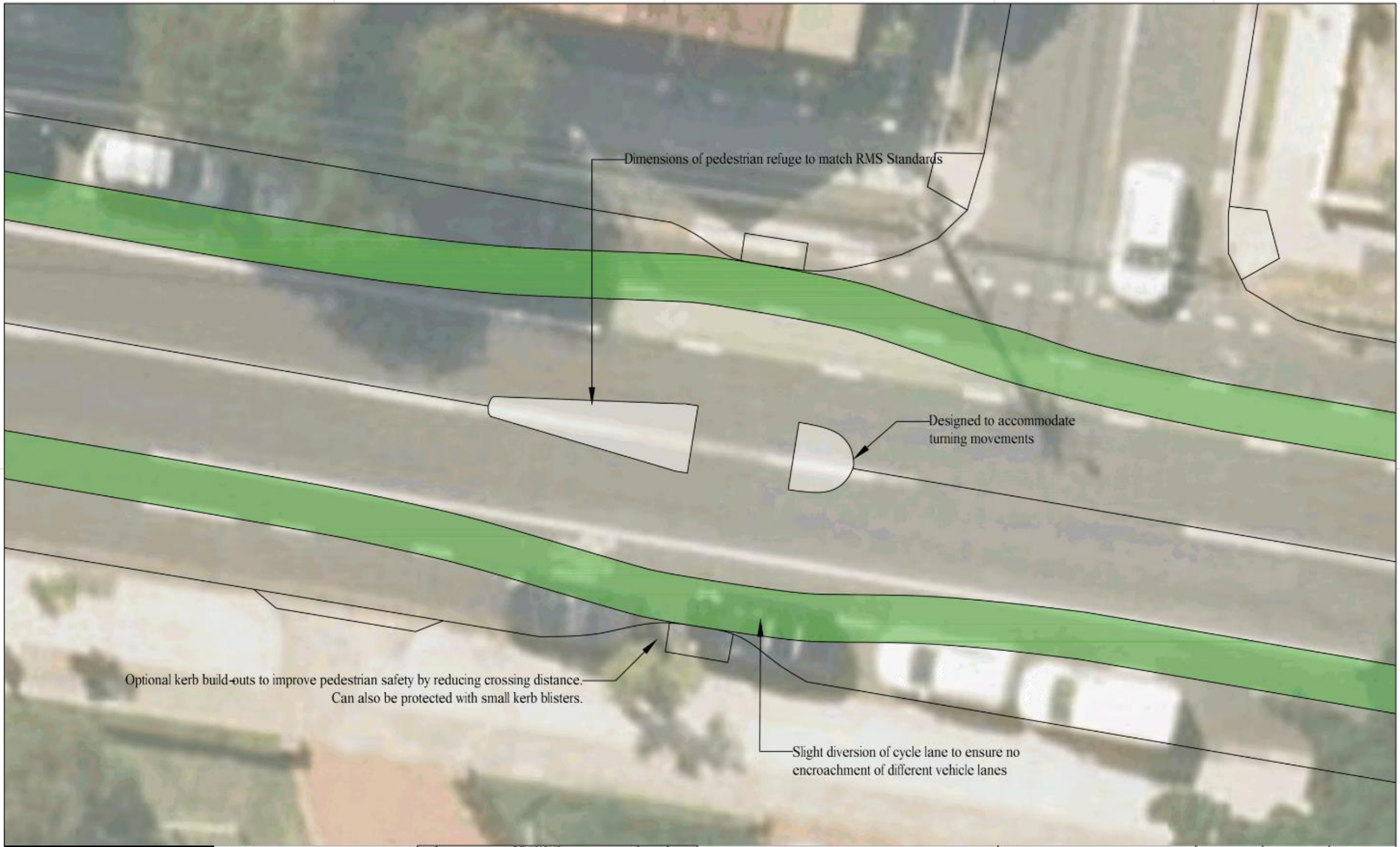
1:200 @ A3

GROUPGSA

Alternative Kerb Blisters Around Trees

1:200 @ A3

GROUPGSA



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project: Waverley 40km/h Zone 1 Speed Review

Title: Proposed Traffic Calming and Management Treatments Pedestrian Refuge

Design	Drawn	Checked
J.Y	J.Y	T.W

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Date: 16.11.2018

Project Number	Sheet Number	Issue
P3792	11	001

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REVISIONS			
Issue	Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project: Waverley 40km/h Zone 1 Speed Review

Title: Proposed Traffic Calming and Management Treatments Median Splitter Island

Design	Drawn	Checked
J.Y	J.Y	T.W

FOR INFORMATION ONLY

Date: 16.11.2018

Project Number	Sheet Number	Issue
P3792	12	001

Slow Point Chicane

1:200 @ A3

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project: Waverley 40km/h Zone 1 Speed Review	Design: J.Y	Drawn: J.Y	Checked: T.W
	FOR INFORMATION ONLY		Date: 16.11.2018
Title: Proposed Traffic Calming and Management Treatments Edge Linemarking	Project Number: P3792	Sheet Number: 14	Issue: 001

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	Proposed Standard Treatments	J.Y	16.11.2018

Project: Waverley 40km/h Zone 1 Speed Review

Title: Proposed Traffic Calming and Management Treatments Contrasting Threshold

Design	Drawn	Checked
J.Y	J.Y	T.W

FOR INFORMATION ONLY

Date	Project Number	Sheet Number	Issue
16.11.2018	P3792	15	001

APPENDIX E

TREATMENT RATIONALISATION

P3792.002S Treatment Rationalisation Table

P3792 Waverley 40km/h Speed Review Zone 1: Stage 2

Treatment Rationalisation Table

ID	Zone	Street	Suburb	Location	Treatment ID	Initial Recommendation	Council Recommendation	Workshop Outcome	Final Recommended Treatment	Recommended Treatment ID	Rationale	Other comments	Bus Route	Cycle Route
1	1	**Botany Street**	Bondi Junction	Immediately south of Allen Parade	7	Flat top road hump with kerb blisters (landscaping)	Flat-top Road Hump	Flat-top Road Hump	**Flat-top Road Hump**	4	Long straight street with good sight lines. Plain road hump to minimise impact to parking.	Treatment may cause noise for local residents	No	No
2	1	**Botany Street**	Bondi Junction	Immediately south of Llandaff Street	7	Flat top road hump with kerb blisters (landscaping)	Flat-top Road Hump	Flat-top Road Hump	**Flat-top Road Hump**	4	Long straight street with good sight lines. Plain road hump to minimise impact to parking.	Treatment may cause noise for local residents	No	No
3	1	**Bronte Road**	Bondi Junction	Between Birrell Street and Ebley Street	13	Edge line marking	Retain	Retain	**Edge Line Marking**	13	Treatment will have minimal impact on traffic volumes and bus services. Treatment assists with the delineation of parking	subject to change in the future as part of streetscape upgrades along this section of road.	Yes	No
4	1	**Denison Street**	Bondi Junction	At Spring Street	-	NONE	Removed from Scope	Removed from Scope	**Removed from Scope**	-	Spring Street Cycleway concept includes shared raised crossing immediately north of Spring Street. Spacing between proposed and existing LATM sufficient	No action at this stage, review traffic speeds/volumes after implementation of cycleway.	No	No
5	1	**Denison Street**	Bondi Junction	At Birrell Street	2	Entry threshold with centre median island and kerb blisters (landscaping)	Remove	Remove	**Removed from Scope**	-	Previous entry threshold was removed by Council due to resident complaints on noise and amenity. Recommended to not reinstate raised entry threshold.	Existing median island	No	No
6	1	**Grafton Street**	Bondi Junction	Between Newland Street and Leswell Street	13	Edge Line Marking	Retain	Retain	**Edge Line Marking**	13	Wide roadway with kerbside parking	cycle road marking should be placed in travel lane to avoid door zone of kerbside parking	No	Yes
7	1	**Grafton Street**	Bondi Junction	Between Nelson Street and Leswell Street	13	Edge Line Marking	Retain	Retain	**Edge Line Marking**	13	Roadway with kerbside parking. Treatment to make consistent/similar to treatment recommended east on Grafton Street	line marking to be applied on southern side adjacent to kerbside parking	No	Yes
8	1	**Lawson Street**	Bondi Junction	At Ebley Street	2	Entry threshold and kerb blisters (landscaping)	Remove	Remove	**Removed from Scope**	-	Short street with T junctions at each end. Existing kerb build out		No	No
9	1	**Lawson Street**	Bondi Junction	At Birrell Street	2	Entry threshold with centre median island and kerb blisters (landscaping)	Remove	Remove	**Removed from Scope**	-	Short street with T junctions at each end. Existing kerb blisters and median at Birrell Street		No	No
10	1	**Ruthven Street**	Bondi Junction	at Gowrie Street	11	Splitter Islands	Remove	Remove	**Removed from Scope**	-	Road alignment at intersection acts as slow point. Crest may obscure safe sight distances to initial recommended splitter islands.	Swept path / turning movement considerations.	No	No
11	1	**Ruthven Street**	Bondi Junction	No. 88, No 90	4	Flat Top Road Hump	Retain	Retain	**Flat-top Road Hump**	4	Downhill with open sight lines. Minimise impact to parking and movements from driveways	Treatment may cause noise for local residents	No	No
12	1	**St James Road**	Bondi Junction	At Birrell Street	2	Entry threshold and kerb blisters (landscaping)	Remove	Remove	**Removed from Scope**	-	Road environment and width acts as traffic calming.		No	No
13	1	**Waverley Street**	Bondi Junction	Between Botany Street and Hollywood Avenue	13	Edge Line Marking	Retain	Retain	**Edge Line Marking**	13	Treatment will have minimal impact on traffic volumes and bus services. Treatment assists with the delineation of parking	Relocate cycling road marking to travel lane to avoid door zone of kerbside parking and delineate two way traffic conditions	No	Yes
14	1	**York Road**	Bondi Junction	South of Bus Depot Driveway	7	Flat Top Road Hump with Kerb Blisters and median (landscaping)	Remove	Remove	**Removed from Scope**	-	York Road carries a high volume of traffic. Existing traffic calming device located 120m south		No	No

P3792 Waverley 40km/h Speed Review Zone 1: Stage 2

Treatment Rationalisation Table

ID	Zone	Street	Suburb	Location	Treatment ID	Initial Recommendation	Council Recommendation	Workshop Outcome	Final Recommended Treatment	Recommended Treatment ID	Rationale	Other comments	Bus Route	Cycle Route
15	2	**Bourke Street**	Queens Park	South of Bourke Lane	3	Flat Top with separated cycle lane	Flat-top Road Hump	Flat-top Road Hump	**Flat-top Road Hump**	4	Long straight street with good sight lines. Plain road hump to minimise impact to parking.	Treatment to be designed as bicycle and bus friendly. Provide kerbside devices to minimise pedestrians crossing at this location.	Yes	Yes
16	2	**Bourke Street**	Queens Park	No. 14 Bourke Street	3	Flat Top with separated cycle lane	Flat-top Road Hump	Flat-top Road Hump	**Flat-top Road Hump**	4	Long straight street with good sight lines. Plain road hump to minimise impact to parking.	Treatment to be designed as bicycle and bus friendly. Provide kerbside devices to minimise pedestrians crossing at this location.	Yes	Yes
17	2	**Bronte Road**	Waverley	Between Birrell Street and Church Street	13	Edge Line Marking	Retain	Retain	**Edge Line Marking**	13	Bronte Road carries a high traffic volume. Treatment assists with the delineation of parking	Eastern side: tie in with existing kerb blisters at start of school zone Western side: end at bus zone south of Birrell Street	Yes	No
18	2	**Bronte Road**	Waverley	Between Birrell Street and Victoria Street	13	Edge Line Marking	Retain	Retain	**Edge Line Marking**	13	Bronte Road carries a high traffic volume. Treatment assists with the delineation of parking		Yes	No
19	2	**Queens Park Road**	Queens Park	At York Road	NONE	NONE	Remove from Scope	Remove from Scope	**Removed from Scope**	-	Existing flat top speed hump at this location		No	No
20	2	**Queens Park Road**	Queens Park	at Victoria Street lower	11	Concrete Median	Remove	Remove	**Removed from Scope**	-	Median treatment at this location deemed unsafe due to road geometry. Existing low profile median.	Data indicates speed issue at this location. Recommend monitoring speeds for future inclusion.	No	Yes
21	2	**Queens Park Road**	Queens Park	Immediately west of Bourke Street	10	Pedestrian Refuge	Retain	Retain	**Pedestrian Refuge**	10	Existing pedestrian crossing point. Relatively high traffic volumes along this section of road.	Size and shape must consider bus movements out of Bourke Street and cycle lanes, some parking may be impacted	Yes	Yes
22	2	**Victoria Street**	Queens Park	East of Henry Street	6	Flat top road hump with cycle diversion (landscaping)	Flat-top Road Hump	Flat-top Road Hump	**Flat-top Road Hump**	4	Straight street with good sight lines. Plain road hump to minimise impact to parking.	Provide kerbside devices to minimise pedestrians crossing at this location.	No	Yes
23	2	**York Road**	Queens Park	190m south of Queens Park Road	8	Speed Cushions with Kerb Blisters (landscaping)	Remove	Remove	**Removed from Scope**	-	Existing pedestrian refuge and bend in road acts as traffic calming.	Existing pedestrian refuge and concrete median south and north of this location respectively.	Yes	No
24	2	**York Road**	Queens Park	Immediately north of Queens Park Road	7	Flat top road hump with median (landscaping)	Remove	Remove	**Removed from Scope**	-	Median and bend in in road acts as traffic calming. Geometry at this location may not allow for safe sight distances.		No	No
25	2	**York Road**	Queens Park	Outside No. 47-49	4	Flat Top Road Hump	Remove	Retain	**Flat-top Road Hump**	4	Optimise spacing of traffic calming devices along this section of road. Straight roadway with good sight lines.	Existing pedestrian refuge and concrete median north and south of this location respectively.	No	No

P3792 Waverley 40km/h Speed Review Zone 1: Stage 2

Treatment Rationalisation Table

ID	Zone	Street	Suburb	Location	Treatment ID	Initial Recommendation	Council Recommendation	Workshop Outcome	Final Recommended Treatment	Recommended Treatment ID	Rationale	Other comments	Bus Route	Cycle Route
26	3	Bennett Street	Bondi	Immediately south of King Street	8	Speed Cushion	Remove	Remove	Removed from Scope	-	Consolidate this treatment with #25		No	No
27	3	Bennett Street	Bondi	Outside No. 29	4	Flat top road hump	Retain	Retain	Flat-top Road Hump	4	Straight road section with good sight lines. Minimal impact to parking.	This treatment is recommended to be relocated along Bennet Street to optimise traffic calming device spacing along this section of road. Spacing and location to be determined during detailed design. May cause noise for local residents.	No	No
28	3	Bondi Road	Bondi	Outside No. 270	8	Speed Cushion	Remove	Remove	Removed from Scope	-	Treatments along Bondi Road are subject to RMS investigation as part of another project.		Yes	No
29	3	Bondi Road	Bondi	Immediately west of Glen Street	8	Speed Cushion	Remove	Remove	Removed from Scope	-	Treatments along Bondi Road are subject to RMS investigation as part of another project.		Yes	No
30	3	Dudley Street	Bondi	Outside No. 15	4	Flat top road hump	Retain	Retain	Flat-top Road Hump	4	Optimise spacing of treatments along this roadway. Treatment has minimal impact on parking.	Consider the existing PWD space and driveway access. Also consider additional line marking.	Yes	No
31	3	Fletcher Street	Bondi	Between Bondi Road and	13	Edge line marking (with centre line marking)	Retain	Retain	Edge Line and Centre Line Marking	13	Road geometry not appropriate for other treatments. Treatment has minimal impact to buses.	Include re-paint of existing centre line marking.	Yes	No
32	3	Ocean Street	Bondi	Entry @ Birrell Street	2	Entry threshold with centre median island and kerb blisters (landscaping)	Pedestrian Refuge	Pedestrian Refuge	Pedestrian Refuge	10	Provide traffic calming on entry/exit and provide for improved pedestrian access along Birrell Street.	Dimensions of refuge to meet minimum RMS requirements and allow for vehicle swept paths.	No	No
33	3	Ocean Street	Bondi	Immediately north of Ewell Street	7	Flat top road hump with kerb blisters (landscaping)	Flat-top Road Hump	Flat-top Road Hump	Flat-top Road Hump	4	Optimise spacing of treatments along this section of road. Treatment has minimal impact on kerbside parking.	Existing traffic calming device approximately 120m north.	No	No
34	3	Ocean Street	Bondi	Immediately south of King Street	13	Edge line marking (with optional centre line marking)	Retain	Retain	Edge Line and Centre Line Marking	13	Road geometry is not appropriate for other treatments.	Include re-paint of existing centre line marking.	No	No
35	3	Park Parade	Bondi	Entry @ Birrell Street	2	Entry threshold and kerb blisters (landscaping)	Retain	Retain	Raised Entry Threshold and Landscaped Kerb Blisters	2	Highlight change in road environment to traffic entering from Birrell Street.	Set back approximately 13m from Birrell Street to avoid drainage	No	No
36	3	Park Parade	Bondi	Outside No. 19	7	Flat top road hump with kerb blisters (landscaping)	Flat-top Road Hump	Flat-top Road Hump	Flat-top Road Hump	4	Optimise spacing of treatments along this section of road. Treatment has minimal impact on kerbside parking.	May cause noise for local residents. Provide kerbside devices to minimise pedestrians crossing at this location.	No	No
37	3	Park Parade	Bondi	Immediately south of Caltex driveway	8	Speed Cushion	Remove	Remove	Removed from Scope	-	Intersection and existing median act as traffic calming devices at this location.		No	No
38	3	Sandridge Street	Bondi	Immediately north of Wilga Street	7	Flat top road hump with centre median island and kerb blisters (landscaping)	Flat-top Road Hump with Median	Flat-top Road Hump with Median	Flat-top Road Hump with Median	7	Optimise Spacing of treatments along this section of road. Median to enhance traffic calming. Minimise impact to kerbside parking.	May cause noise for local residents. Provide kerbside devices to minimise pedestrians crossing at this location.	Yes	No
39	3	Watson Street	Bondi	Outside No. 67	7	Flat top road hump with centre median island and kerb blisters (landscaping)	Flat-top Road Hump	Flat-top Road Hump	Flat-top Road Hump	4	Optimise spacing of treatments along this section of road. Treatment has minimal impact on kerbside parking.	Near childcare centre. Provide kerbside devices to minimise pedestrians crossing at this location.	No	No

P3792 Waverley 40km/h Speed Review Zone 1: Stage 2

Treatment Rationalisation Table

ID	Zone	Street	Suburb	Location	Treatment ID	Initial Recommendation	Council Recommendation	Workshop Outcome	Final Recommended Treatment	Recommended Treatment ID	Rationale	Other comments	Bus Route	Cycle Route
40	4	**Alfred Street**	Bronte	Length	13	Edge line marking	Retain	Retain	**Edge Line Marking**	**13**	Road geometry does not allow for other treatments. This treatment has minimal impact on buses.	No centre line marking	Yes	No
41	4	**Brown Street**	Bronte	Outside No. 18	4	Flat top road hump	Retain	Retain	**Flat-top Road Hump**	**4**	Optimise spacing of treatments along this section of road and slow vehicles approaching bend. Treatment has minimal impact on kerbside parking.	No blisters or median to maintain parking and turning manoeuvres.	No	No
42	4	**Dickson Street**	Bronte	Entry at Birrell Street	1	Raised Entry threshold	Retain	Retain	**Raised Entry Threshold**	**1**	Highlight change in road environment to traffic entering from Birrell Street.		No	No
43	4	**Dickson Street**	Bronte	Immediately south of Read Street	7	Flat top road hump with kerb blisters (landscaping)	Flat-top Road Hump	Flat-top Road Hump	**Flat-top Road Hump**	**4**	Optimise Spacing of treatments along this section of road. Minimise impact to kerbside parking. Tie in with start of School Zone.	Provide kerbside devices to minimise pedestrians crossing at this location.	No	No
44	4	**Gipps Street**	Bronte	between Henrietta Street and Bronte Road	13	Edge line marking	Retain	Retain	**Edge Line Marking**	**13**	Road geometry does not allow for other treatments. Treatment assists to delineate kerbside parking.		No	No
45	4	**Henrietta Street**	Waverley	Between Victoria Street and Salisbury Street	Custom	Install 0.3m concrete median separator between vehicle and cycle lane (similar to Wilson St, Newtown).	Retain	Retain	**Bicycle Contra-flow Lane and Median Separator**	**Custom**	Council has advised preference to separate contra-flow bicycle lane from vehicle traffic. Concrete median separator will narrow roadway, assist in reducing traffic speeds, and improve cyclist safety.	New arrangement: 1.2m cycle, 0.3m median, 3.0m travel, 1.9m parking. Alternatively, introduce a flat-top speed hump outside No. 61, ramps to be bicycle friendly design	No	Yes
46	4	**Henrietta Street**	Waverley	Between Victoria Street and Bronte Road	Custom	Install 0.3m concrete median separator between vehicle and cycle lane (similar to Wilson St, Newtown).	Retain	Retain	**Bicycle Contra-flow Lane and Median Separator**	**Custom**	Council has advised preference to separate contra-flow bicycle lane from vehicle traffic. Concrete median separator will narrow roadway, assist in reducing traffic speeds, and improve cyclist safety.	New arrangement: 1.2m cycle, 0.3m median, 3.0m travel, 1.9m parking. Alternatively, introduce a flat-top speed hump outside 123, ramps to be bicycle friendly design	No	Yes
47	4	**Hewlett Street**	Bronte	Outside No. 60	4	Flat top road hump	Retain	Retain	**Flat-top Road Hump**	**4**	Optimise spacing of treatments along this section of road. Minimise impact to kerbside parking. Maintain consistency of treatments along Hewlett Street.	Avoid bus zone near Alfred Street	Yes	No
48	4	**Langlee Avenue**	Bondi	Through road bend	13	Edge line marking (with centre line marking)	Retain	Retain	**Edge Line and Centre Line Marking**	**13**	Road geometry does not allow for other treatments. Treatment assists to delineate kerbside parking and guides traffic through bend.	Include centreline marking.	No	No
49	4	**Langlee Avenue**	Bondi	At the road narrowing approx. 70m south of Birrell Street	4	Flat top road hump	Retain	Retain	**Flat-top Road Hump**	**4**	Optimise Spacing of treatments along this section of road. Minimise impact to kerbside parking and driveway access. Also act as entry threshold at narrow road opening		No	No
50	4	**Murray Street**	Bronte	Outside No. 30	8	Speed Cushion	Remove	Flat-top Road Hump	**Flat-top Road Hump**	**4**	Optimise spacing of treatments along this section of road. Control vehicle speeds on this section of Murray Street. Location to avoid driveways.	Road hump to be installed at location of existing kerb blisters to minimise impact to parking and further reduce vehicle speeds. Hump design to be bus friendly. May cause noise for local residents.	Yes	No
51		**Murray Street**	Bronte	Outside No. 26	8	Speed Cushion	Remove	Flat-top Road Hump	**Flat-top Road Hump**	**4**	Optimise spacing of treatments along this section of road. Control vehicle speeds on this section of Murray Street. Location to avoid driveways.	Road hump to be installed at location of existing kerb blisters to minimise impact to parking and further reduce vehicle speeds. Hump design to be bus friendly. May cause noise for local residents.	Yes	No
52	4	**Pacific Avenue**	Tamarama	Outside No. 5, No.4	8	Speed Cushion	Remove	Remove	**Removed from Scope**	-			Yes	No
53	4	**Tamarama Marine Drive**	Tamarama	Mid-way on straight section	8	Speed Cushion	Remove	Flat-top Road Hump	**Flat-top Road Hump**	**4**	Straight and open section of road, adjacent to highly trafficked pedestrian path.		Yes	No
54	4	**Victoria Street**	Queens Park	Outside No. 44	6	Flat top road hump with cycle diversion (landscaping)	Flat-top Road Hump	Flat-top Road Hump	**Flat-top Road Hump**	**4**	Optimise spacing of traffic calming along this section of road. Treatment has minimal impact on kerbside parking.	May cause noise for local residents. Provide kerbside devices to minimise pedestrians crossing at this location. Hump to be bicycle friendly.	No	Yes

P3792.002S Treatment Rationalisation Table

P3792 Waverley 40km/h Speed Review Zone 1: Stage 2

Treatment Rationalisation Table

ID	Zone	Street	Suburb	Location	Treatment ID	Initial Recommendation	Council Recommendation	Workshop Outcome	Final Recommended Treatment	Recommended Treatment ID	Rationale	Other comments	Bus Route	Cycle Route
55	5	**Arden Street**	Bronte	25m North of Baglin Street	8	Speed Cushion	Remove	Remove	**Removed from Scope**	-	Subject to separate project along this section of road.		Yes	Yes
56	5	**Arden Street**	Bronte	15m South of Chesterfield parade	8	Speed Cushion	Remove	Remove	**Removed from Scope**	-	Subject to separate project along this section of road.		Yes	Yes
57	5	**Bronte Road**	Bronte	S Bend at Bronte House	13	Edge line marking (with centre line marking)	Retain	Retain	**Edge Line and Centre Line Marking**	13	Sight distances are not suitable for physical treatments. Line treatment visually narrows roadway to slow traffic on approach and through bend. Treatment assists in delineating kerbside parking.	re-paint centreline marking	No	Yes
58	5	**Bronte Road**	Bronte	No 460, 462 Bronte Road	4	Flat Top Road Hump	Retain	Retain	**Flat-top Road Hump**	4	Traffic calming on straight section of Bronte Road in built up area, minimal impact on parking, street lighting provided at this location	May cause noise for local residents.	No	Yes
59	5	**Bronte Road**	Bronte	No 496 Bronte Road	4	Flat Top Road Hump	Retain	Retain	**Flat-top Road Hump**	4	Traffic calming on straight section of Bronte Road, minimal impact on parking, street lighting provided at this location	May cause noise for local residents.	No	Yes
60	5	**Chesterfield Parade**	Bronte	Between Arden Street and St Thomas Street	13	Edge line marking	Retain	Retain	**Edge Line Marking**	13	Utilise existing roadway width. Treatment minimises impact to kerbside parking.		No	Yes
61	5	**Evans Street**	Bronte	Immediately north of Brae Street	7	Flat top road hump with kerb blisters (landscaping)	Flat-top road hump	Flat-top road hump	**Flat-top Road Hump**	4	Wide straight street, adequate distance from crest		No	No
62	5	**Leichhardt Street**	Bronte	At Macpherson Street	1	Raised Entry Threshold	Removed	Removed	**Removed from Scope**	-	Local street adjoining collector road/roundabout. Entry is currently controlled by roundabout splitter island.	Existing narrow roadway due to parking on both sides of Leichhardt Street.	No	No
63	5	**Lugar Street**	Bronte	South of Brae Street	7	Flat top road hump with kerb blisters (landscaping)	Flat-top road hump	Flat-top road hump	**Flat-top Road Hump**	4	Traffic calming on approach to intersection. Located near street lighting. Minimal impact to parking.	Relatively long and straight section of road.	No	No
64	5	**Macpherson Street**	Bronte	70m east of Collingwood Street	8	Speed Cushions with Cycle Diversion	Removed	Removed	**Removed from Scope**	-	Traffic calming on long and straight section of Macpherson Street. However, a physical treatment was deemed unsafe due to road geometry.		Yes	Yes
65	5	**Macpherson Street**	Bronte	At St Thomas Street	5	Raised Pedestrian Crossing	Retained	Retained	**Raised Pedestrian Crossing**	5	Traffic calming on Macpherson Street by raising platform of existing pedestrian crossing	Bus stop on Macpherson Street	Yes	Yes
66	5	**Macpherson Street**	Bronte	47m west of Yanko Street	13	Edge line marking (with centre line marking)	Retained	Retained	**Edge Line and Centre Line Marking**	13	Refresh line marking at existing pedestrian refuge / around blisters to visually narrow roadway and define travel lanes (vehicle and bicycle)		Yes	Yes
67	5	**Macpherson Street**	Bronte	between Evans Street and Arden Street	13	Edge line marking (with centre line marking)	Retained	Retained	**Edge Line and Centre Line Marking**	13	Refresh existing line marking including bicycle lane to define travel lanes (vehicle and bicycle)		Yes	Yes
68	5	**Pacific Street**	Bronte	At Macpherson Street	2	Entry threshold and kerb blisters (landscaping)	Median Splitter island	Median Splitter island	**Median Splitter island**	11	Median treatment at intersection narrows roadway. Controls vehicle paths into and out Pacific Street (existing open intersection).	Minimal impact to parking	No	No
69	5	**St Thomas Street**	Bronte	Outside No. 48	4	Flat top road hump	Pedestrian Refuge	Pedestrian Refuge	**Median Splitter island**	11	Median treatment narrows roadway at bottom of hill. Visible from top of hill southbound	Vertical deflection not appropriate due to downhill slope. Parking may be impacted subject to treatment detailed design.	No	No
70	1	**Birrell Street**	Waverley	Between Bronte Road and Carrington Road	13	Edge line marking (with optional centre line marking)	Retained	Retained	**Edge Line and Centre Line Marking**	13	Edge line marking to visually narrow the roadway. Treatment assists with the delineation of parking		No	Yes

P3792.002S Treatment Rationalisation Table

P3792 Waverley 40km/h Speed Review Zone 1: Stage 2

Treatment Rationalisation Table

ID	Zone	Street	Suburb	Location	Treatment ID	Initial Recommendation	Council Recommendation	Workshop Outcome	Final Recommended Treatment	Recommended Treatment ID	Rationale	Other comments	Bus Route	Cycle Route
71	3	**Birrell Street**	Waverley	Between Carrington Road and Henrietta Street	13	Edge line marking (with optional centre line marking)	Retained	Retained	**Edge Line and Centre Line Marking**	**13**	Edge line marking to visually narrow the roadway. Treatment assists with the delineation of parking		No	No
72	3	**Bondi Road**	Bondi	Immediately east of Park Parade	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold deemed unsafe due to possible perception as a pedestrian facilty.		Yes	No
73	3	**Bondi Road**	Bondi	Immediately west of Denham Street slip lane	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		Yes	No
74	3	**Boonara Avenue**	Bondi	At Bondi Road	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		No	No
75	3	**Imperial Avenue**	Bondi	At Bondi Road	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		No	No
76	3	**Watson Street**	Bondi	At Bondi Road	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		No	No
77	3	**Ocean Street**	Bondi	At Bondi Road	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		No	No
78	3	**Bennett Street**	Bondi	At Bondi Road	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		No	No
77	5	**Bronte Road**	Waverley	North of Albion Street	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		Yes	No
78	5	**Bronte Road**	Waverley	South of Victoria Street	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		Yes	No
79	5	**Macpherson Street**	Bronte	East of Yanko Street	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		Yes	Yes
80	5	**St Thomas Street**	Bronte	South of Macpherson Street	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		No	No
81	5	**St Thomas Street**	Bronte	North of Macpherson Street	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		No	No
82	5	**Bronte Road**	Bronte	Immediately east of Calga Place	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		Yes	Yes
83	5	**Bronte Road**	Bronte	Immediately east of Nelson Street	14	Contrasting Threshold	Remove	Remove	**Removed from Scope**	-	Contrasting threshold to highlight entry to High Pedestrian Activity Area		Yes	Yes

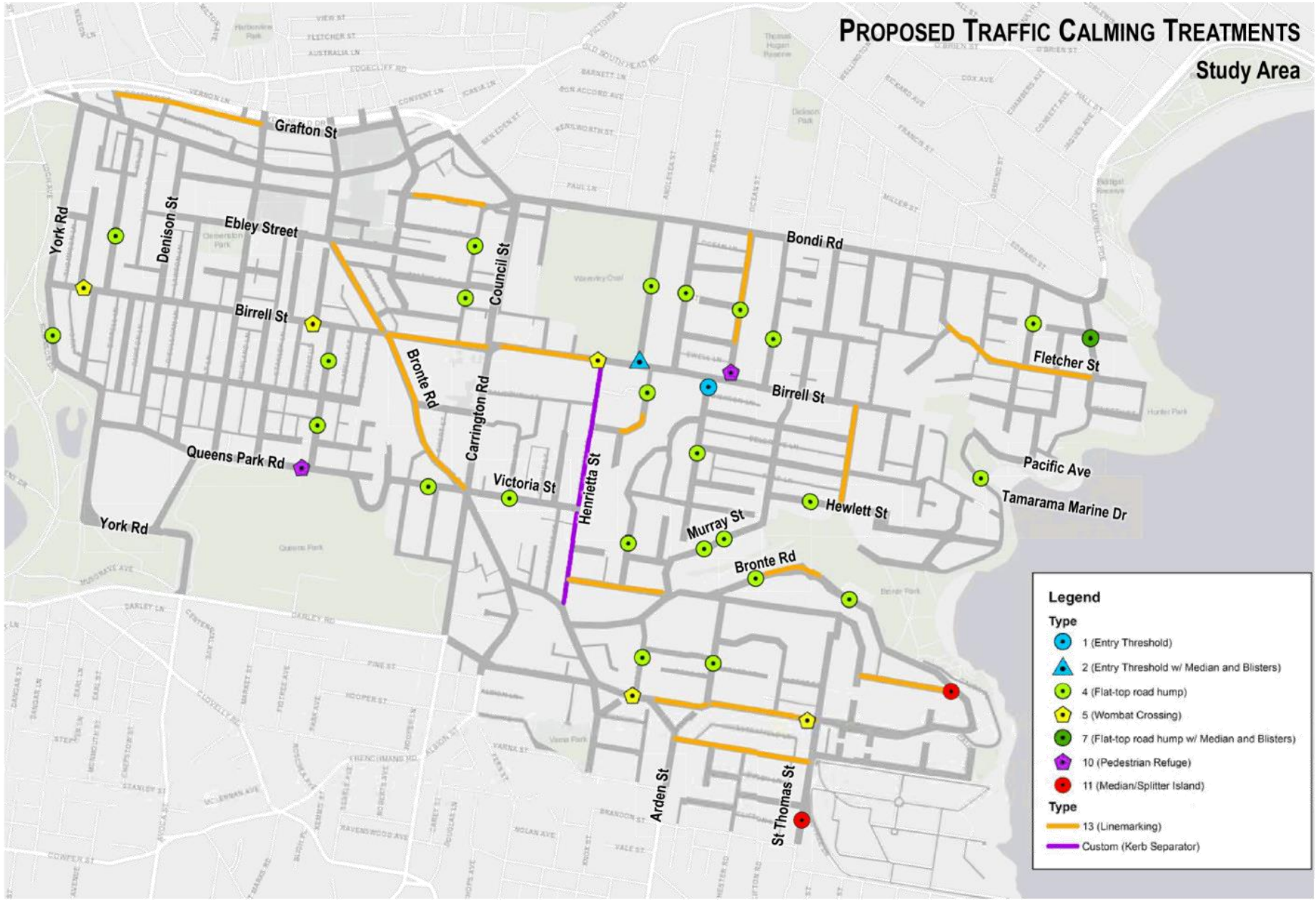
P3792 Waverley 40km/h Speed Review Zone 1: Stage 2

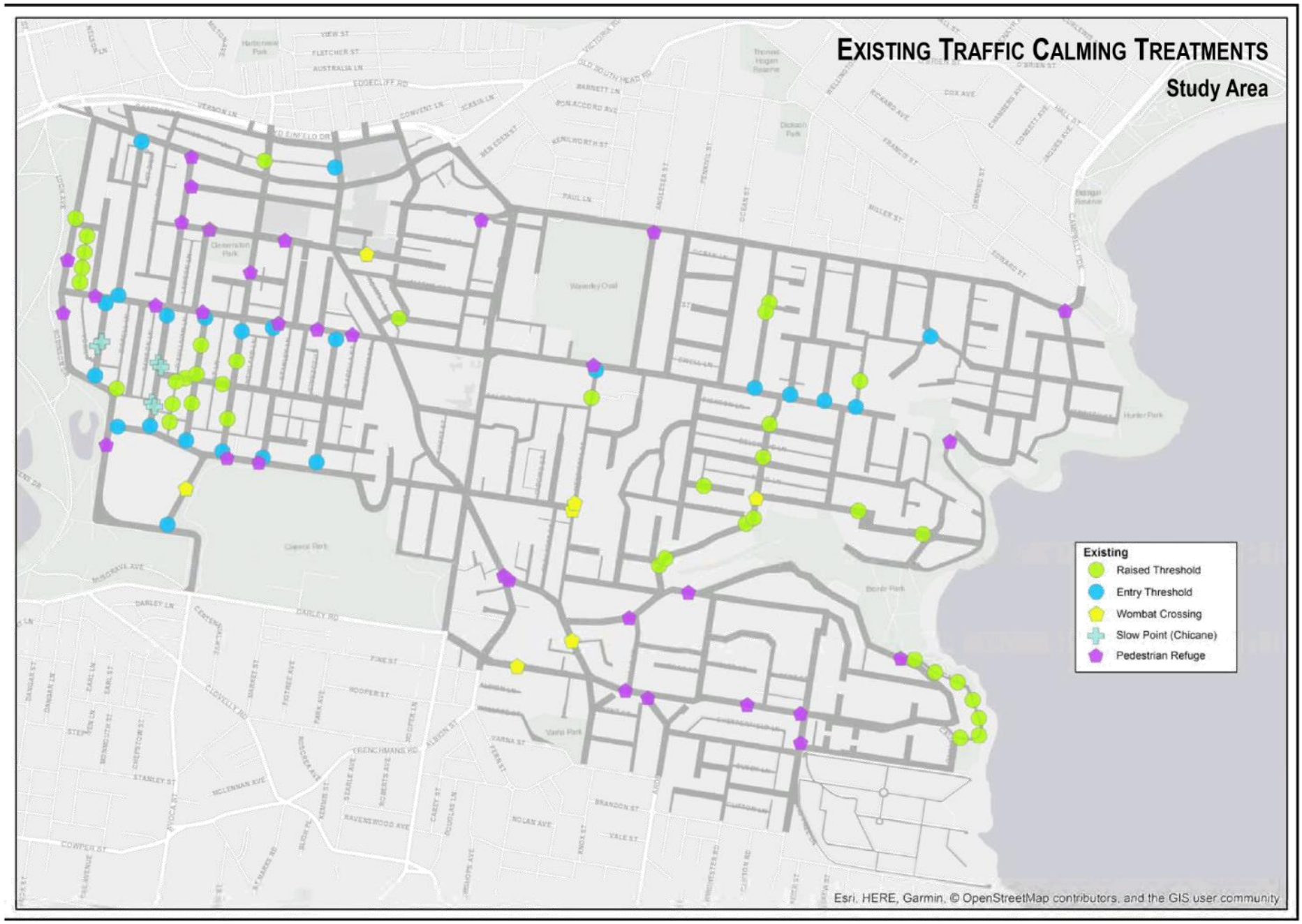
Treatment Rationalisation Table

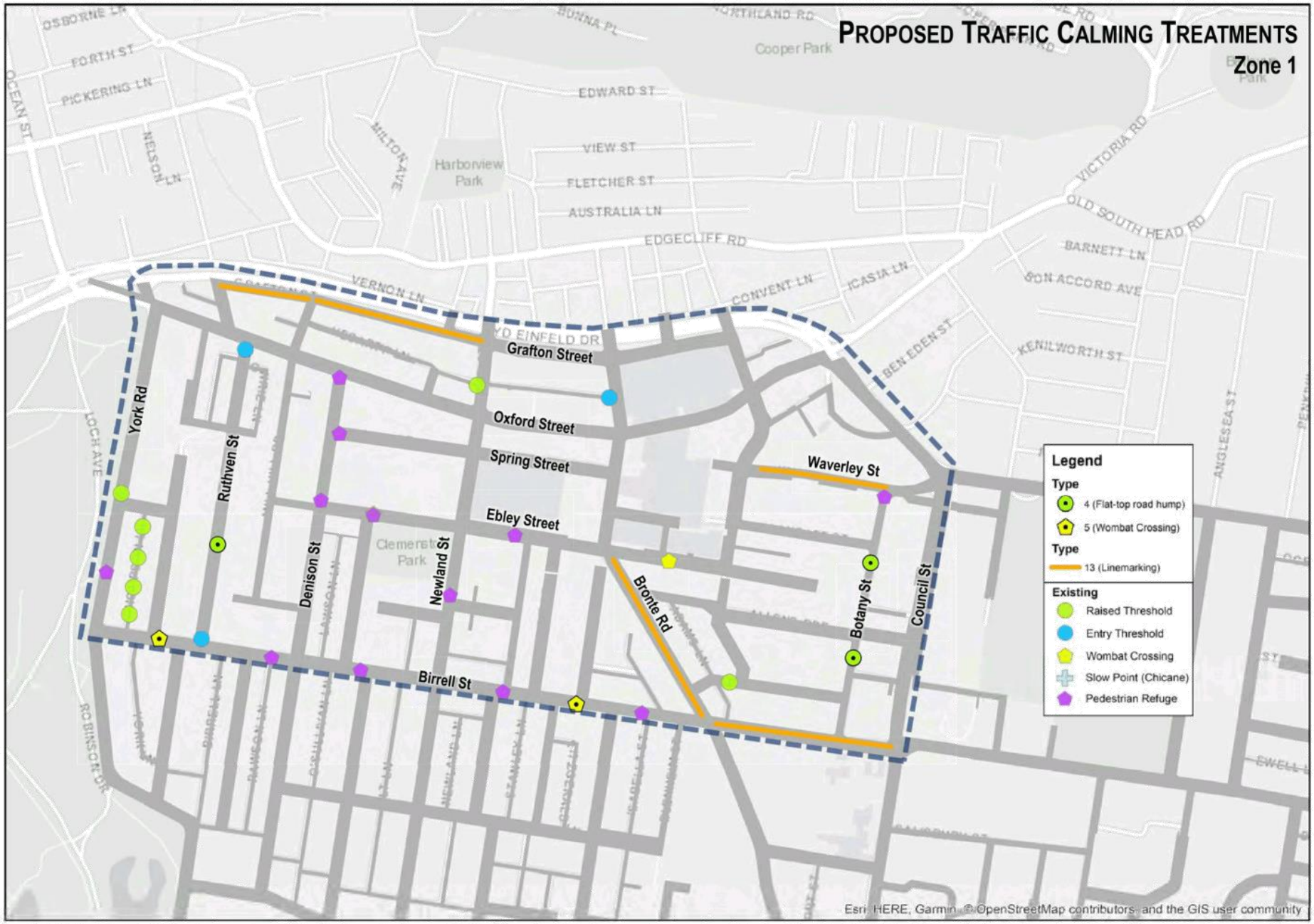
ID	Zone	Street	Suburb	Location	Treatment ID	Initial Recommendation	Council Recommendation	Workshop Outcome	Final Recommended Treatment	Recommended Treatment ID	Rationale	Other comments	Bus Route	Cycle Route
84	2	Birrell Street	Queens Park	Immediately east of St James Road	4	-	Flat-top Road Hump	Wombat Crossing	Raised Pedestrian Crossing	5	Traffic calming on Birrell Street by raising platform of existing pedestrian crossing	Upgrade existing pedestrian crossing	No	Yes
85	2	Birrell Street	Queens Park	Immediately west of Brisbane Street	5	-	Wombat Crossing	Wombat Crossing	Raised Pedestrian Crossing	5	Traffic calming on Birrell Street by raising platform of existing pedestrian crossing	Upgrade existing pedestrian crossing	Yes	Yes
86	3	Birrell Street	Waverley	Immediately west of Goldie Avenue	5	-	Wombat Crossing	Remove	Removed from Scope	-	Not appropriate due to existing signalised mid-block crossing		Yes	Yes
87	3	Birrell Street	Waverley	At Henrietta Street	5	-	Wombat Crossing	Wombat Crossing	Raised Pedestrian Crossing	5	Traffic calming on Birrell Street by raising platform of existing pedestrian crossing	Upgrade existing pedestrian crossing	Yes	Yes
88	5	Leichhardt Street	Bronte	North of Varna Street	4	-	Flat-top Road Hump	Remove	Removed from Scope	-	Deemed not necessary due to surrounding road conditions and expected traffic.		No	No
89	5	Macpherson Street	Waverley	West of Lugar Street	5	-	Wombat Crossing	Wombat Crossing	Raised Pedestrian Crossing	5	Traffic calming on Macpherson Street by raising platform of existing pedestrian crossing	Upgrade existing pedestrian crossing	Yes	Yes
90	5	Pacific Street	Bronte	Length	13	-	Line marking	Line marking	Edge Line Marking	13	Edge line marking to visually narrow the roadway, less impact on parking/traffic operations in area	High turnover parking along Pacific Street	No	No

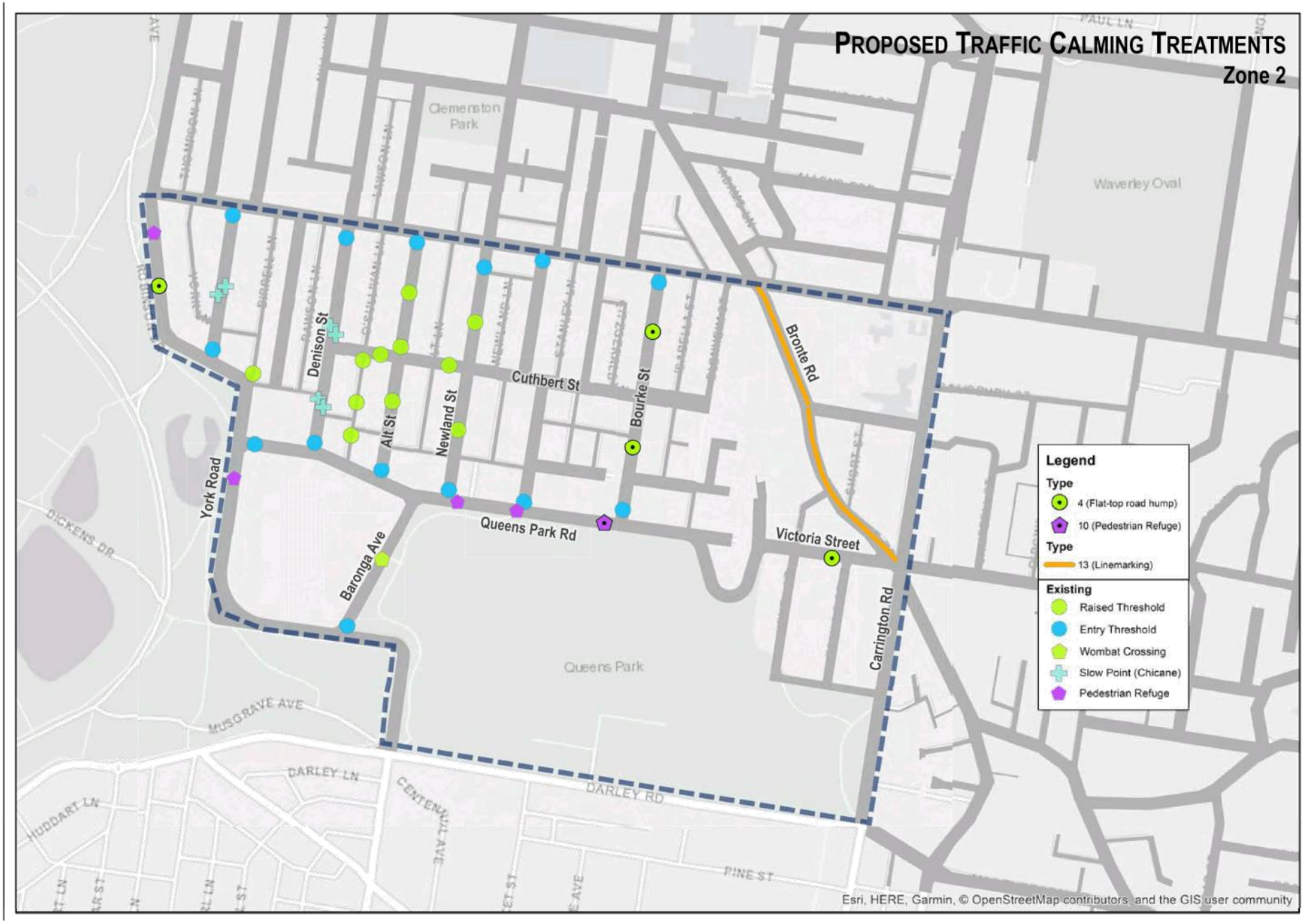
APPENDIX F

ROAD TREATMENT RECOMMENDATION MAPS


PROPOSED TRAFFIC CALMING TREATMENTS
Study Area
Grafton St
York Rd
Denison St
Ebley Street
Birrell St
Council St
Bondi Rd
Bronte Rd
Carrington Rd
Henrietta St
Victoria St
Queens Park Rd
York Rd
Birrell St
Fletcher St
Pacific Ave
Tamarama Marine Dr
Hewlett St
Murray St
Bronte Rd
Arden St
St Thomas St
Legend
Type
1 (Entry Threshold)
2 (Entry Threshold w/ Median and Blisters)
4 (Flat-top road hump)
5 (Wombat Crossing)
7 (Flat-top road hump w/ Median and Blisters)
10 (Pedestrian Refuge)
11 (Median/Splitter Island)
Type
13 (Linemarking)
Custom (Kerb Separator)


EXISTING TRAFFIC CALMING TREATMENTS
Study Area
Existing
Raised Threshold
Entry Threshold
Wombat Crossing
Slow Point (Chicane)
Pedestrian Refuge
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community


PROPOSED TRAFFIC CALMING TREATMENTS
Zone 1
Grafton Street
Oxford Street
Spring Street
Ebley Street
Birrell St
York Rd
Ruthven St
Denison St
Newland St
Bronte Rd
Waverley St
Botany St
Council St
Legend
Type
4 (Flat-top road hump)
5 (Wombat Crossing)
Type
13 (Linemarking)
Existing
Raised Threshold
Entry Threshold
Wombat Crossing
Slow Point (Chicane)
Pedestrian Refuge
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community


PROPOSED TRAFFIC CALMING TREATMENTS
Zone 2
Clemenston Park
Waverley Oval
Denison St
Cuthbert St
Alt St
Newland St
Bourke St
Bronte Rd
York Road
Baronga Ave
Queens Park Rd
Victoria Street
Carrington Rd
Queens Park
DICKENS DR
MUSGRAVE AVE
DARLEY LN
DARLEY RD
HUDDART LN
CENTENNIAL AVE
PINE ST
Legend
Type
4 (Flat-top road hump)
10 (Pedestrian Refuge)
Type
13 (Linemarking)
Existing
Raised Threshold
Entry Threshold
Wombat Crossing
Slow Point (Chicane)
Pedestrian Refuge
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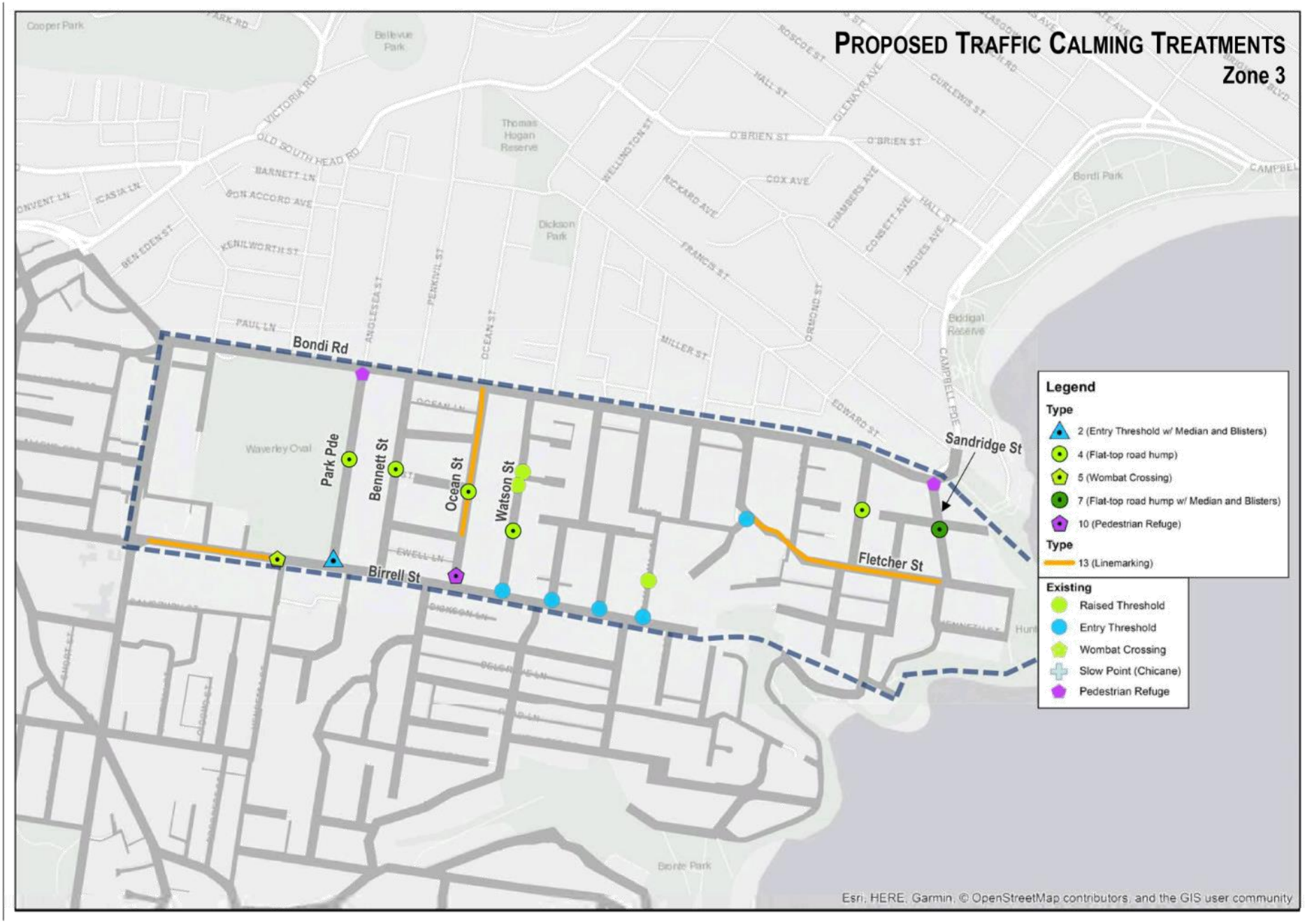
PROPOSED TRAFFIC CALMING TREATMENTS
Zone 3
Bondi Rd
Park Pde
Bennett St
Ocean St
Watson St
Birrell St
Fletcher St
Sandridge St
Waverley Oval
Bondi Park
Legend
Type
2 (Entry Threshold w/ Median and Blisters)
4 (Flat-top road hump)
5 (Wombat Crossing)
7 (Flat-top road hump w/ Median and Blisters)
10 (Pedestrian Refuge)
Type
13 (Linemarking)
Existing
Raised Threshold
Entry Threshold
Wombat Crossing
Slow Point (Chicane)
Pedestrian Refuge
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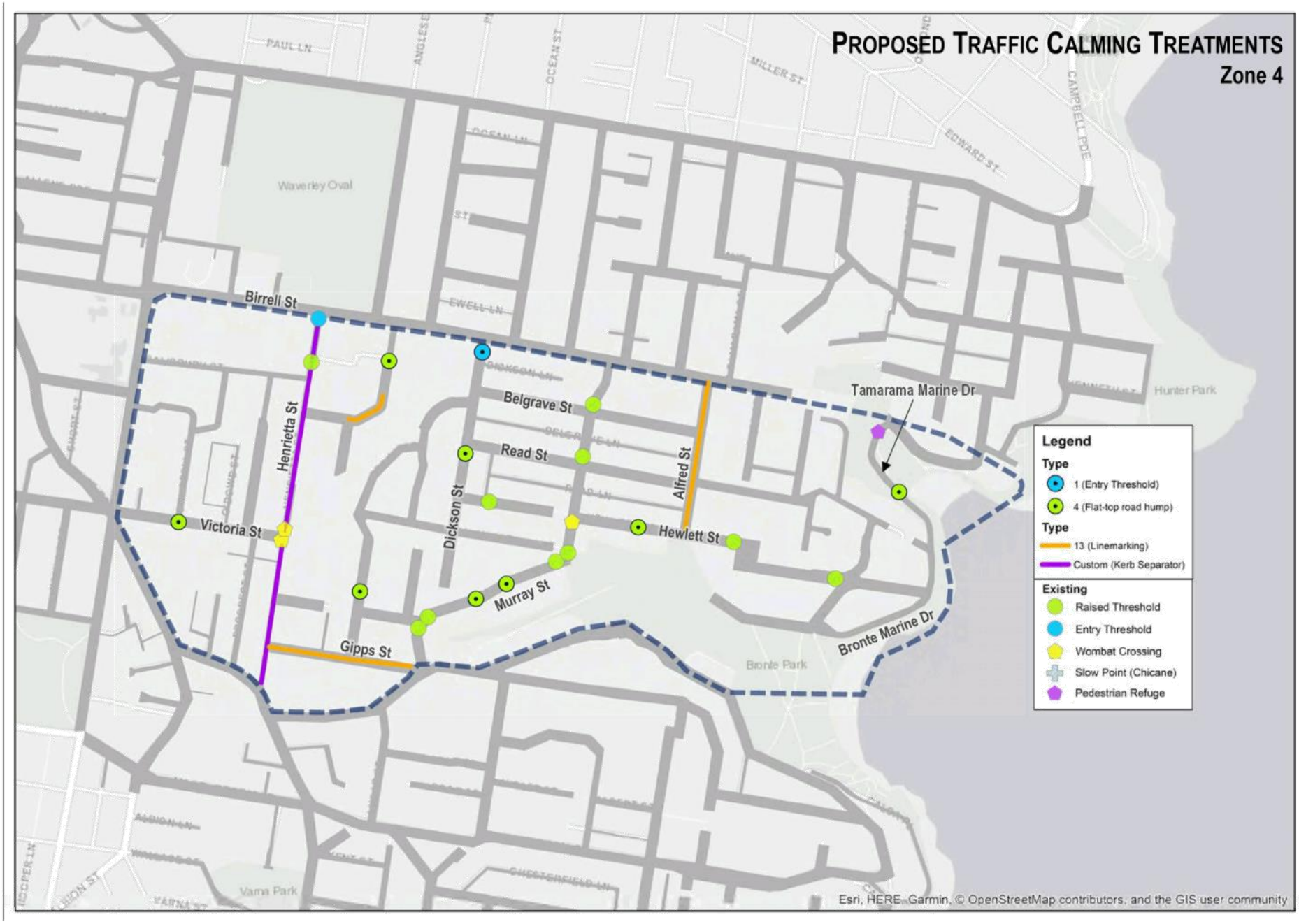
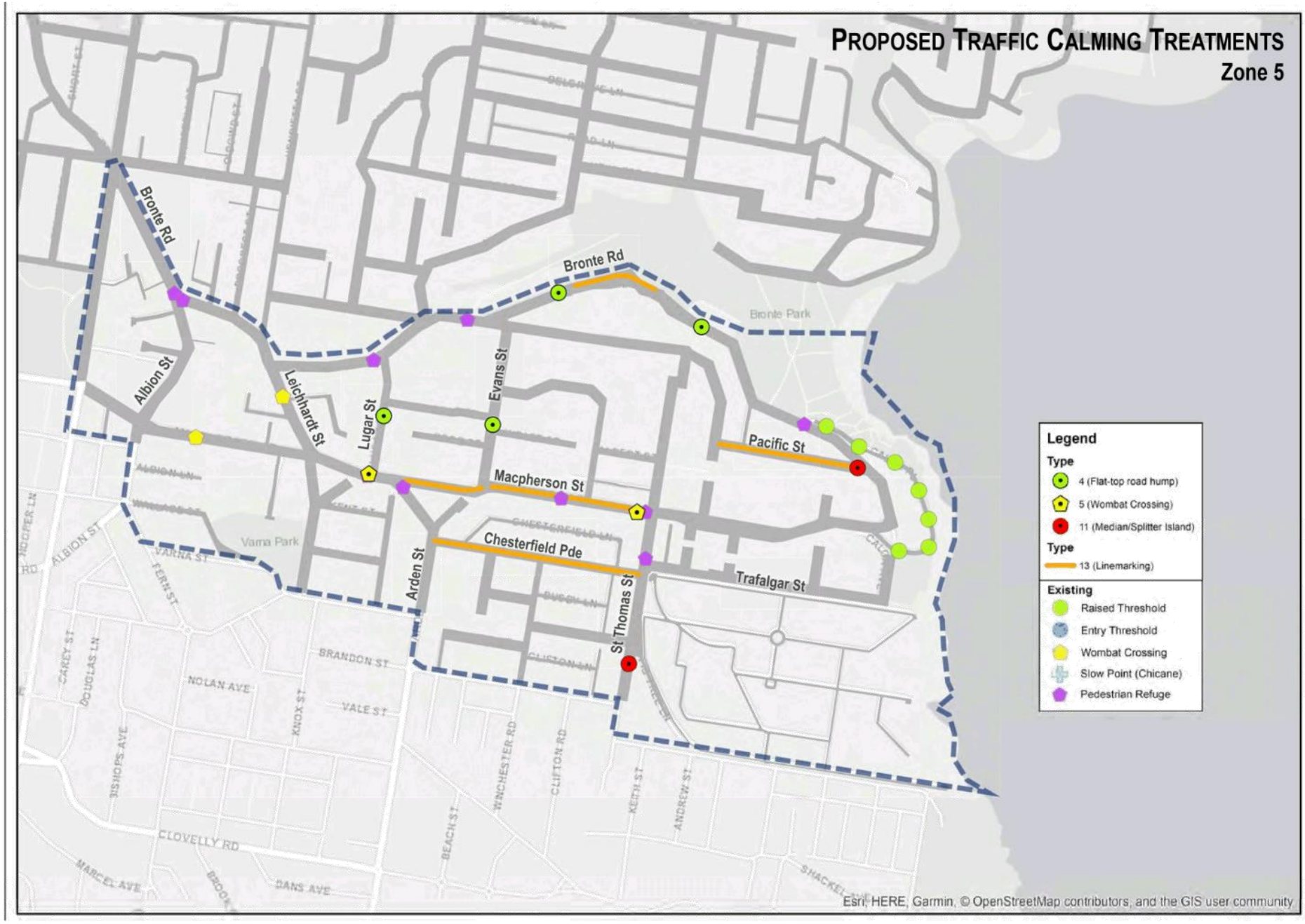

PROPOSED TRAFFIC CALMING TREATMENTS
Zone 4
Waverley Oval
Birrell St
Henrietta St
Victoria St
Gipps St
Belgrave St
Read St
Dickson St
Murray St
Hewlett St
Alfred St
Tamarama Marine Dr
Bronte Marine Dr
Bronte Park
Hunter Park
Vama Park
Legend
Type
1 (Entry Threshold)
4 (Flat-top road hump)
Type
13 (Linemarking)
Custom (Kerb Separator)
Existing
Raised Threshold
Entry Threshold
Wombat Crossing
Slow Point (Chicane)
Pedestrian Refuge
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community


PROPOSED TRAFFIC CALMING TREATMENTS
Zone 5
Bronte Rd
Albion St
Leichhardt St
Lugar St
Evans St
Bronte Park
Pacific St
Macpherson St
Chesterfield Pde
Arden St
St Thomas St
Trafalgar St
Vaila Park
Legend
Type
4 (Flat-top road hump)
5 (Wombat Crossing)
11 (Median/Splitter Island)
Type
13 (Linemarking)
Existing
Raised Threshold
Entry Threshold
Wombat Crossing
Slow Point (Chicane)
Pedestrian Refuge
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APPENDIX G

STREETSCAPE CONCEPT DESIGNS

PARK PARADE - Flat Top With Blister On Western Side

CROSS SECTION

1:50 @ A3

GROUPGSA

PARK PARADE - Flat Top With Blister On Western Side

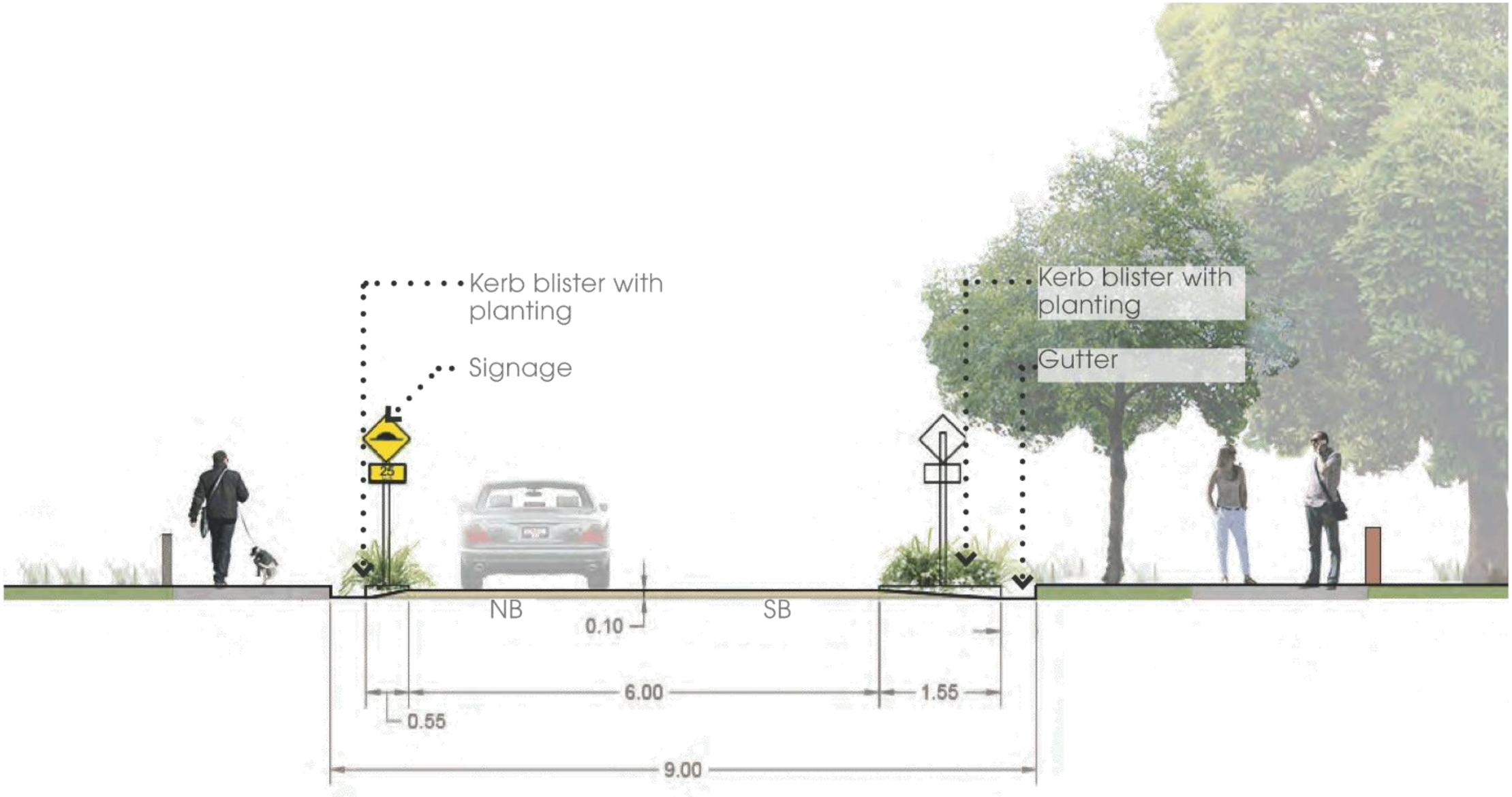
LONGITUDINAL SECTIONS

1:50 @ A3

GROUPGSA

PARK PARADE - Entry Threshold with Blisters

CROSS SECTION

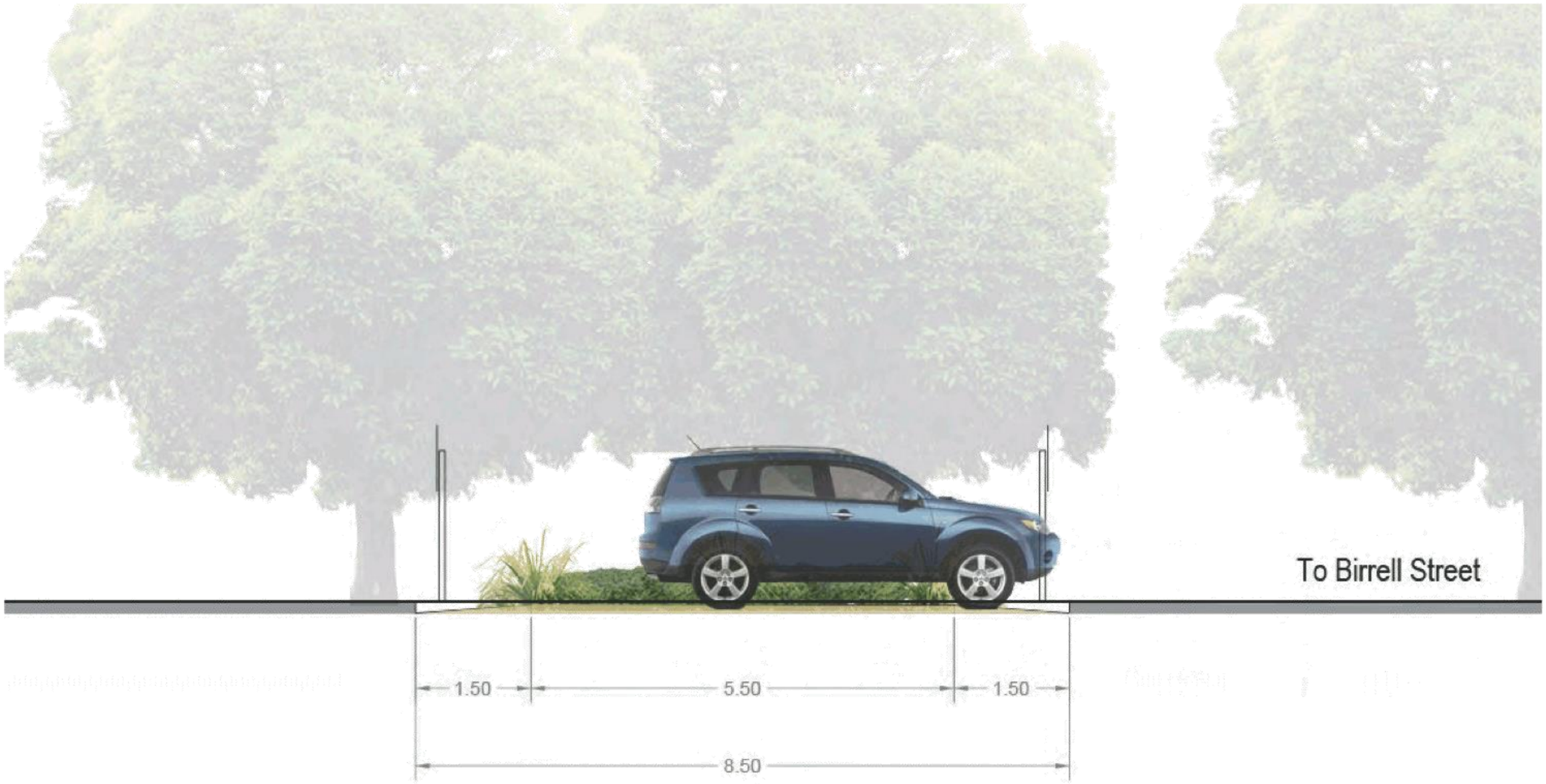


1:50 @ A3

GROUPGSA

PARK PARADE - Entry Threshold With Blisters

LONGITUDINAL SECTION

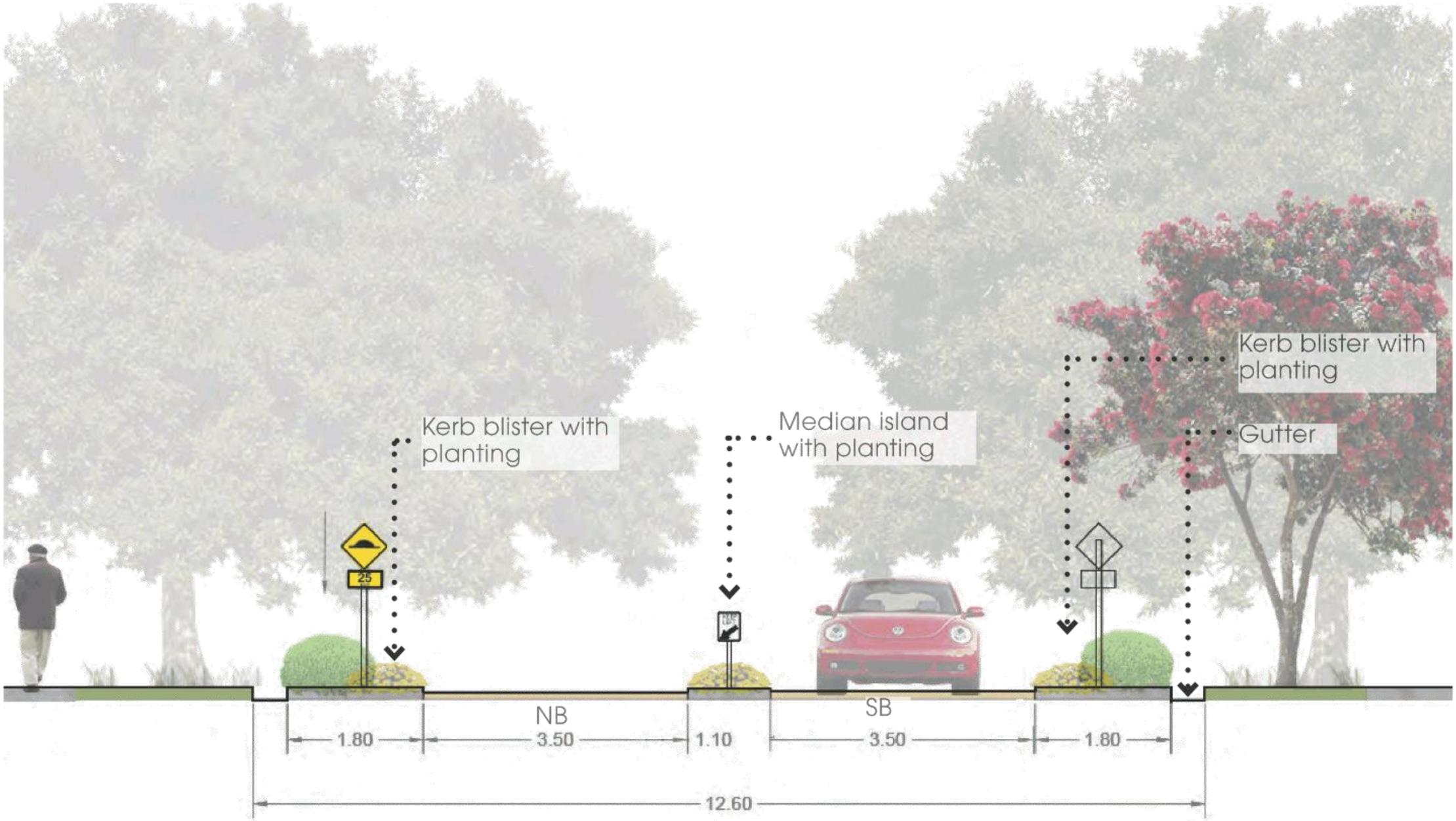


1:50 @ A3

GROUPGSA

LAWSON ST - Entry Threshold With Blisters And Centre Median

CROSS SECTION

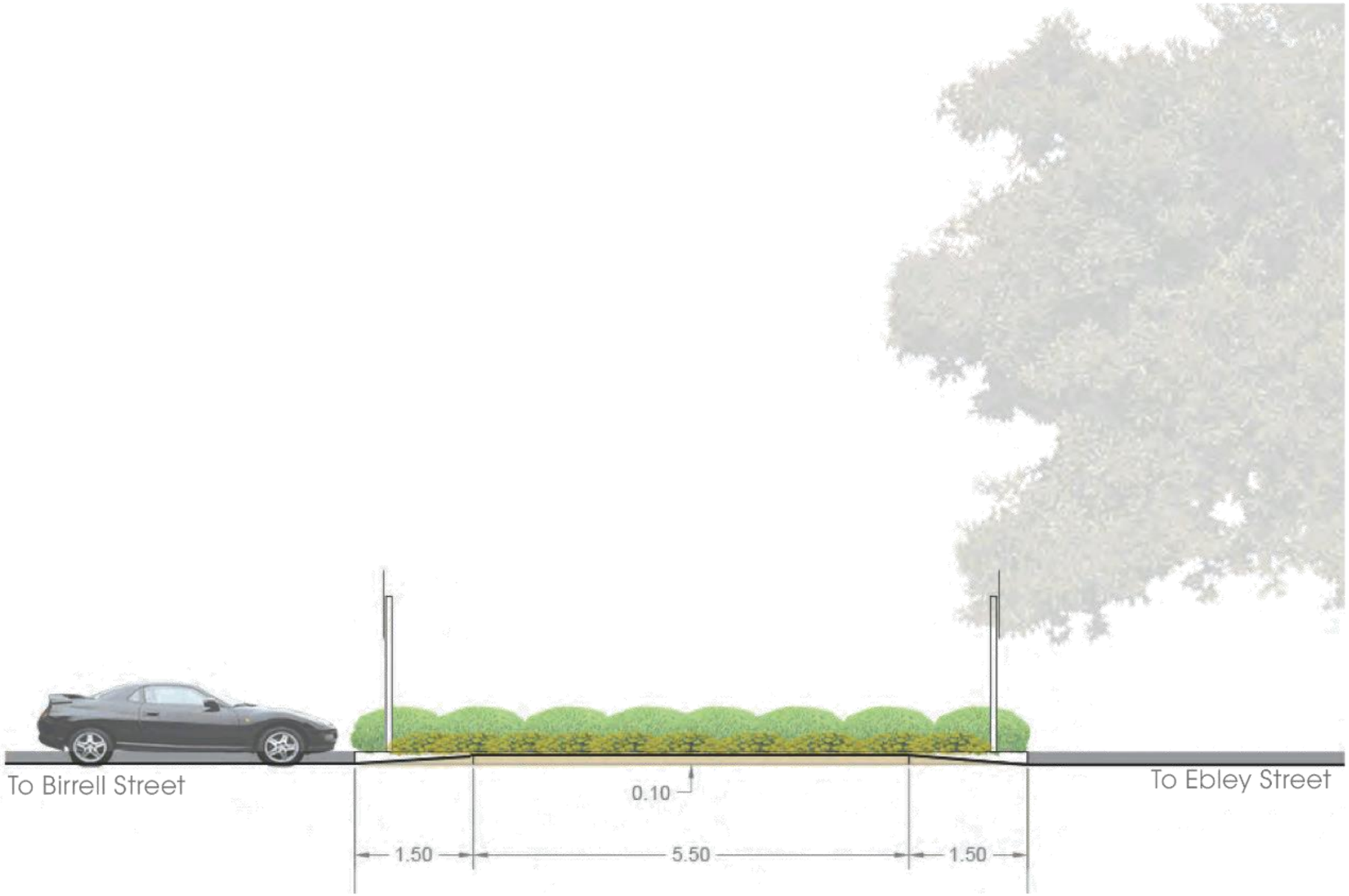


1:50 @ A3

GROUPGSA

LAWSON ST - Entry Threshold With Blisters And Centre Media

LONGITUDINAL SECTION

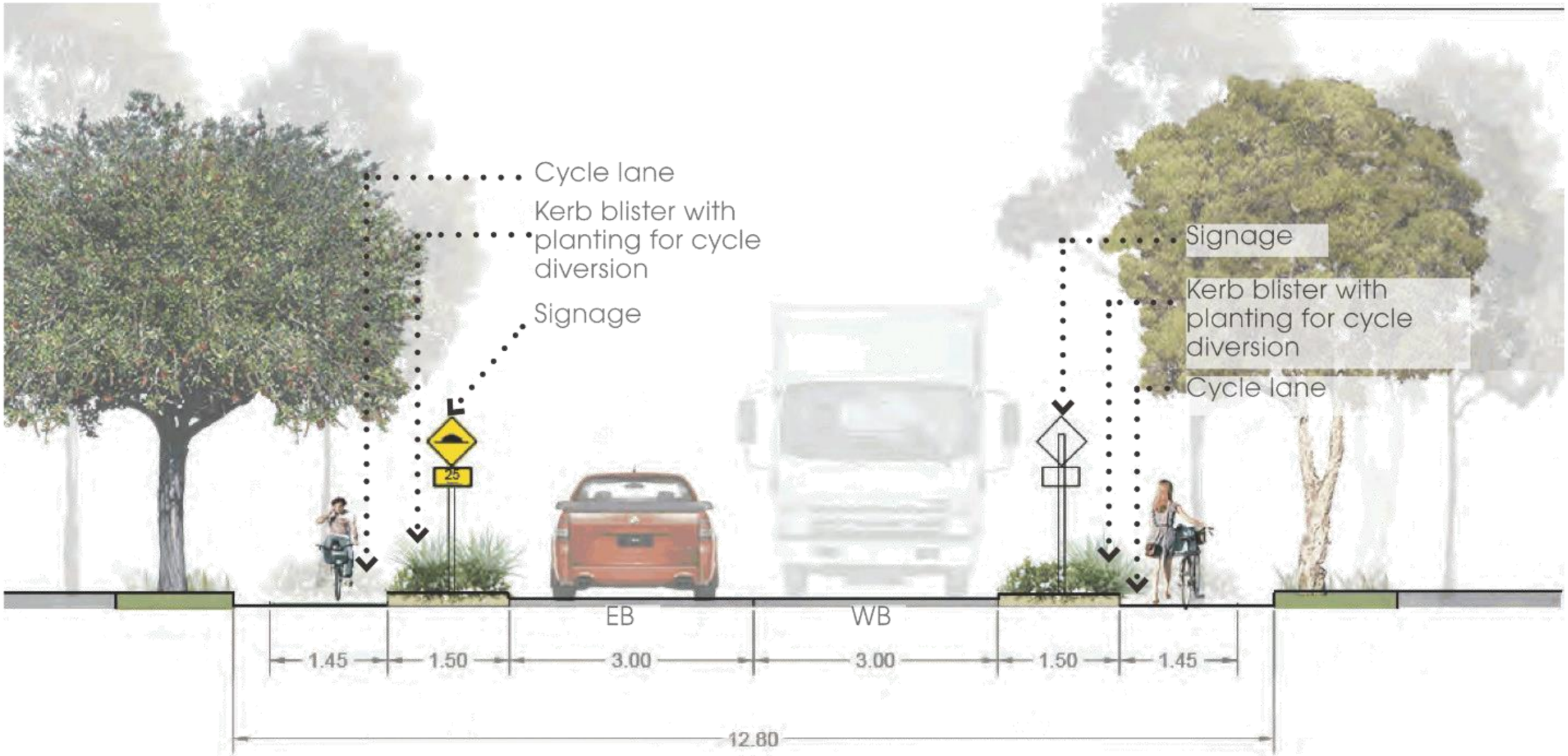


1:50 @ A3

GROUPGSA

VICTORIA ST - Flat Top With Cycle Diversion With Blisters To Direct Cyclists

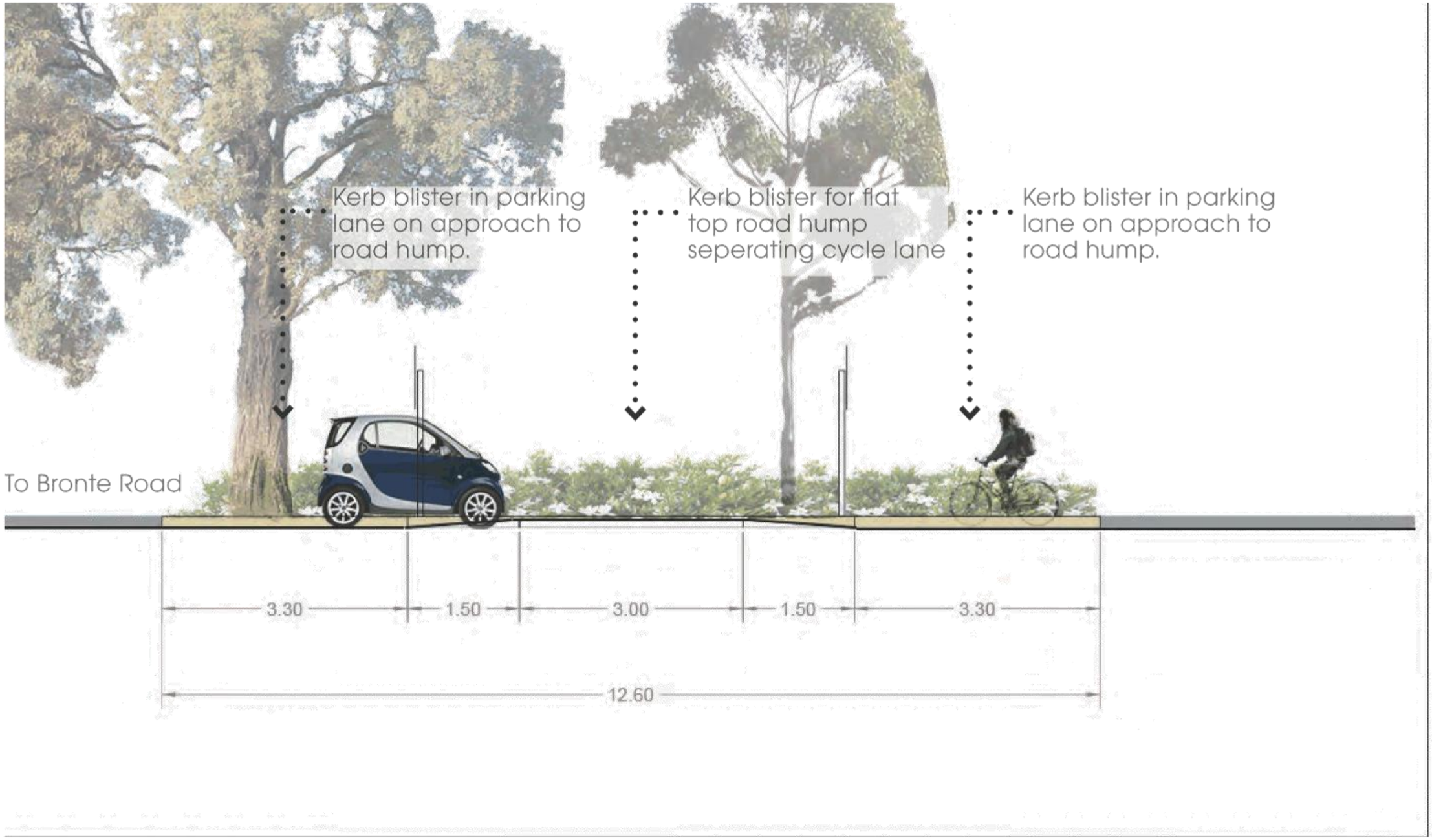
CROSS-SECTION



1:50 @ A3

GROUPGSA

VICTORIA ST - Flat Top with Cycle Diversion with Blisters to Direct Cyclists LONGITUDINAL SECTION

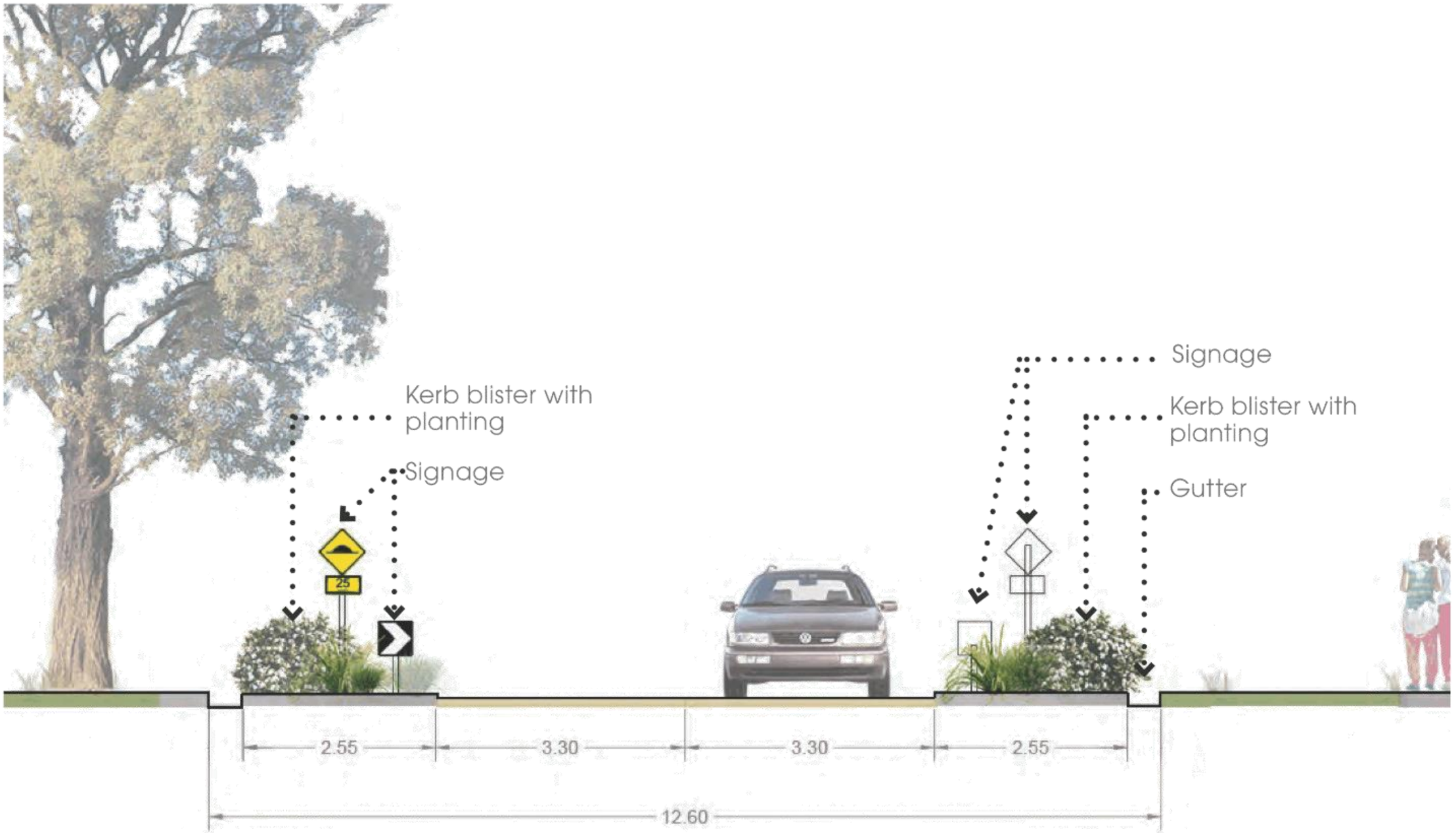


1:50 @ A3

GROUPGSA

WATSON ST - Flat Top With Blisters

CROSS-SECTION



1:50 @ A3

GROUPGSA

WATSON ST - Flat Top With Blisters

LONGITUDINAL SECTION

1:50 @ A3

GROUPGSA

INDICATIVE PLANTING SCHEDULE

TREES

BOTANIC NAME	COMMON NAME	MATURE HEIGHT X WIDTH (M)
Banksia integrifolia	Coastal Banksia	15 x 6
Banksia serrata	Old Man Banksia	15 x 4
Callistemon viminalis	Bottlebrush	1.5 x 1.3
Cupaniopsis anacardioides	Tuckeroo	15 x 5
Elaeocarpus reticulatus	Blueberry Ash	10 x 4
Melaleuca decora	White Feather Honeymyrtle	10 x 8
Melaleuca styphelioides	Prickly Paperbark	10 x 3
Tristaniopsis laurina	Water Gum	15 x 6

SHRUBS

BOTANIC NAME	COMMON NAME	MATURE HEIGHT X WIDTH (M)
Baekea imbricata	Heath Myrtle	0.75 x 1
Callistemon viminalis 'Better John'	Bottlebrush	0.75 x 1
Correa alba	White Correa	2 x 2
Crowea saligna	Willow-Leaved Crowea	1.5 x 1.5
Helichrysum elatum	White Paper Daisy	
Rhapjiolepsis indica 'Snow Maiden'	Indian Hawthorn	0.75 x 0.5
Rosmarinus officinalis	Rosemary	1.0 x 0.8
Westringia fruiticosa	Coastal Rosemary	1.5 x 1.5

GRASSES

BOTANIC NAME	COMMON NAME	MATURE HEIGHT X WIDTH (M)
Cymbopogon citratus	Lemon Grass	1 x 0.9
Dianella caerulea 'Little Jess'	Clumping Dianella	0.4 x 0.4
Lomandra longifolia	Mat Rush - various types	0.6 x 0.5
Dianella congesta	Beach Flax Lily	1 x 0.5
Microleana stipoides	Weeping meadow grass	0.3 x 0.3
Themeda australis	Kangaroo Grass	0.7 x 0.5

GROUNDCOVERS

BOTANIC NAME	COMMON NAME	MATURE HEIGHT X WIDTH (M)
Carpobrotus glaucescens	Pig Face	0.2 x 0.5
Chrysocephalum apiculatum	Yellow Buttons	0.6 x 0.5
Delosperma sp.	Yellow Ice Plant	0.3 x 0.5
Hardenbergia violecea	False sarspiralla	3 x 0.2
Hibbertia scandens	Climbing guinea flower	0.5 x 3
Scaevola aemula 'Bright Eyes'	Scaevola Bright Eyes	0.5 x 1.5

Species selected from Waverley Council 'Planting a Footpath Garden List

NOTE: Confirm selection of street trees. Refer Waverley Council Street Tree Masterplan.

Trees

Banksia integrifolia
Coastal Banksia

Banksia serrata
Old Man Banksia

Cupaniopsis anacardioides
Tuckeroo

Callistemon viminalis
Bottlebrush

Elaeocarpus reticulatus
Blueberry Ash

Melaleuca decora
White Feather Honeymyrtle

Melaleuca styphelioides
Prickly Papaerbark

Tristaniopsis laurina
Watergum

GROUPGSA

Shrubs

Callistemon viminialis 'Better John'

Bottlebrush

Correa Alba

White Correa

Crowea saligna

Willow-Leaved Crowea

Hellichrysum elatum

White Paper Daisy

Raphiolepsis indica 'Snow Maiden'

Indian Hawthorn

Rosemarinus officinalis

Rosemary

Westringia fruticosa

Coastal Rosemary

Cymbopogon citratus

Lemongrass

Grasses

Dianella caerulea 'Little Jess'

Blue-Flax Lily

Dianella congesta Beach Flax Lily

Lomandra longifolia

Mat Rush

Microleana stipoides

Weeping Meadow Grass

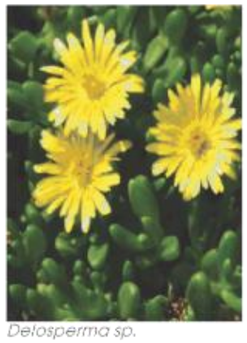
Themeda australis

Kangaroo Grass

Groundcovers

Carpobrotus glaucescens

Pig Face



Delosperma sp.

Yellow Ice Plant

Hardenbergia violecea

False sarspiralla

Hibbertia scandens

Climbing guinea flower

Scaevola aemula 'Bright Eyes'

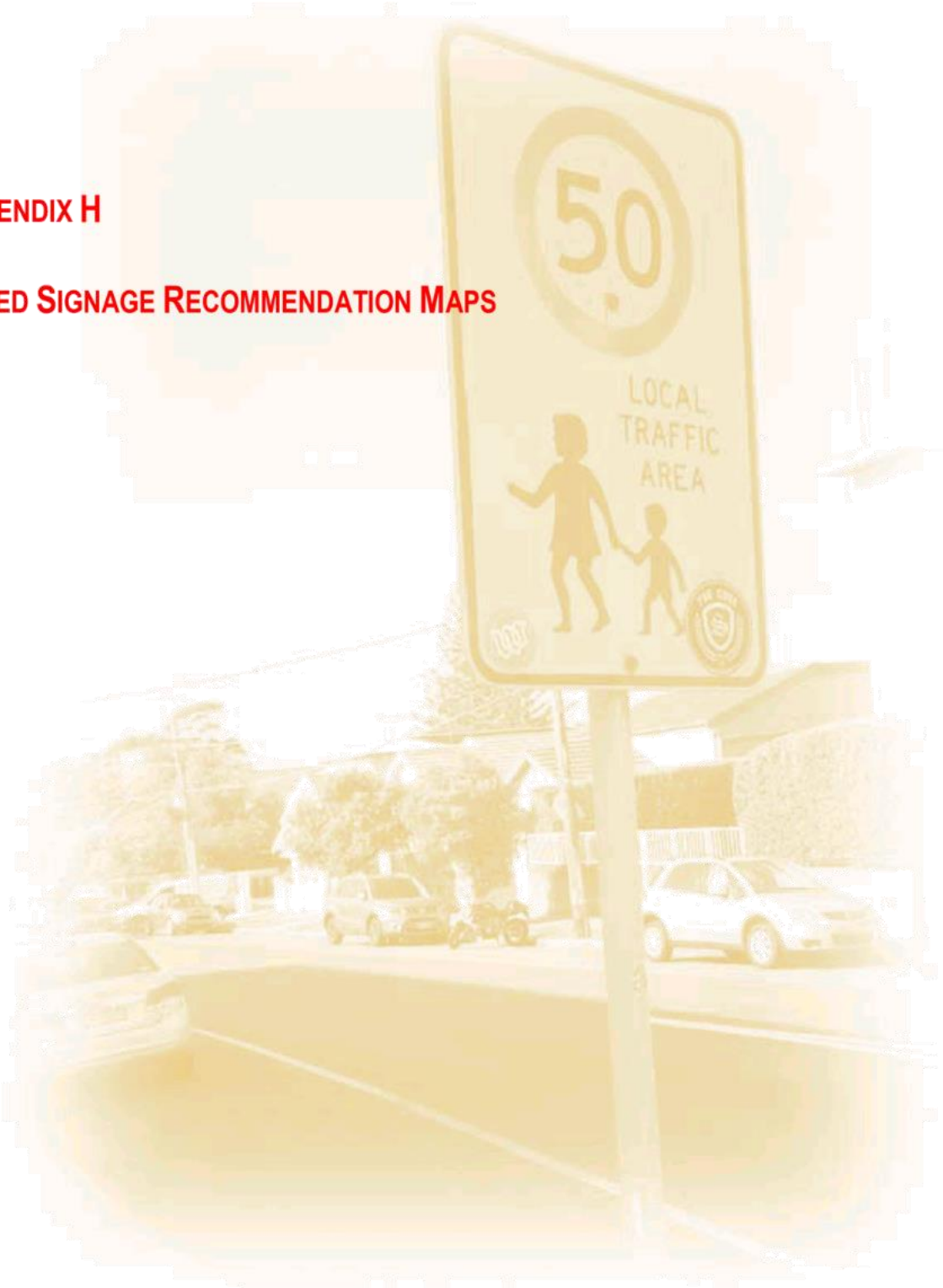
Scaevola Bright Eyes

Trachelospermum jasminoides

Star Jasmine

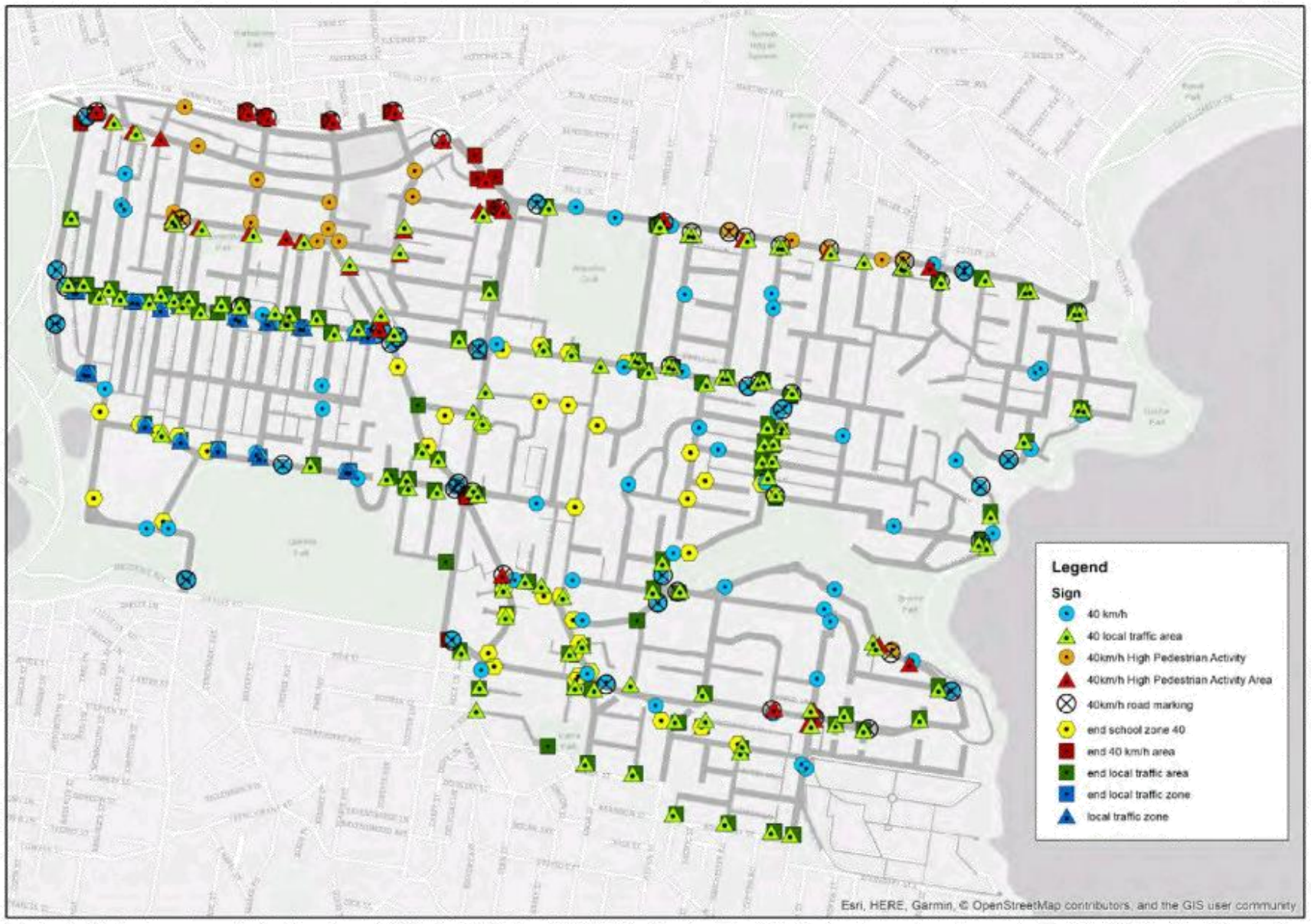
APPENDIX H

SPEED SIGNAGE RECOMMENDATION MAPS



PROPOSED SIGNAGE – ALL SIGNS

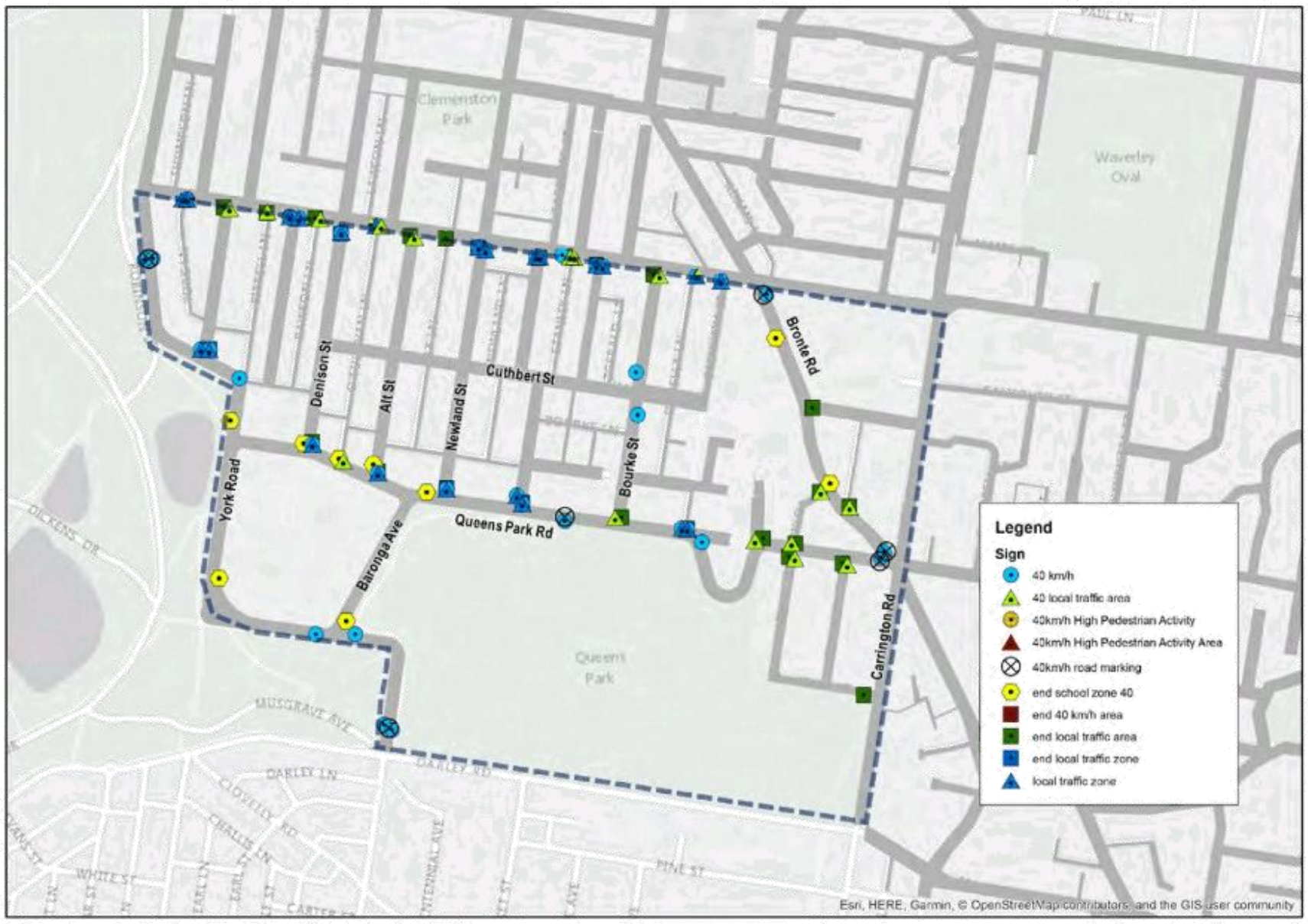
Study Area Overview



Zone 1

PROPOSED SIGNAGE – ALL SIGNS

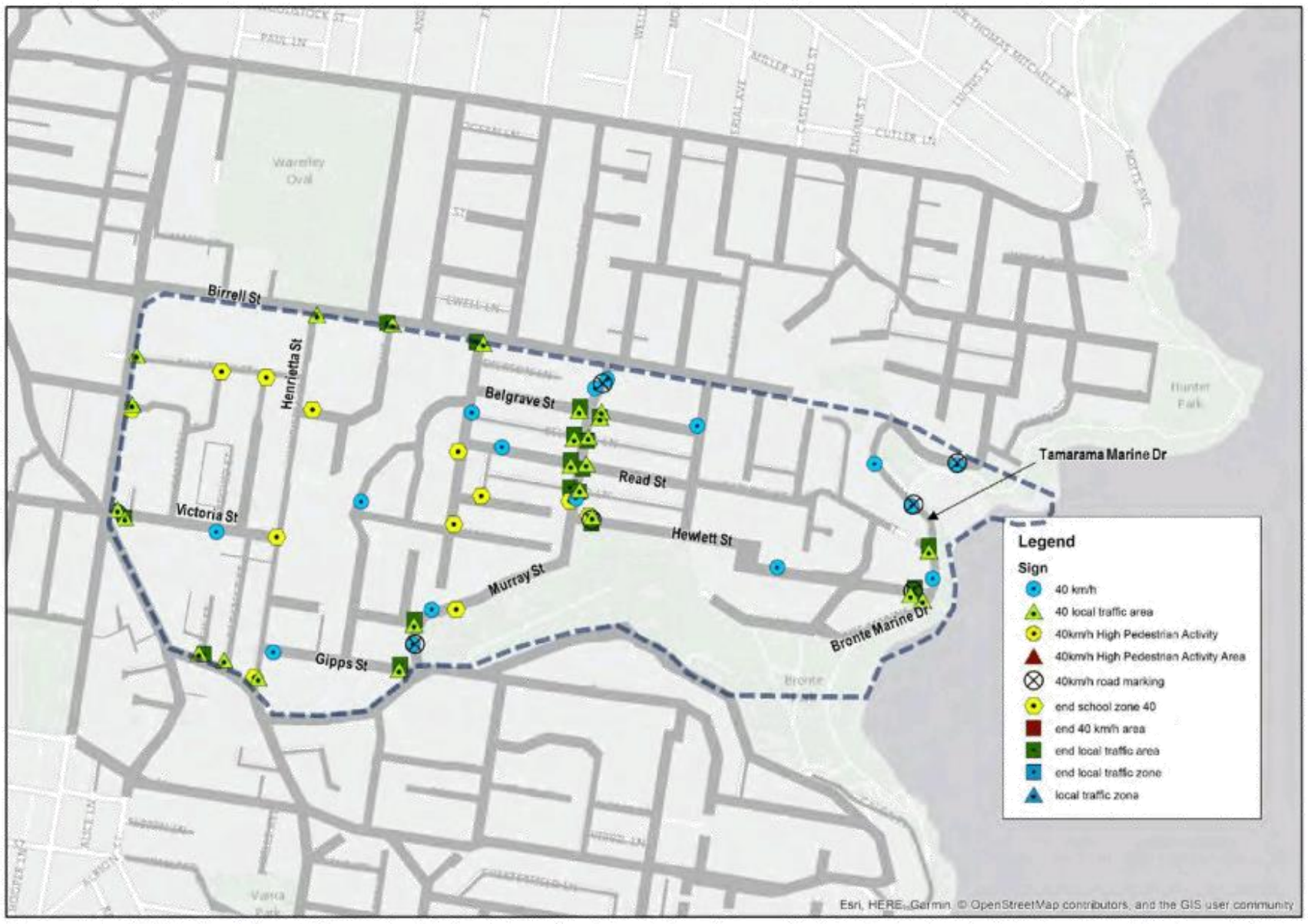
Zone 2



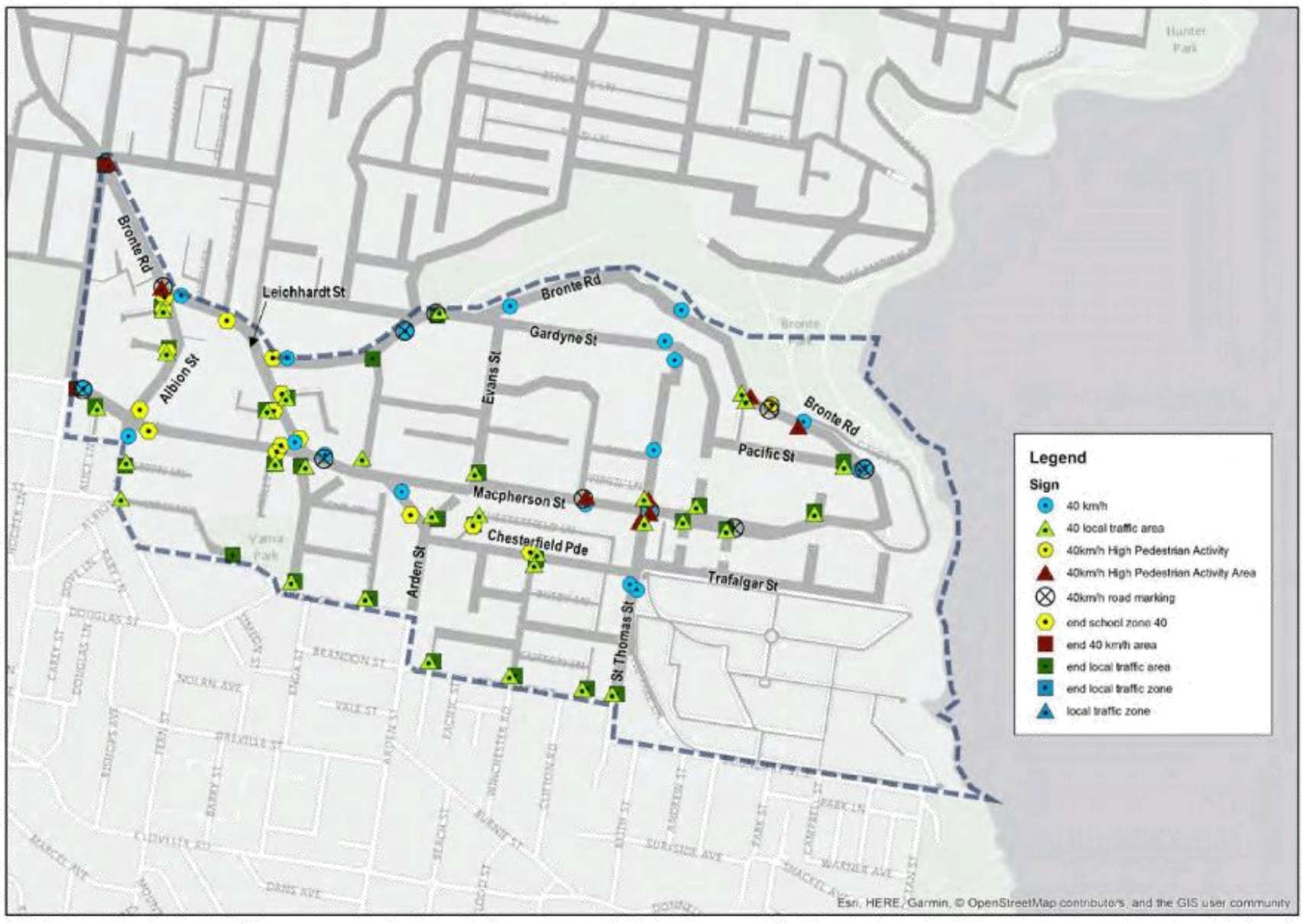
Zone 3

PROPOSED SIGNAGE – ALL SIGNS

Zone 4



Zone 5



PROPOSED SIGNAGE – LOCAL TRAFFIC AREAS

Study Area Overview

Zone 1

PROPOSED SIGNAGE – LOCAL TRAFFIC AREAS

Zone 2

Zone 3

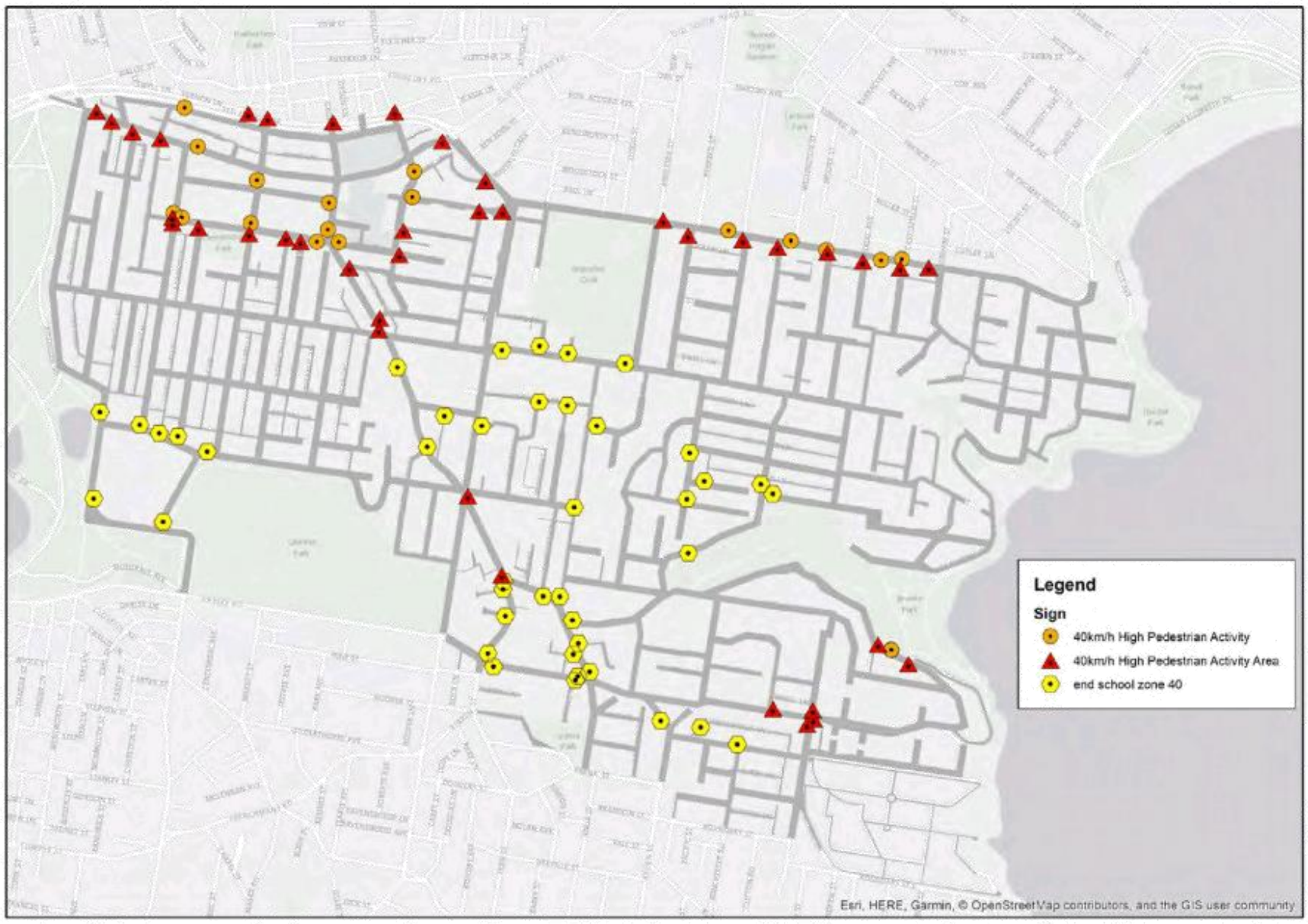
PROPOSED SIGNAGE – LOCAL TRAFFIC AREAS

Zone 4

Zone 5

PROPOSED SIGNAGE – HIGH PEDESTRIAN ACTIVITY AREAS AND SCHOOL ZONES

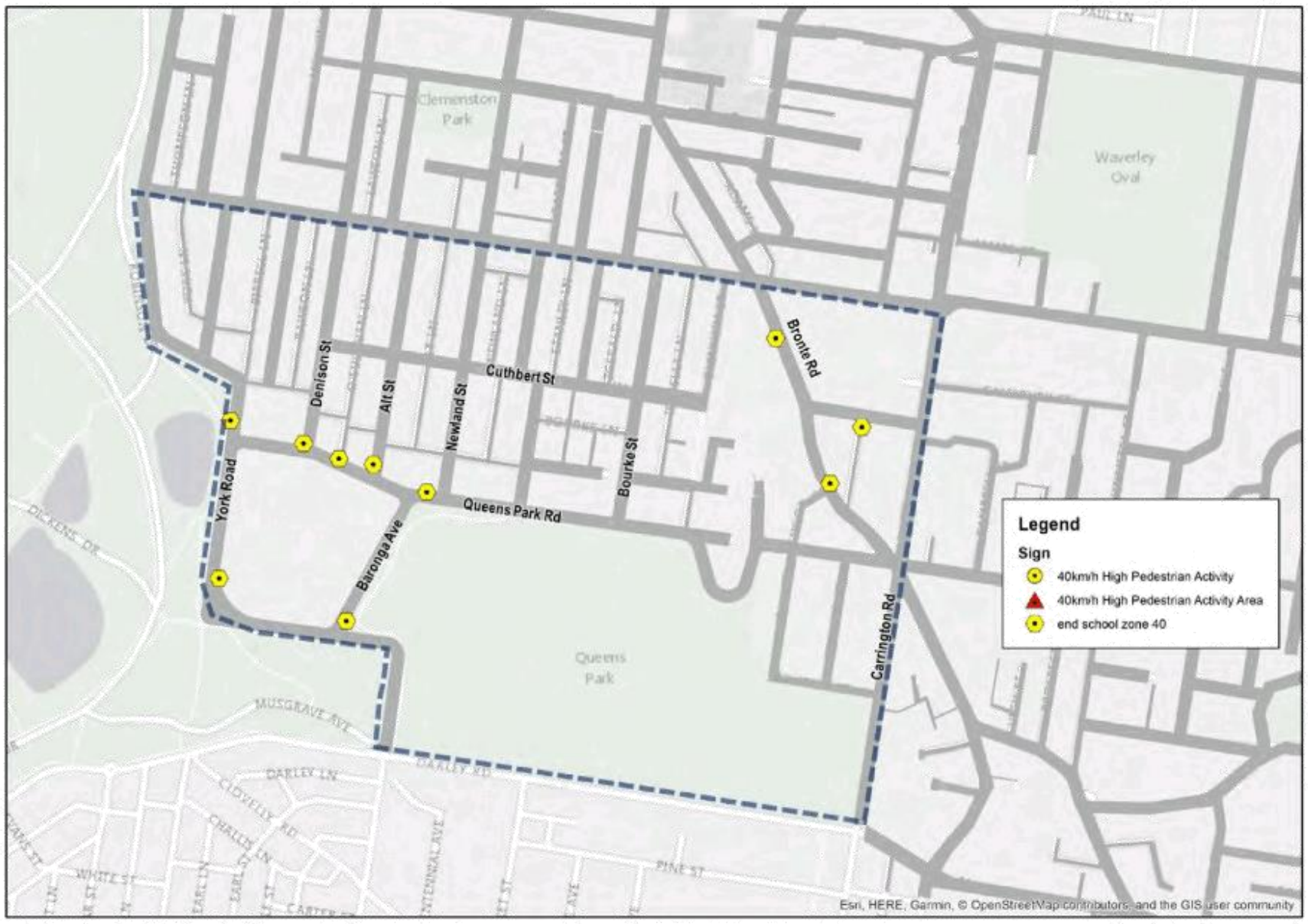
Study Area Overview



Zone 1

PROPOSED SIGNAGE – HIGH PEDESTRIAN ACTIVITY AREAS AND SCHOOL ZONES

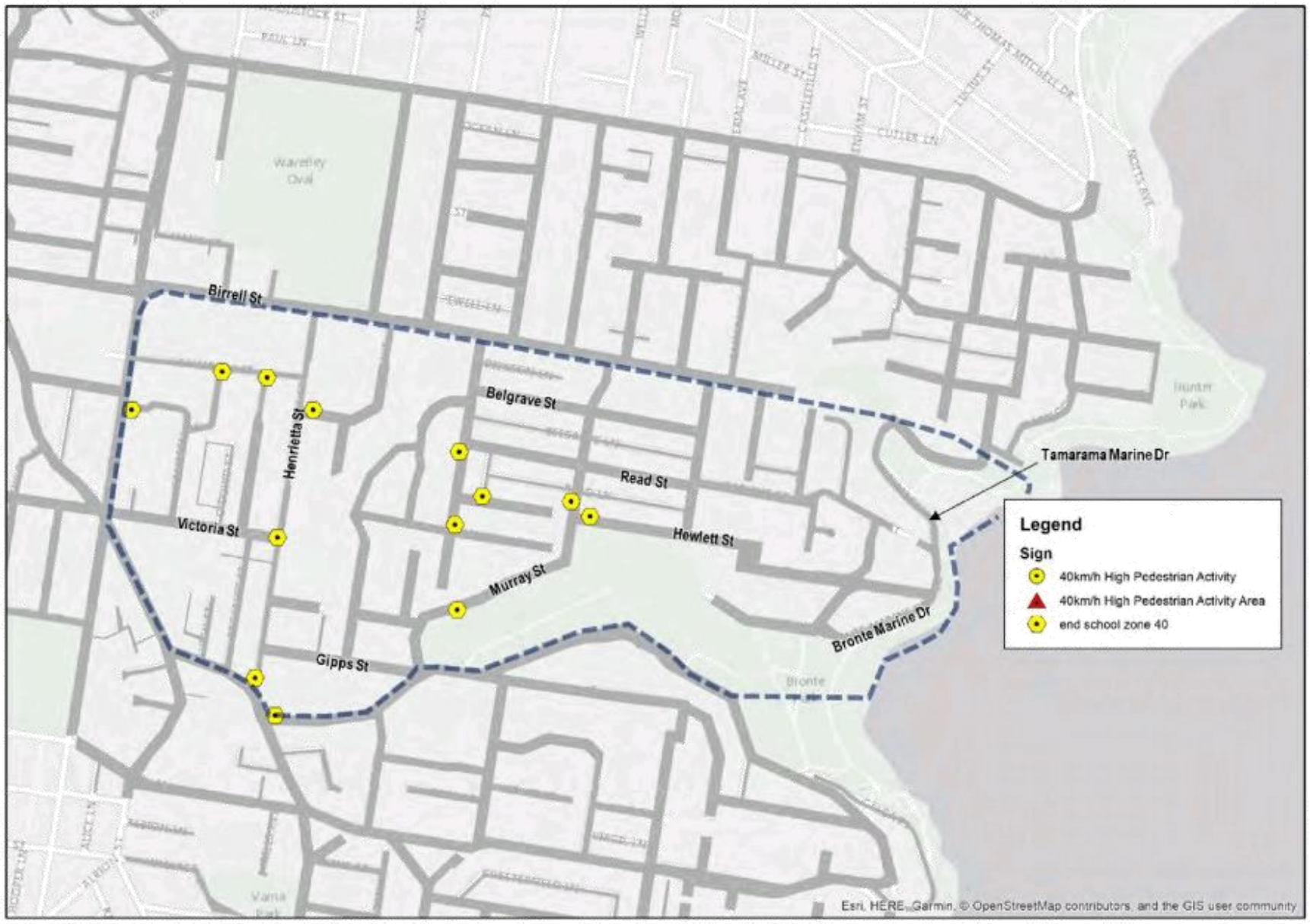
Zone 2



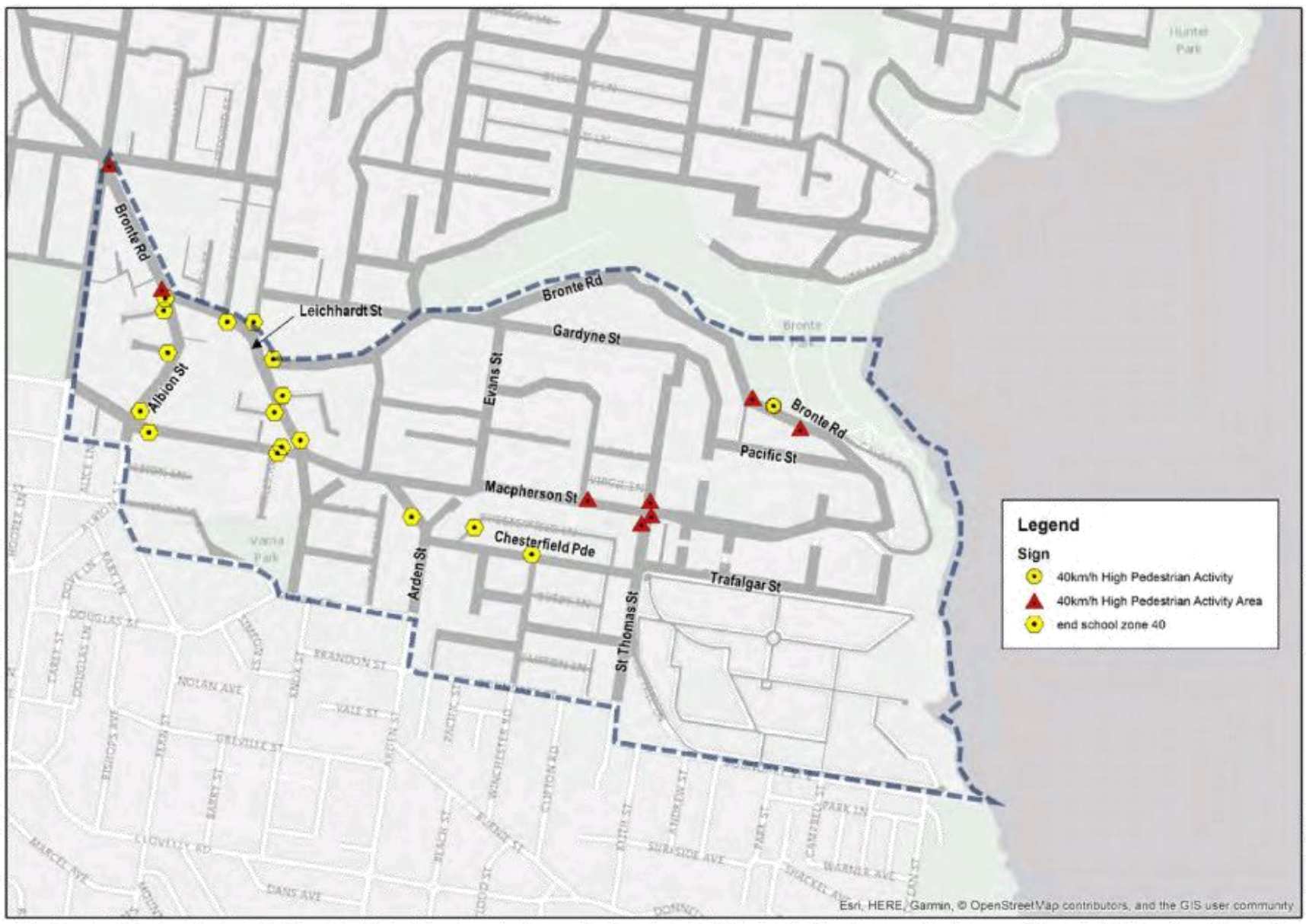
Zone 3

PROPOSED SIGNAGE – HIGH PEDESTRIAN ACTIVITY AREAS AND SCHOOL ZONES

Zone 4



Zone 5



PROPOSED SIGNAGE – 40KM/H ROAD MARKINGS

Study Area Overview


Allens
Parade
Street
Botany
N
100mm Concrete Flat Top Road Hump
'Terracotta' Colour Surface Treatment or Similar
Plain Concrete Ramps and Wings Light Colour or White Surface Treatment
Maintain Existing Parking and No Stopping Zone
No. 29
No. 31
No. 33
No. 35
No. 37
No. 39
No. 41
No. 43
No. 45
No. 47
25
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REVISIONS
Issue | Revisions Descriptions | Drawn | Date
001 | CONCEPT DESIGN | K.W | 12.09.2019
002 | CONCEPT DESIGN | K.W | 22.10.2019
Scale @ A3 0 2 4 6 8 10 1:200
Project P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1
Title CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 1) BOTANY STREET & ALLENS PARADE BONDI JUNCTION
Design G.Y
Drawn K.W
Checked T.W
CONCEPT ONLY
Date 22.10.2019
Project Number P3792
Sheet Number 1
Issue 002

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002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

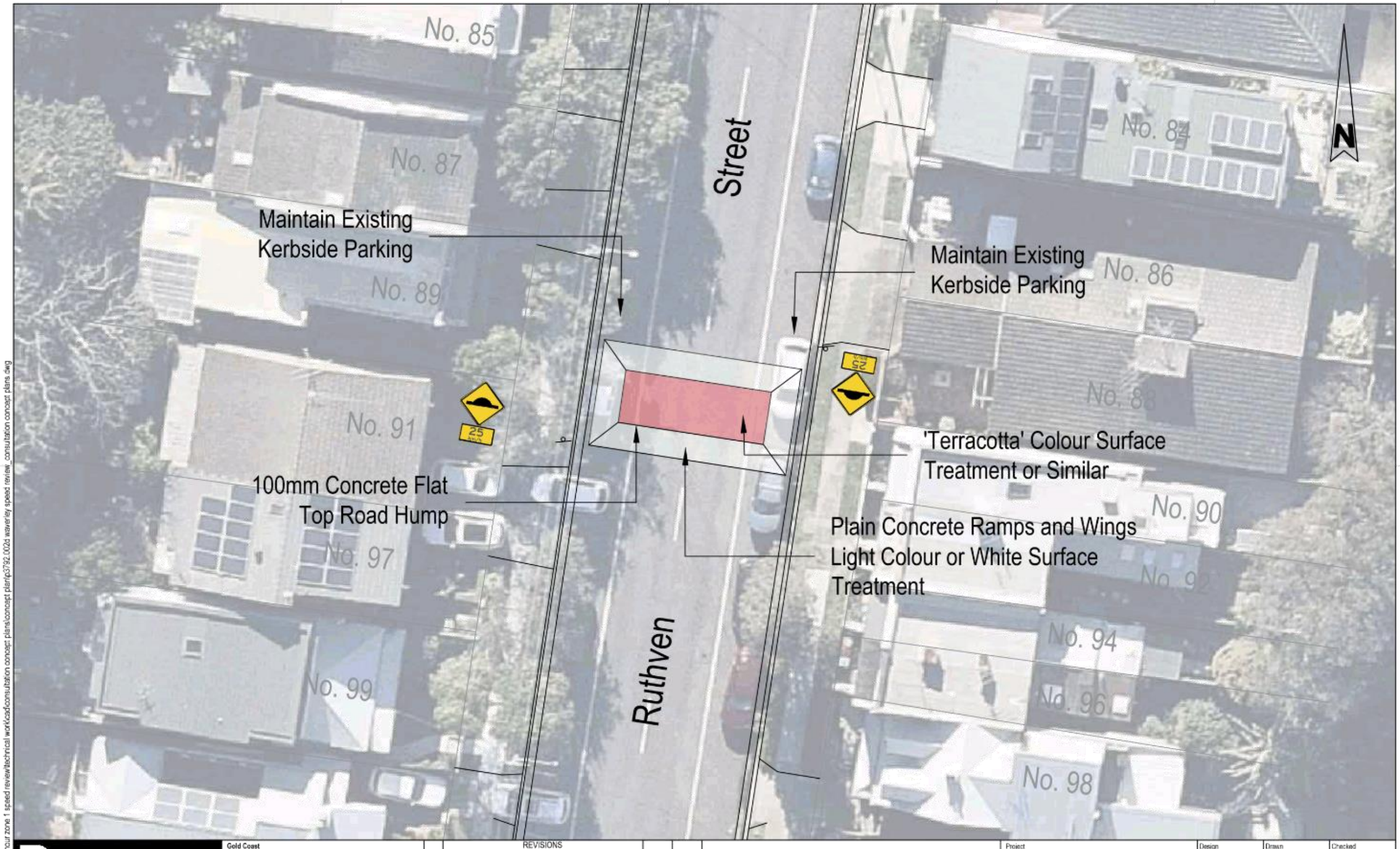
Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 2)
BOTANY STREET & LLANDAFF STREET
BONDI JUNCTION

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	2	002



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002	CONCEPT DESIGN	K.W	22.10.2019

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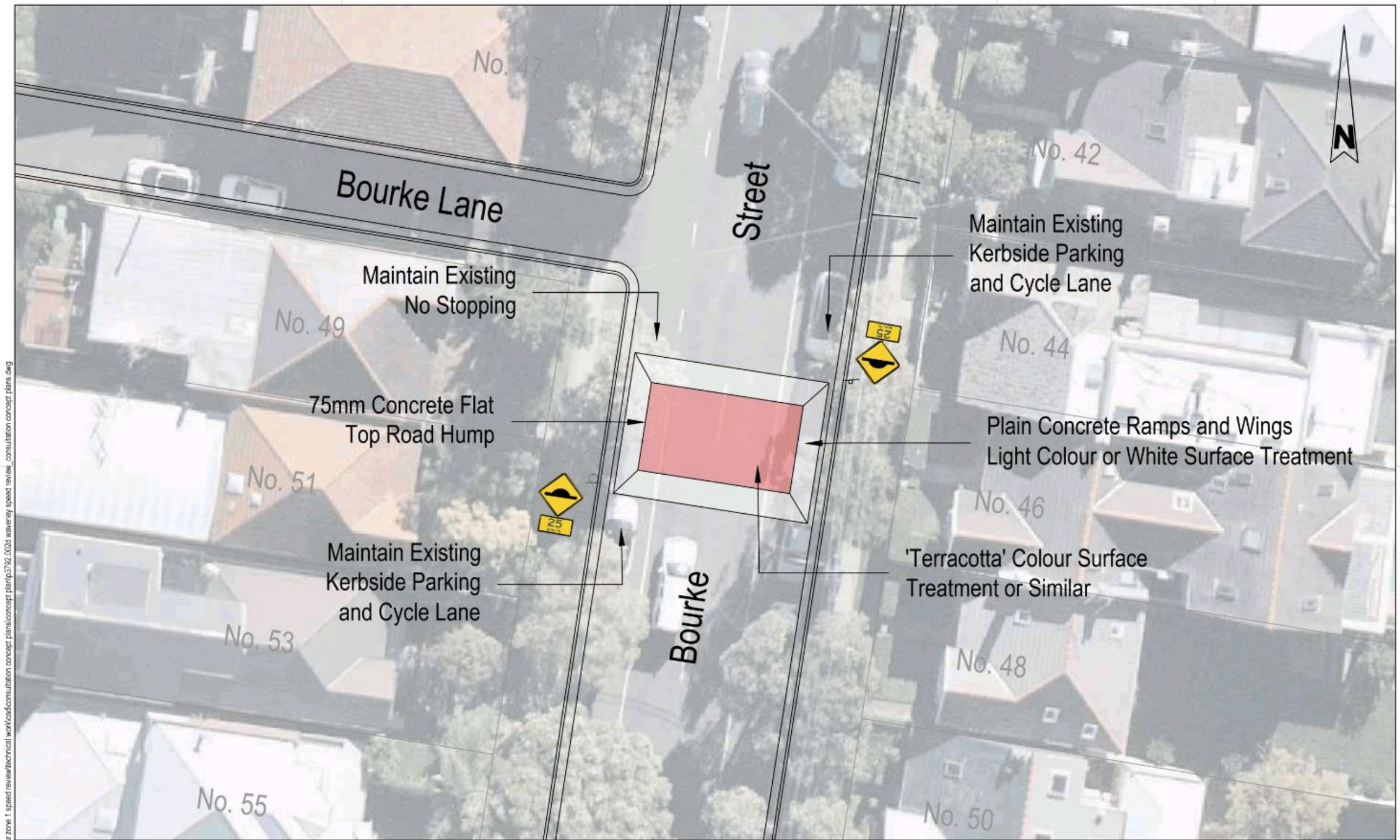
Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 11)
RUTHVEN STREET (No. 90)
QUEENS PARK

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 3	Issue 002



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002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 15)
BOURKE STREET & BOURKE LANE
QUEENS PARK

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	4	002

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

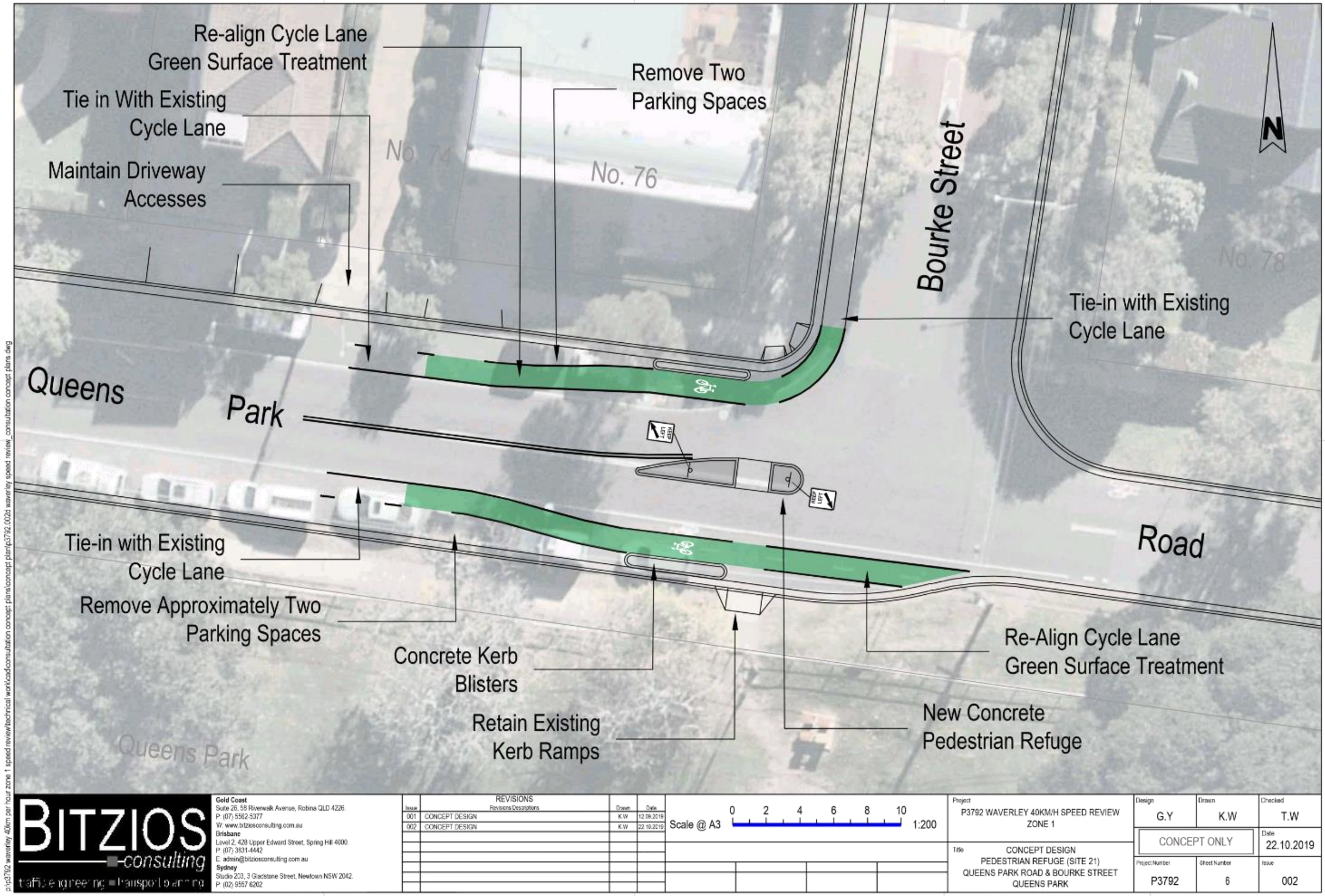
Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 16)
BOURKE STREET (No. 10)
QUEENS PARK

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	5	002


Re-align Cycle Lane
Green Surface Treatment
Tie in With Existing
Cycle Lane
Maintain Driveway
Accesses
Remove Two
Parking Spaces
No. 74
No. 76
No. 78
Bourke Street
N
Tie-in with Existing
Cycle Lane
Queens
Park
Road
Tie-in with Existing
Cycle Lane
Remove Approximately Two
Parking Spaces
Concrete Kerb
Blisters
Retain Existing
Kerb Ramps
Re-Align Cycle Lane
Green Surface Treatment
New Concrete
Pedestrian Refuge
Queens Park
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002 CONCEPT DESIGN K.W 22.10.2019
Scale @ A3
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Project
P3792 WAVERLEY 40KM/H SPEED REVIEW
ZONE 1
Design G.Y
Drawn K.W
Checked T.W
CONCEPT ONLY
Date 22.10.2019
Title
CONCEPT DESIGN
PEDESTRIAN REFUGE (SITE 21)
QUEENS PARK ROAD & BOURKE STREET
QUEENS PARK
Project Number P3792
Sheet Number 6
Issue 002
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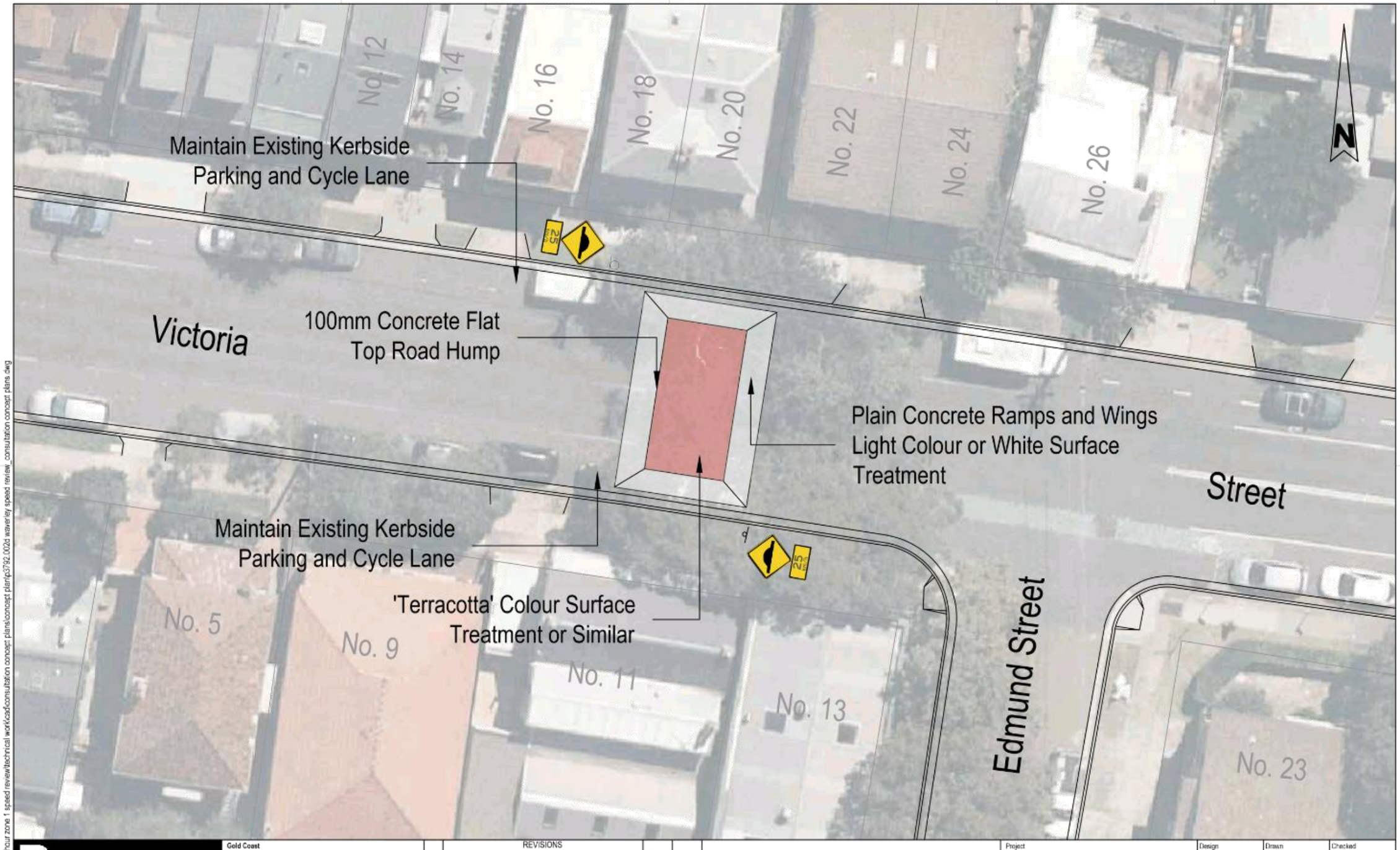

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 22)
VICTORIA STREET & EDMUND STREET
QUEENS PARK

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 7	Issue 002

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001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 25)
YORK ROAD (No. 47 & 49)
QUEENS PARK

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 8	Issue 002

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 27)
BENNETT STREET (No. 34)
BONDI

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 9	Issue 002


No. 17
No. 19
No. 21
No. 23
No. 25
No. 27
No. 14
No. 16
No. 18
No. 20
No. 22
No. 24
No. 26
N
Dudley Street
Maintain Existing Kerbside Parking
75mm Concrete Flat Top Road Hump
Maintain Driveway Access
Plain Concrete Ramps and Wings Light Colour or White Surface Treatment
Maintain Driveway Access
'Terracotta' Colour Surface Treatment or Similar
Maintain Existing Kerbside Parking
25
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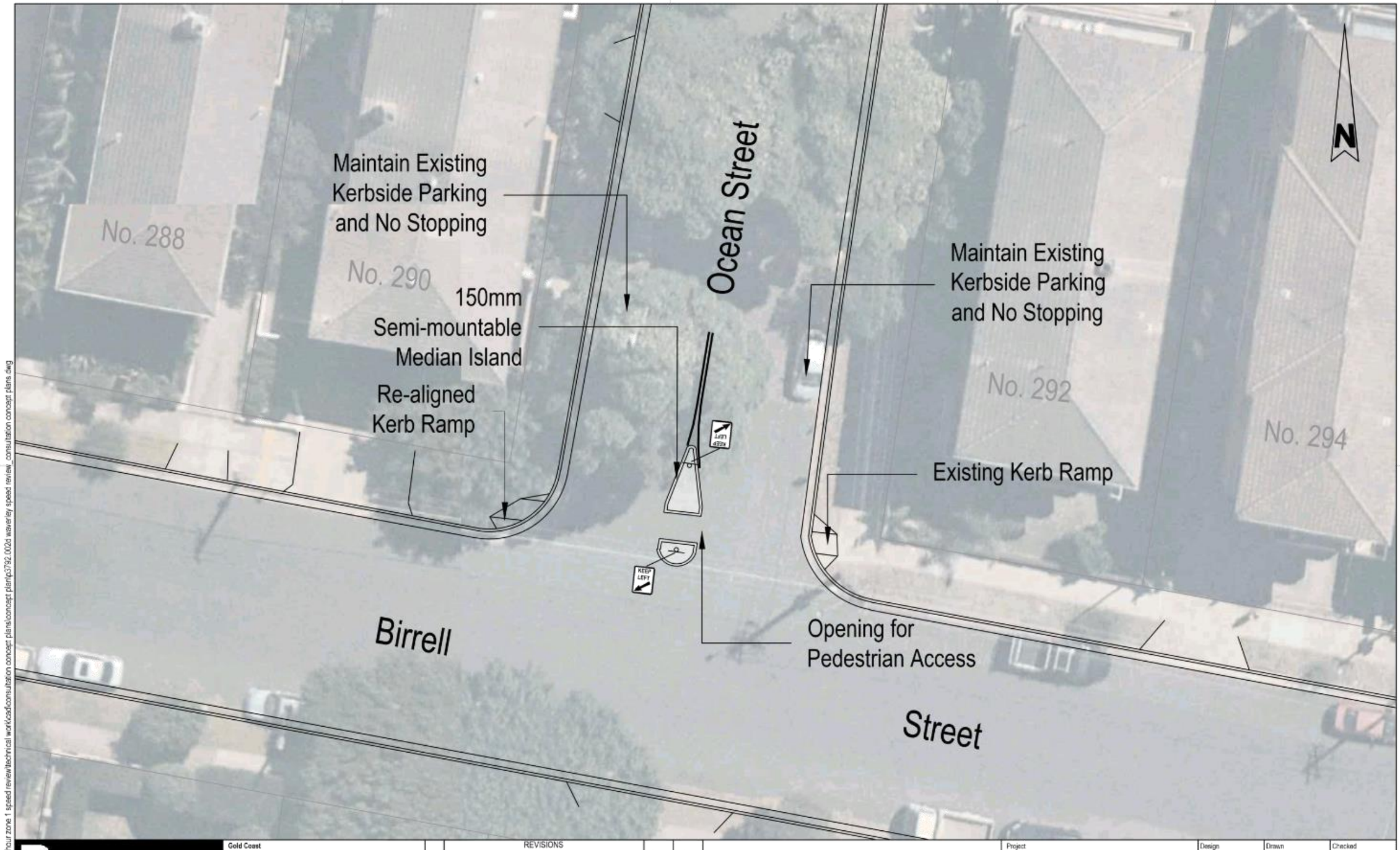
REVISIONS
Issue | Revisions Descriptions | Drawn | Date
001 | CONCEPT DESIGN | G.Y | 12.09.2019
002 | CONCEPT DESIGN | K.W | 22.10.2019
Scale @ A3 0 2 4 6 8 10 1:200
Project P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1
Title CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 30) DUDLEY STREET (No. 21) TAMARAMA
Design G.Y
Drawn G.Y
Checked T.W
CONCEPT ONLY
Date 22.10.2019
Project Number P3792
Sheet Number 10
Issue 002



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001	CONCEPT DESIGN	G.Y	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
PEDESTRIAN REFUGE (SITE 32)
OCEAN STREET & BIRRELL STREET
BONDI

Design	Drawn	Checked
G.Y	G.Y	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 11	Issue 002

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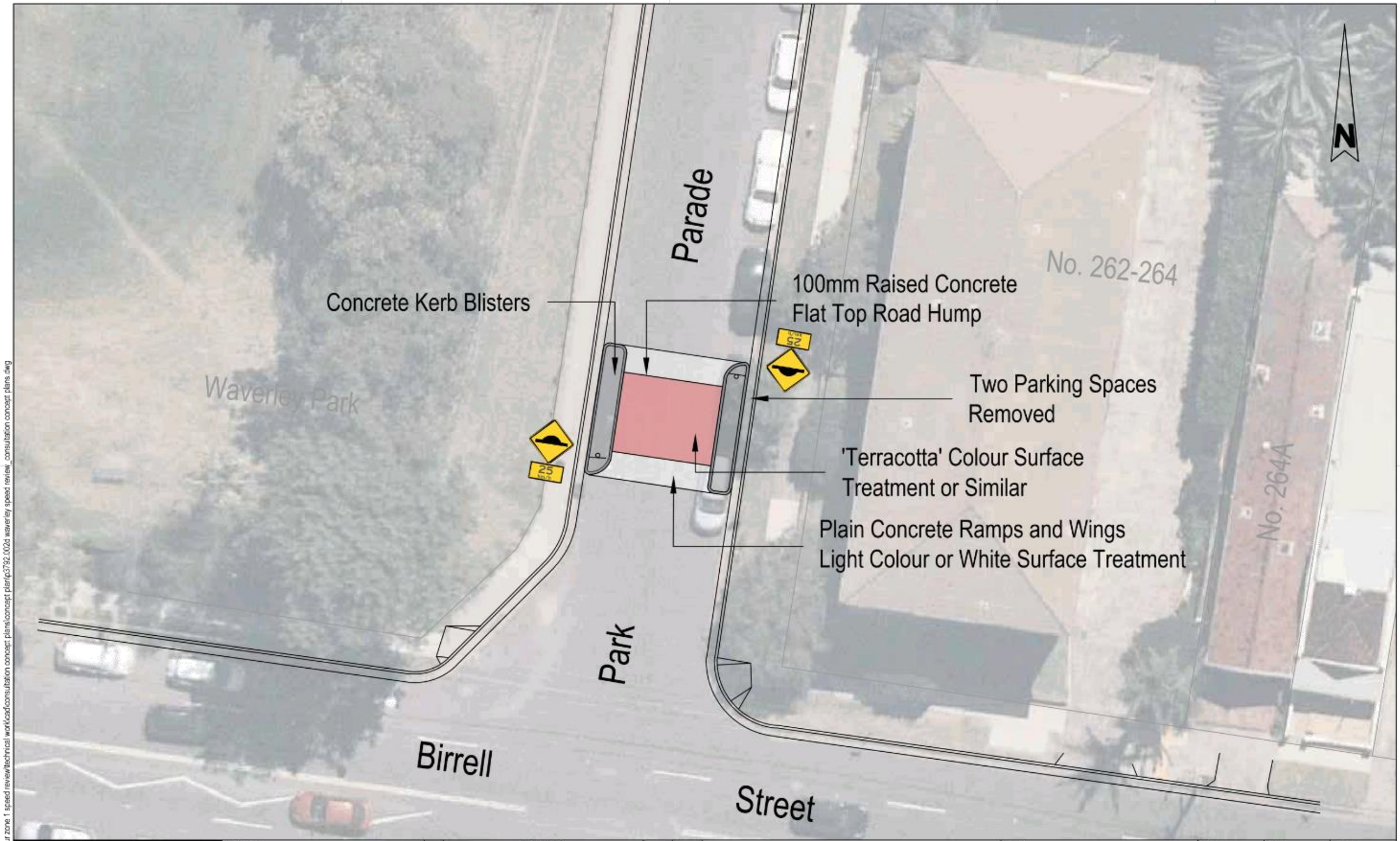
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 33)
OCEAN STREET (No. 94)
BONDI

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 12	Issue 002



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001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	G.Y	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN RAISED ENTRY THRESHOLD (SITE 35) PARK PARADE & BIRRELL STREET BONDI

Design	Drawn	Checked
G.Y	G.Y	S.B

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	13	002

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 36) PARK PARADE (No. 19) BONDI

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 14	Issue 002

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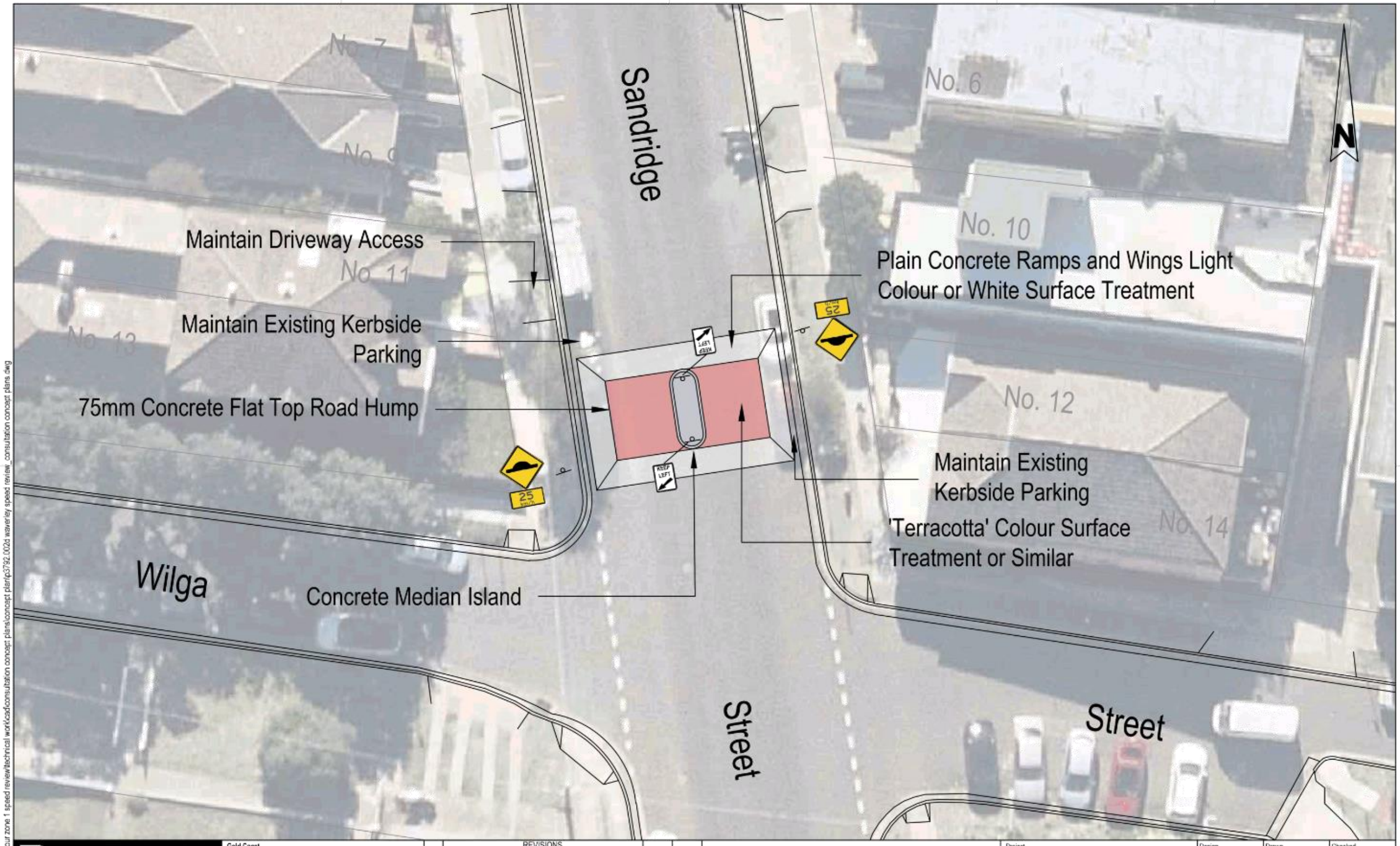

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001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	G.Y	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 38)
SANDRIDGE STREET & WILGA STREET
BONDI

Design	Drawn	Checked
G.Y	G.Y	S.B

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	15	002

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002	CONCEPT DESIGN	K.W	22.10.2019

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Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 39) WATSON STREET (No. 67) BONDI

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	16	002

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002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 41) BROWN STREET (No. 18) BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	17	002

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001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
RAISED ENTRY THRESHOLD (SITE 42)
DICKSON STREET & BIRRELL STREET
BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	18	002

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

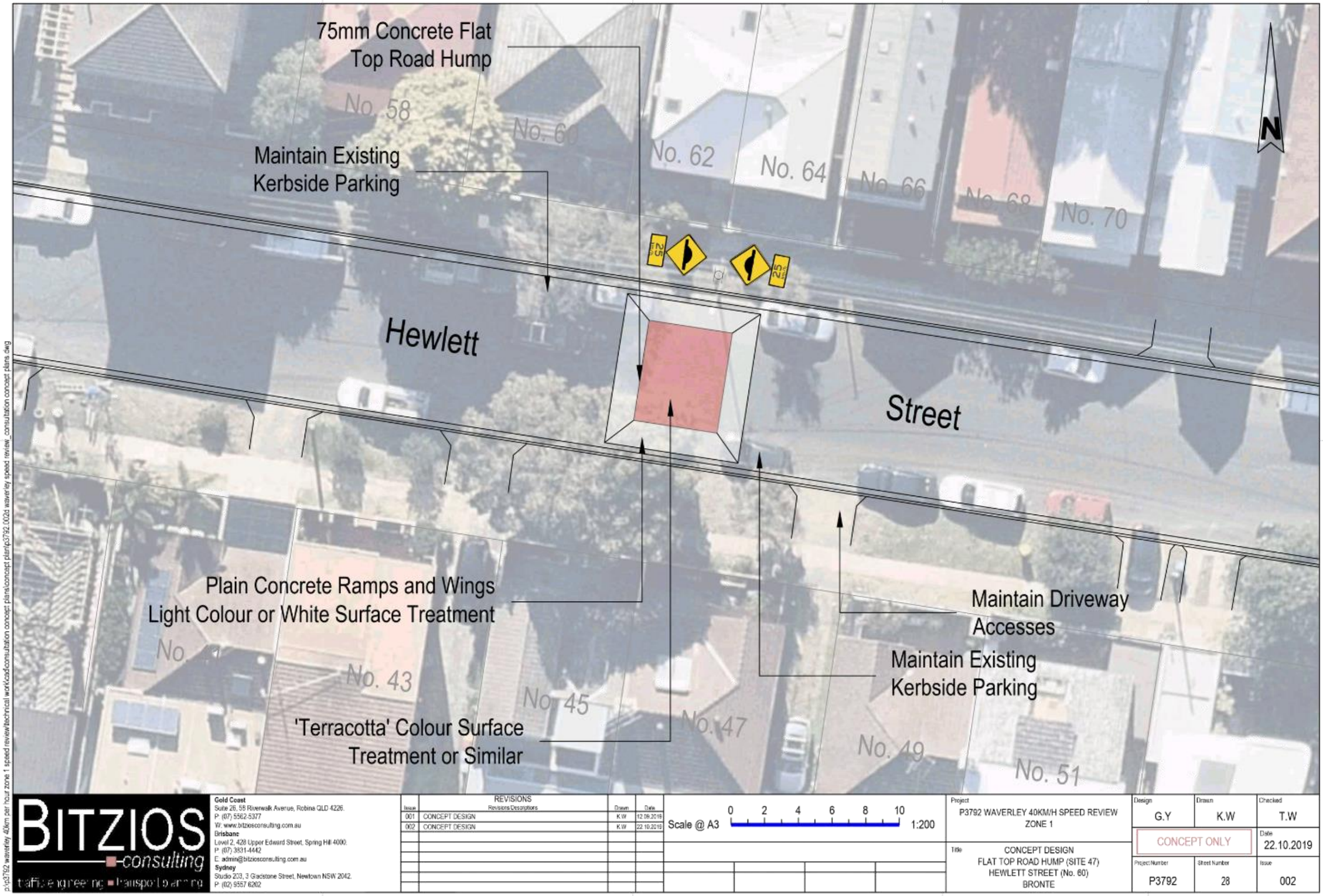
Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 43)
DICKSON STREET & READ STREET
BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	19	002



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 47)
HEWLETT STREET (No. 60)
BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	28	002

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Issue	REVISIONS Revision Description	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 49) LANGLEE AVENUE (No. 35) WAVERLEY

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 29	Issue 002

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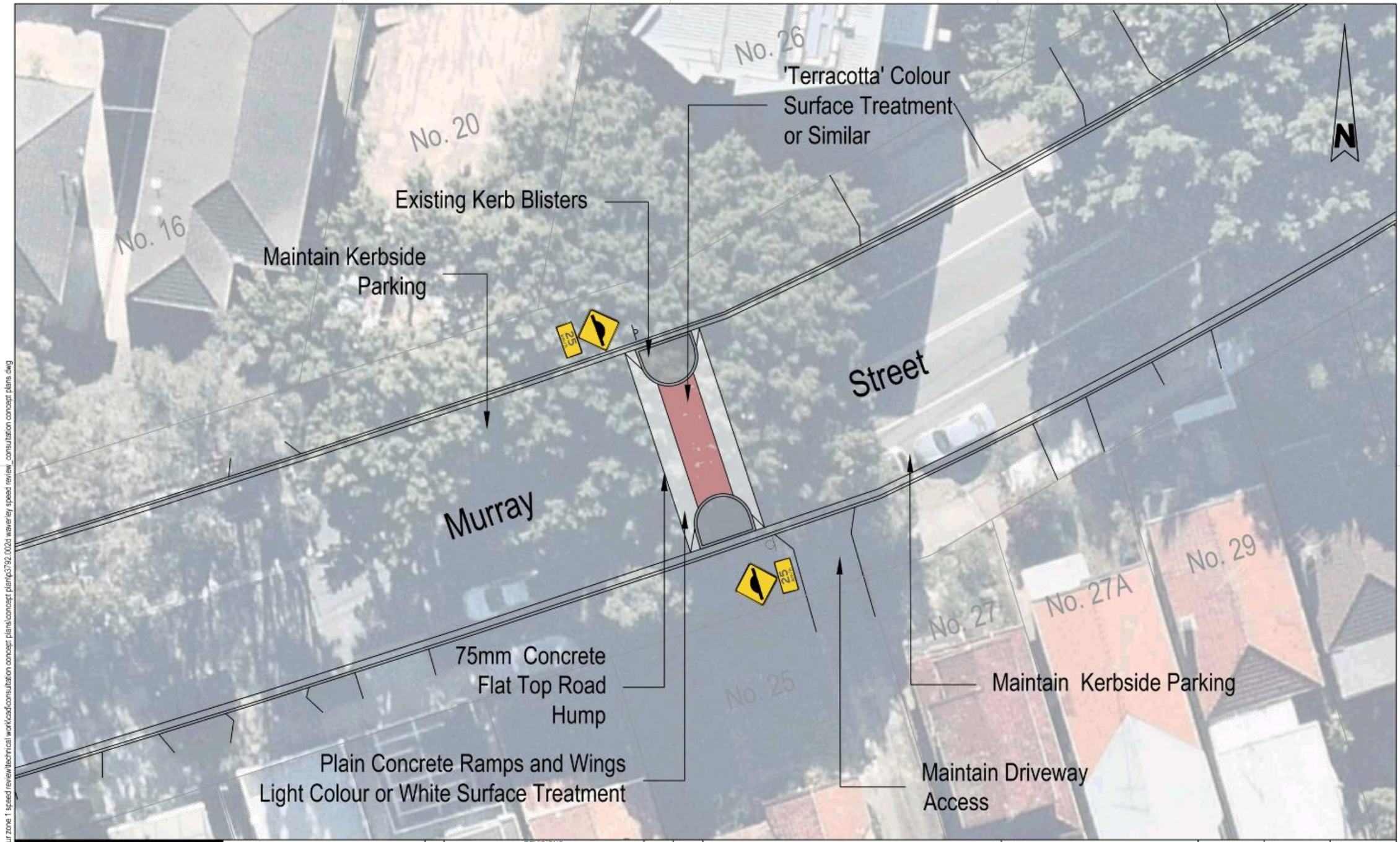

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Issue	REVISIONS Revisions Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

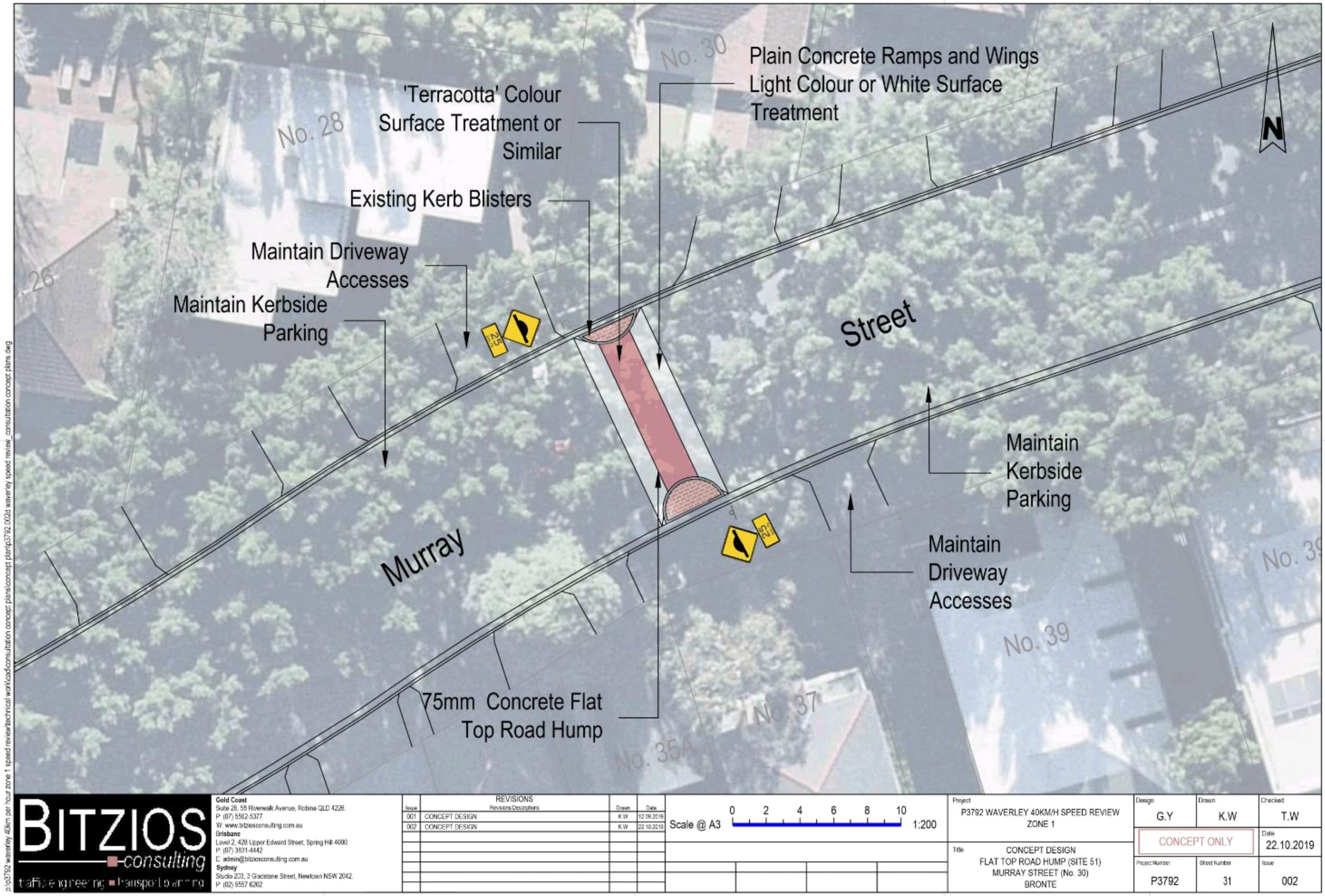
Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 50)
MURRAY STREET (No. 26)
BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	30	002



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

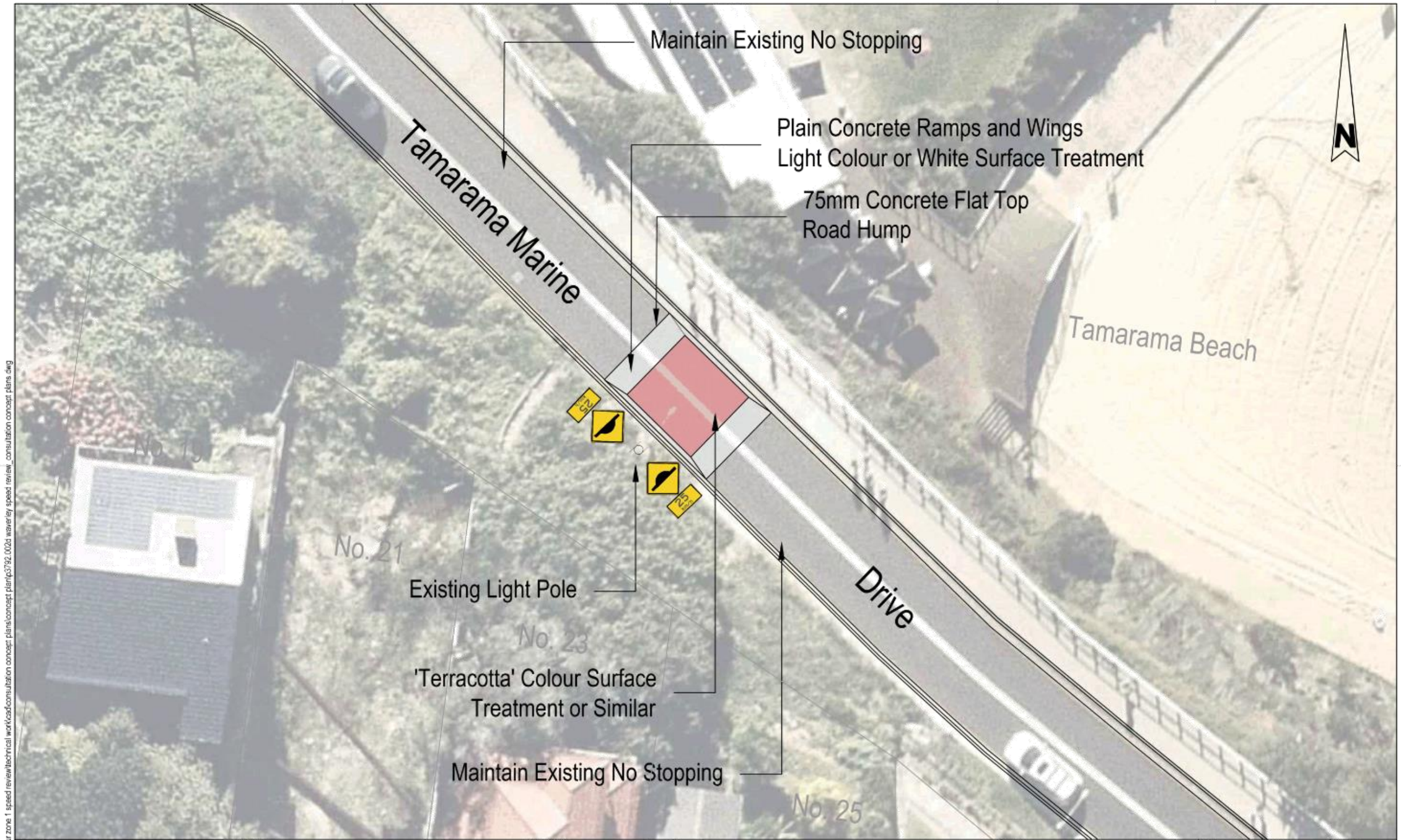
Title: CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 51) MURRAY STREET (No. 30) BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	31	002



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Issue	REVISIONS Revision/Description	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

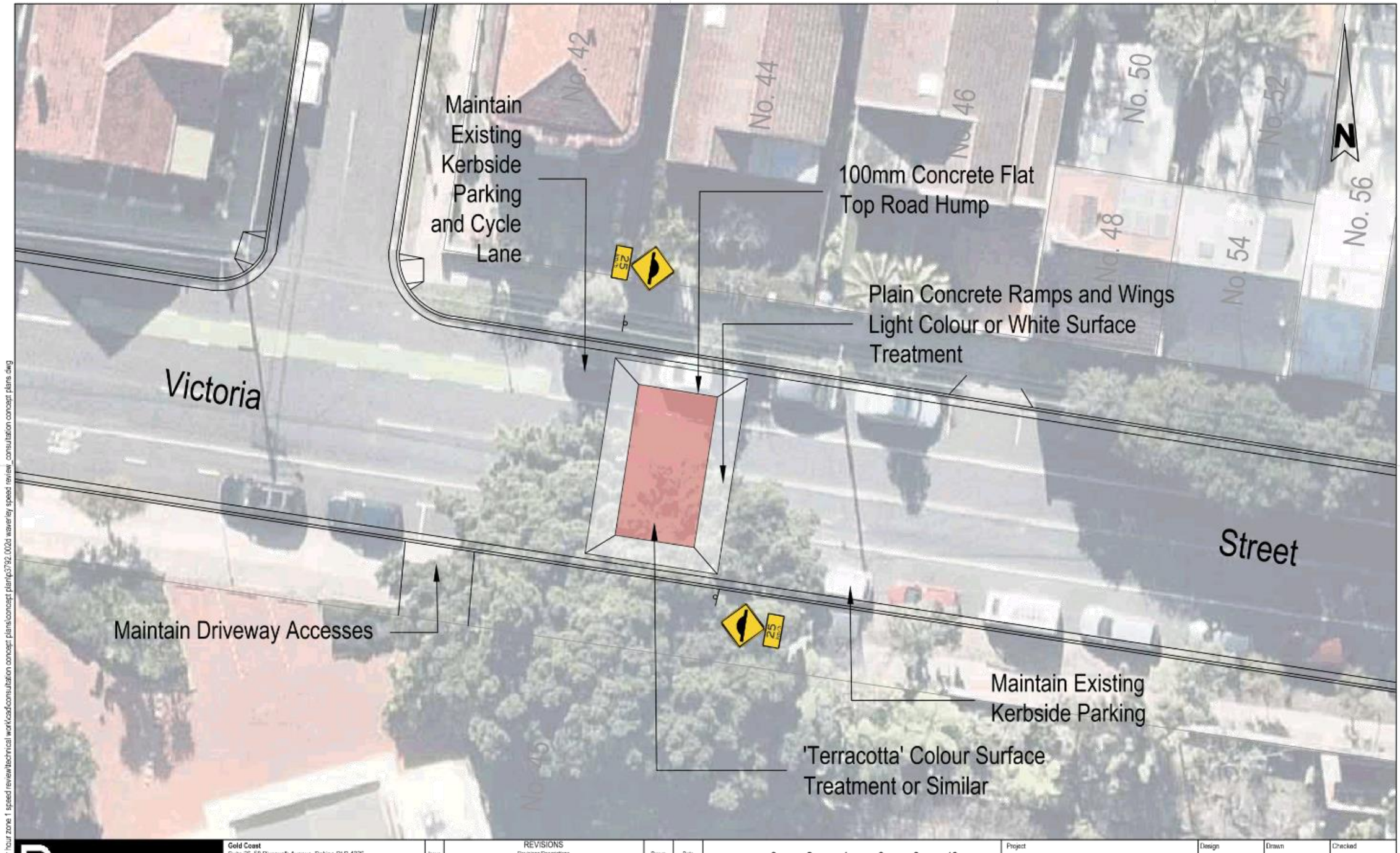
Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 53)
TAMARAMA MARINE DRIVE (SOUTH OF BEACH)
TAMARAMA

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	32	002



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Issue	REVISIONS Revision/Description	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

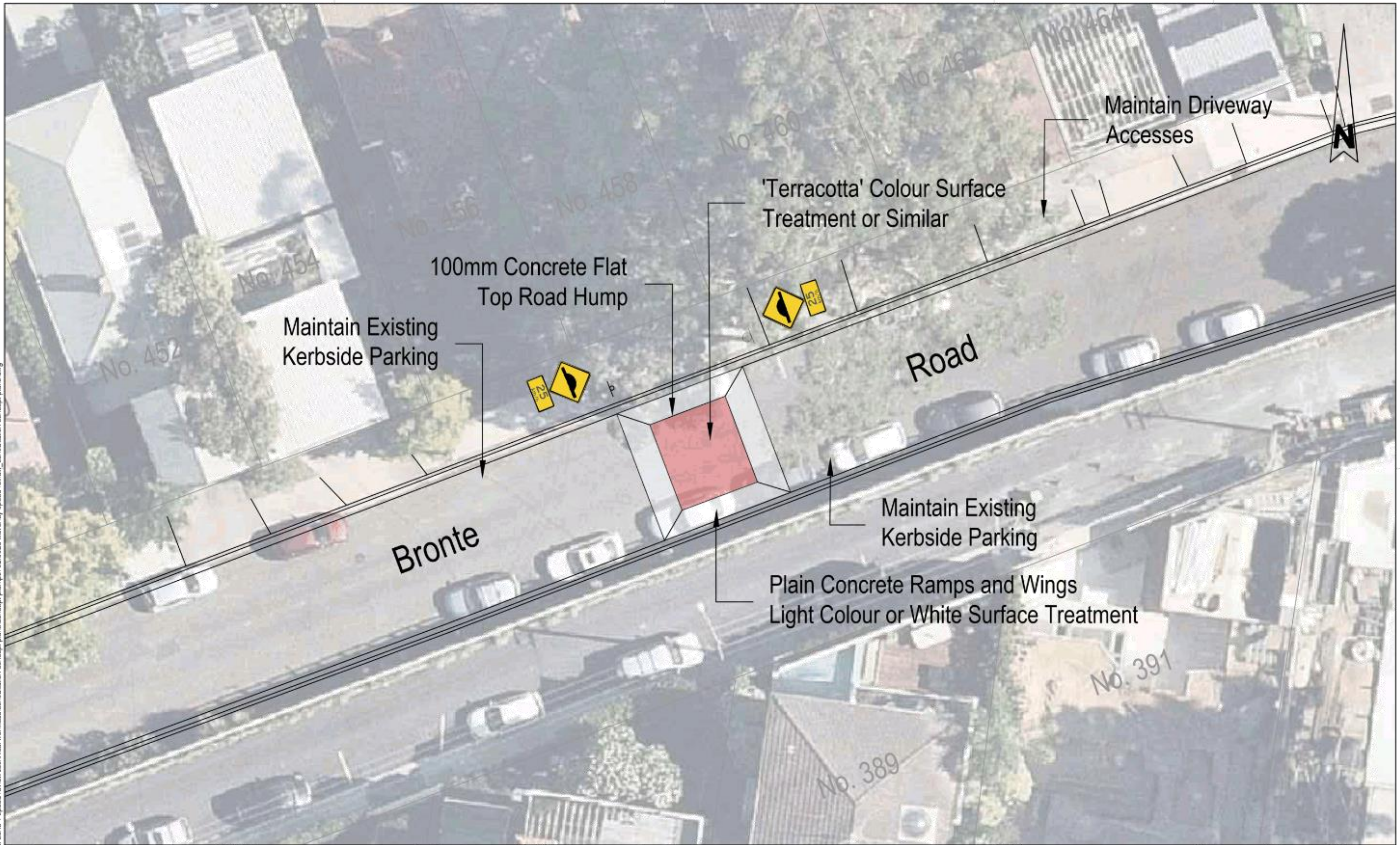
Title: CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 54) VICTORIA STREET (No. 44) WAVERLEY

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	33	002



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Issue	Revisions Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 58)
BRONTE ROAD (No. 458)
BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	34	002

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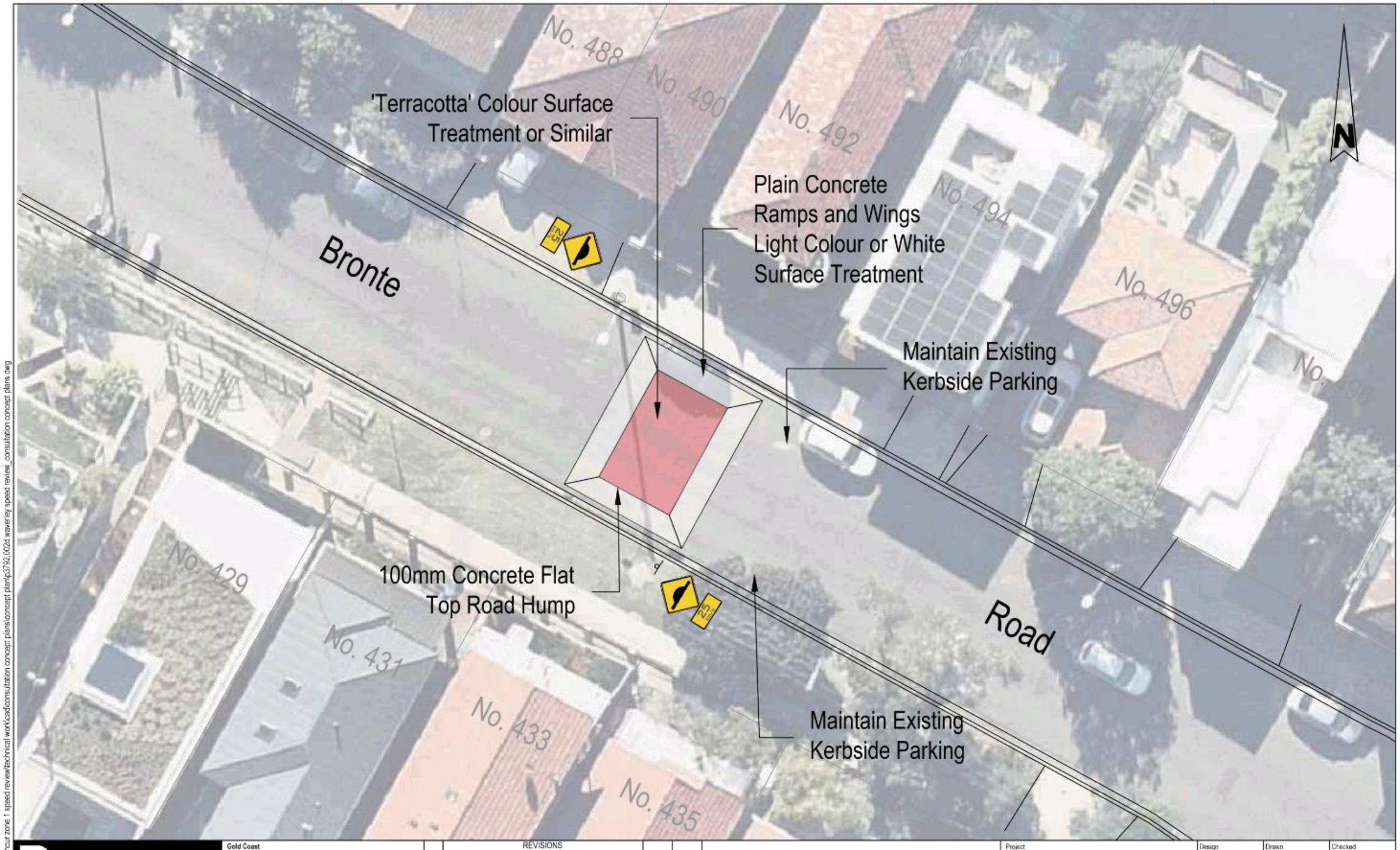

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 59) BRONTE ROAD (No. 492) BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 35	Issue 002

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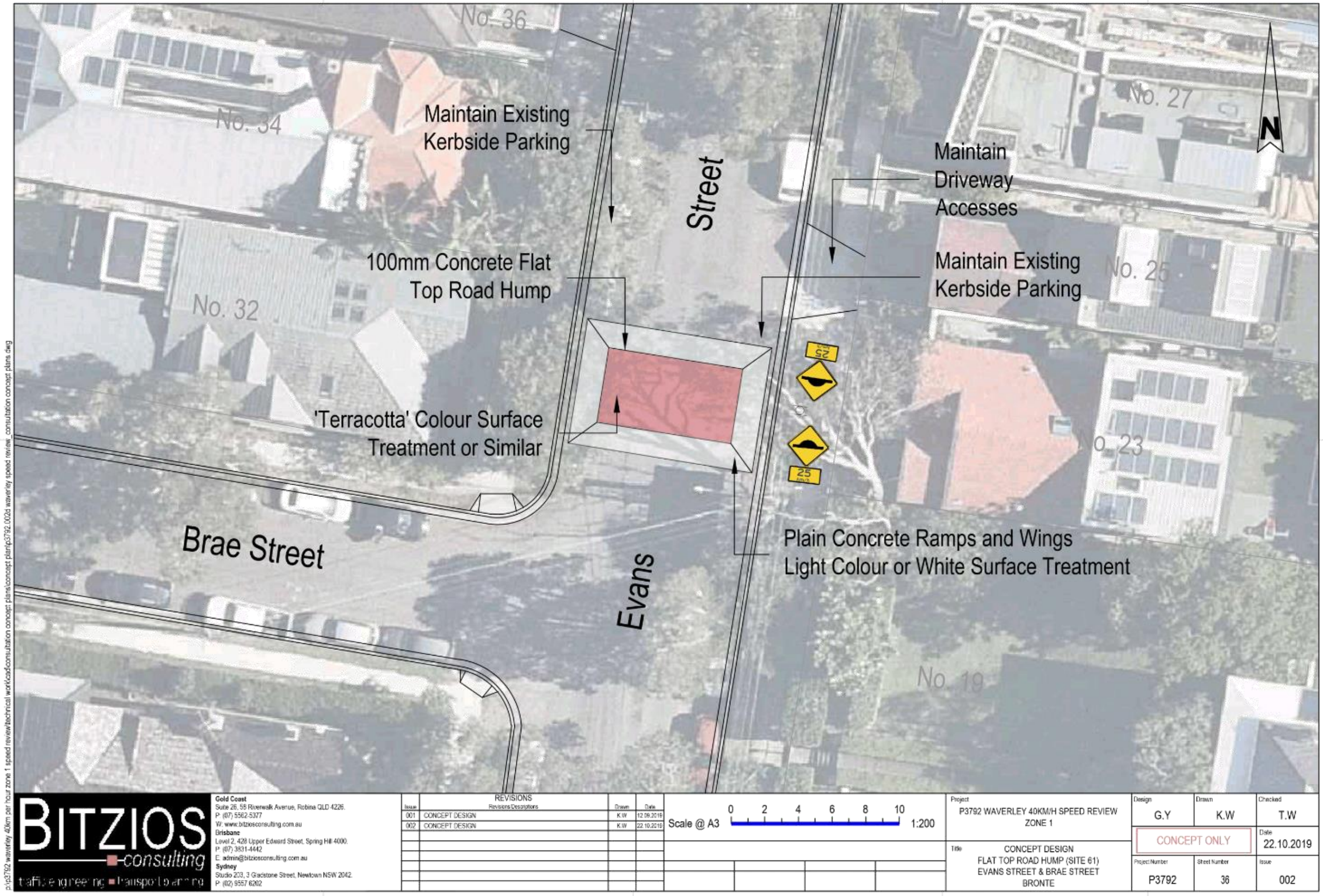

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
FLAT TOP ROAD HUMP (SITE 61)
EVANS STREET & BRAE STREET
BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	36	002

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

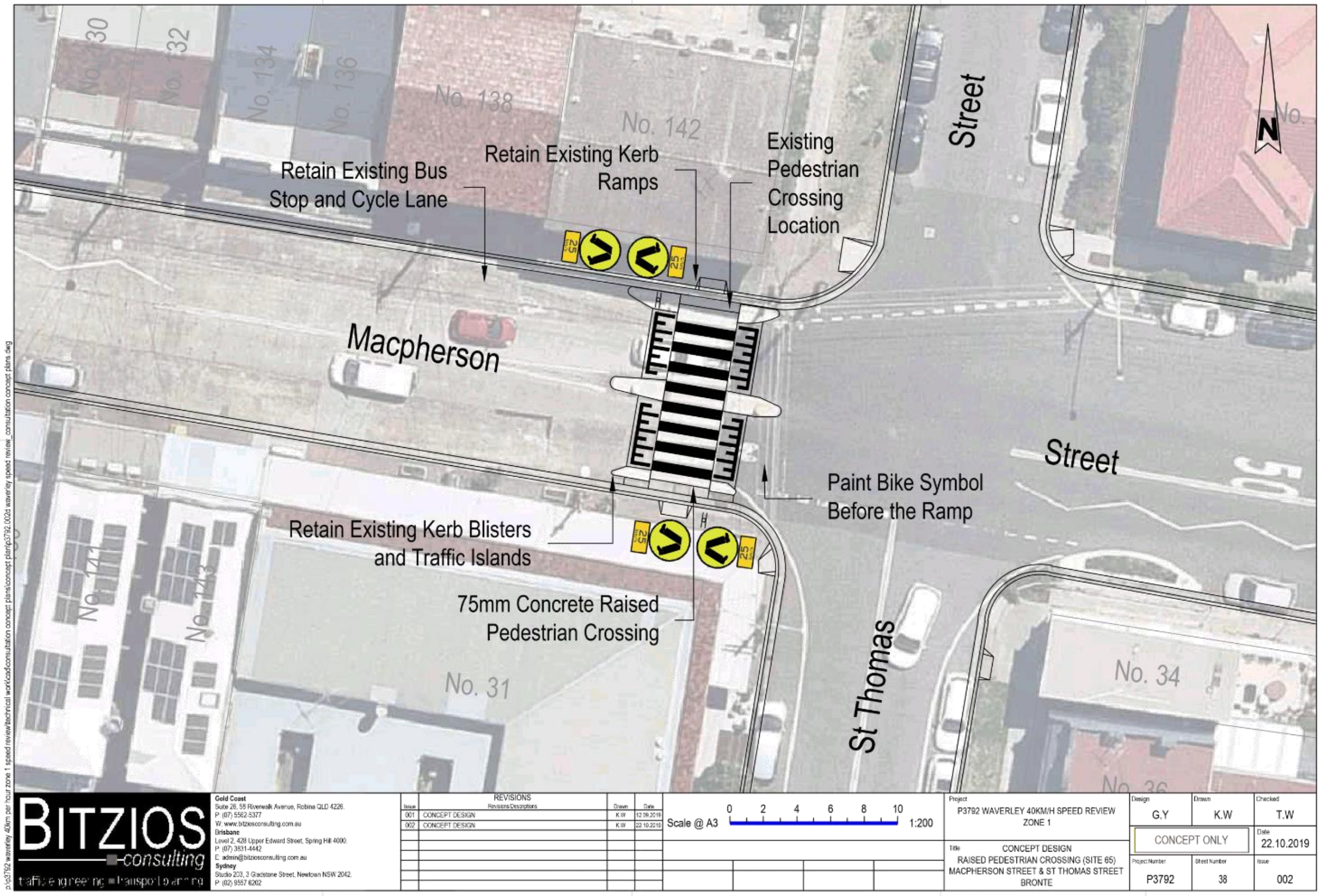
Title: CONCEPT DESIGN FLAT TOP ROAD HUMP (SITE 63) LUGAR STREET & BRAE STREET BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	37	002



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

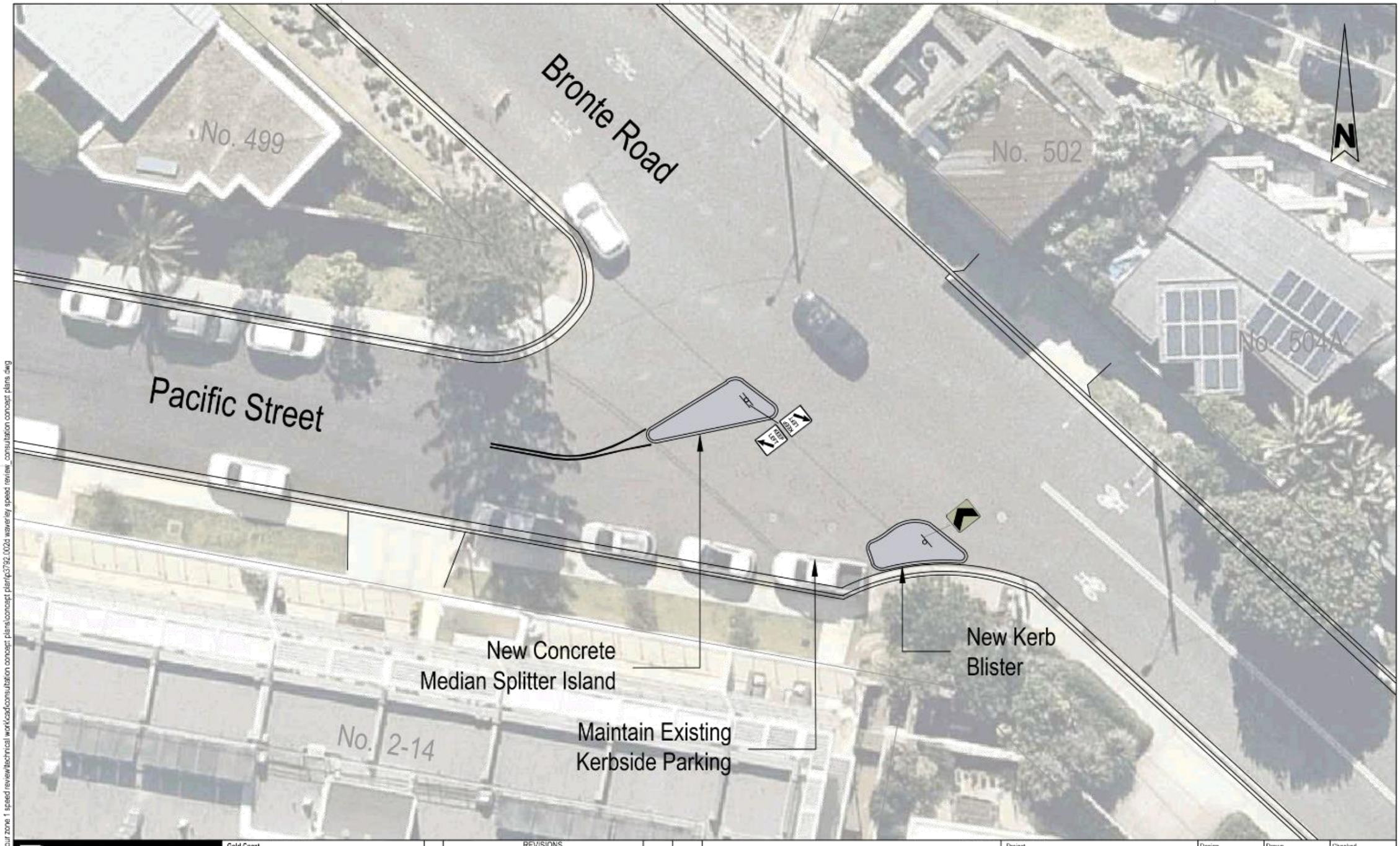
Title: CONCEPT DESIGN
RAISED PEDESTRIAN CROSSING (SITE 65)
MACPHERSON STREET & ST THOMAS STREET
BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	38	002



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Issue	REVISIONS Revisions Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	G.Y	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN MEDIAN ISLAND (SITE 68) PACIFIC STREET & BRONTE ROAD BRONTE

Design	Drawn	Checked
G.Y	K.W	S.B
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 39	Issue 002

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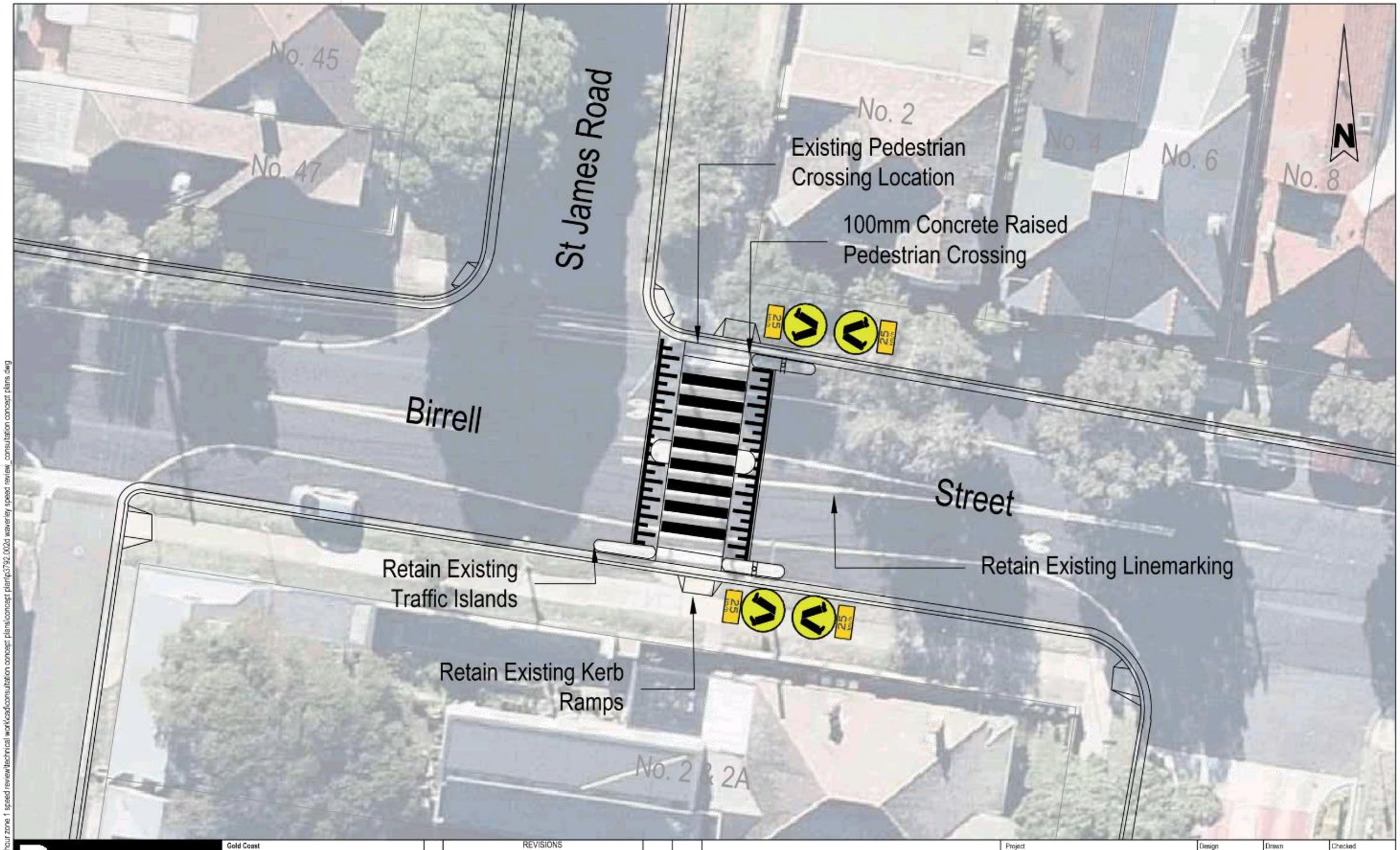
Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN MEDIAN ISLAND (SITE 69) ST THOMAS STREET (No. 48) BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 40	Issue 002



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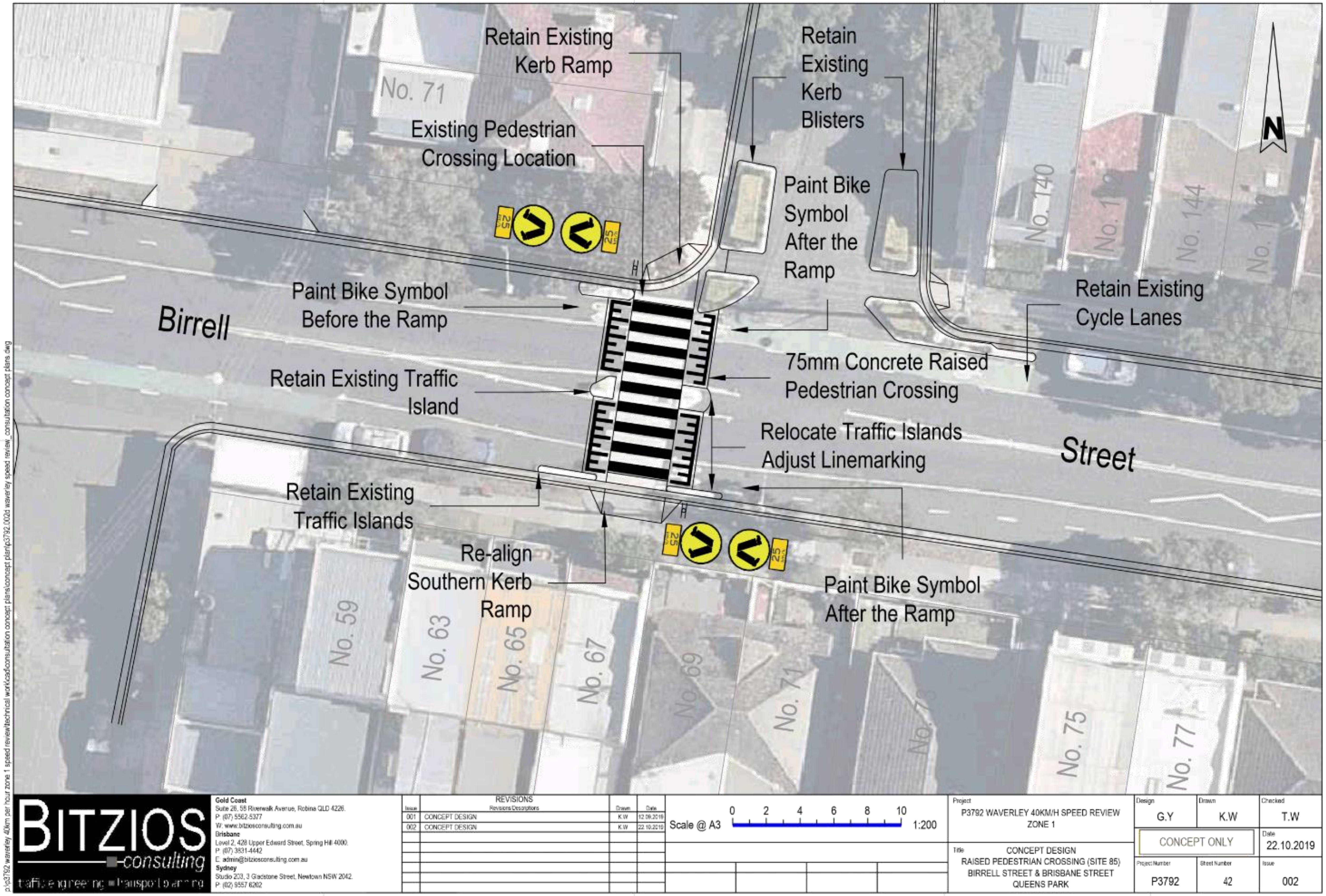
Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
RAISED PEDESTRIAN CROSSING (SITE 84)
BIRRELL STREET & ST JAMES ROAD
QUEENS PARK

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 41	Issue 002


Retain Existing Kerb Ramp
Retain Existing Kerb Blisters
No. 71
Existing Pedestrian Crossing Location
Paint Bike Symbol After the Ramp
No. 140
No. 144
N
Birrell
Paint Bike Symbol Before the Ramp
Retain Existing Cycle Lanes
75mm Concrete Raised Pedestrian Crossing
Retain Existing Traffic Island
Relocate Traffic Islands Adjust Linemarking
Street
Retain Existing Traffic Islands
Re-align Southern Kerb Ramp
Paint Bike Symbol After the Ramp
No. 59
No. 63
No. 65
No. 67
No. 69
No. 71
No. 75
No. 77
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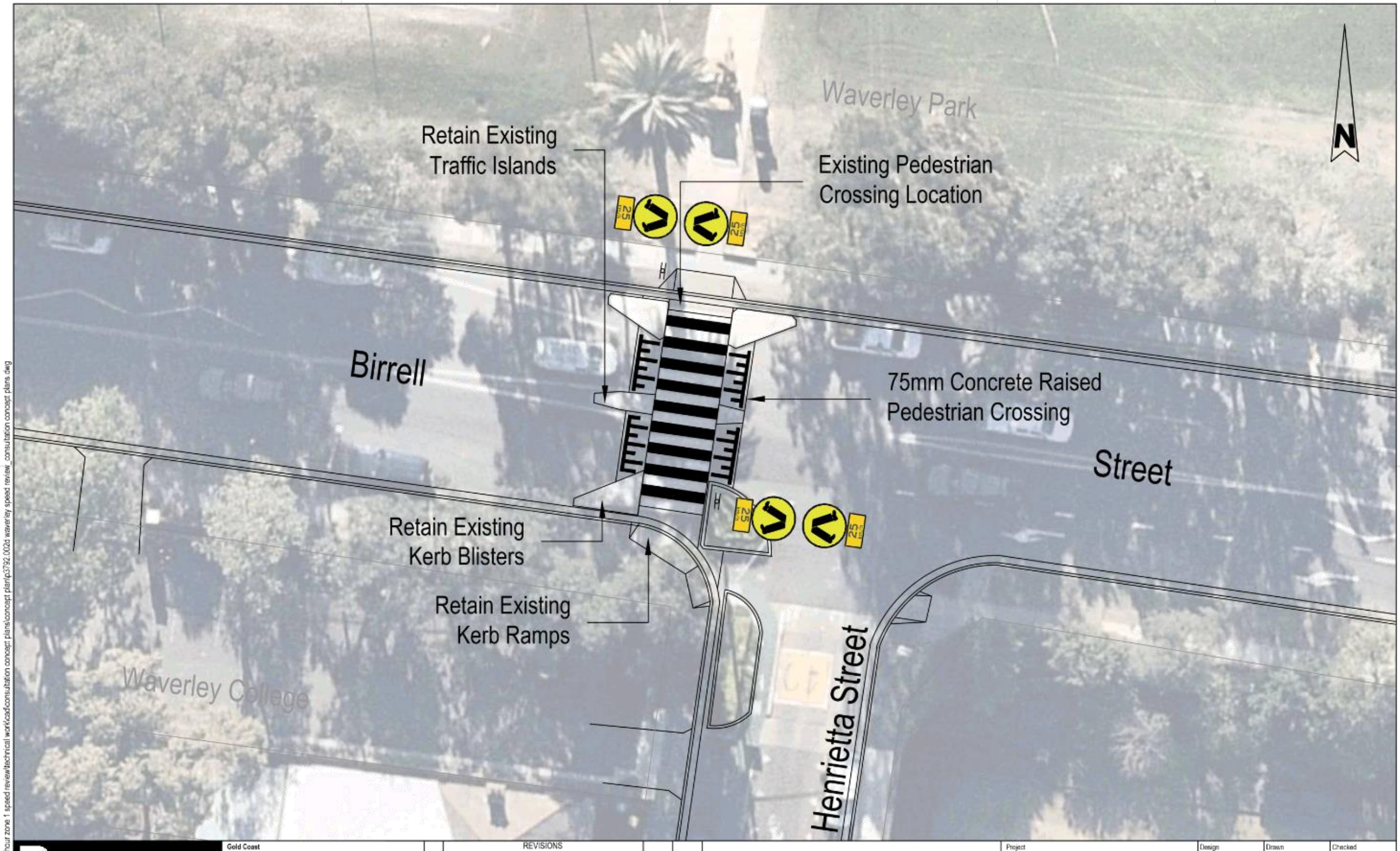
REVISIONS
Issue | Revisions Descriptions | Drawn | Date
001 | CONCEPT DESIGN | K.W | 12.09.2019
002 | CONCEPT DESIGN | K.W | 22.10.2019
Scale @ A3 0 2 4 6 8 10 1:200
Project P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1
Title CONCEPT DESIGN RAISED PEDESTRIAN CROSSING (SITE 85) BIRRELL STREET & BRISBANE STREET QUEENS PARK
Design G.Y
Drawn K.W
Checked T.W
CONCEPT ONLY
Date 22.10.2019
Project Number P3792
Sheet Number 42
Issue 002



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

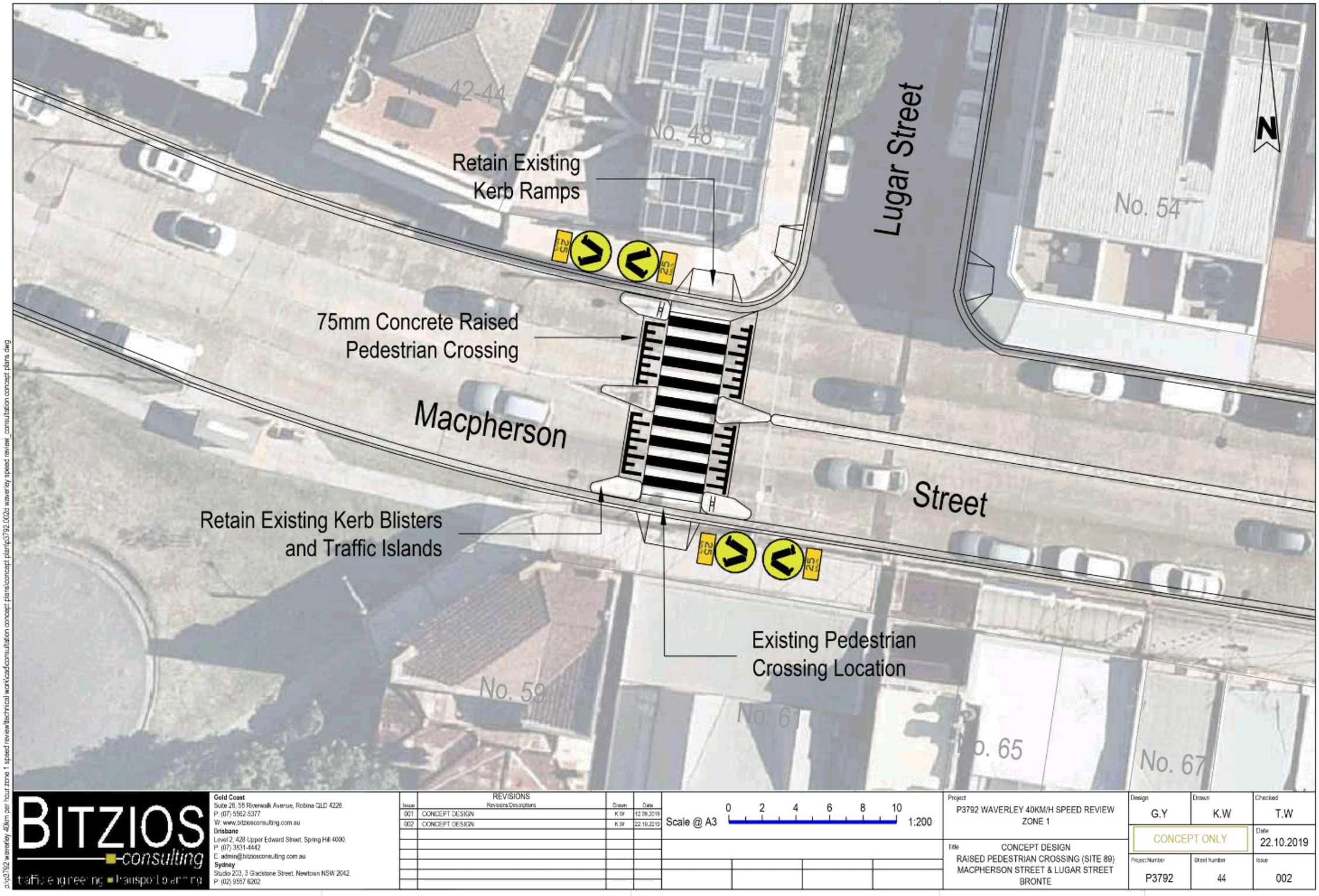
Title: CONCEPT DESIGN
RAISED PEDESTRIAN CROSSING (SITE 87)
BIRRELL STREET & HENRIETTA STREET
WAVERLEY

Design	Drawn	Checked
G.Y	K.W	T.W

CONCEPT ONLY

Date: 22.10.2019

Project Number	Sheet Number	Issue
P3792	43	002



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	CONCEPT DESIGN	K.W	12.09.2019
002	CONCEPT DESIGN	K.W	22.10.2019

Scale @ A3 0 2 4 6 8 10 1:200

Project: P3792 WAVERLEY 40KM/H SPEED REVIEW ZONE 1

Title: CONCEPT DESIGN
RAISED PEDESTRIAN CROSSING (SITE 89)
MACPHERSON STREET & LUGAR STREET
BRONTE

Design	Drawn	Checked
G.Y	K.W	T.W
CONCEPT ONLY		Date 22.10.2019
Project Number P3792	Sheet Number 44	Issue 002

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