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Report

Inner West Council - WestConnex Local Area Improvement Strategy

Prepared for Inner West Council

Prepared by Beca Pty Ltd

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Action	Name	Signed	Date
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on behalf of	Beca Pty Ltd		

Executive Summary

Inner West Council (IWC) engaged Beca to undertake a review of the impacts of Westconnex on the amenity and safety of local neighbourhoods and associated road network, within the IWC area boundary. The outcome of the study is a Local Area Improvement Strategy (LAIS) to address predicted traffic issues.

The following **study objectives** have been developed:

- Understand and benchmark the transport system that currently exists within the IWC area;
- Understand the extent of WestConnex and identify potential issues associated with its implementation;
- Identify a strategy to mitigate effects to be incorporated into the delivery of WestConnex.

Based on the study objectives, the **scope of this strategy** is to:

- Undertake a literature review and analysis to base line the current local area transport network;
- Review and incorporate WestConnex in the context of the IWC boundary and determine area of influences;
- Undertake a high level assessment of current local area transport measures;
- Undertake a high-level peer review of the Zenith Modelling undertaken by Veitch Lister Consulting;
- Review strategic modelling outputs to identify potential rat-running and traffic growth routes associated with each stage of WestConnex;
- Undertake Community Consultation to gauge community concerns regarding potential impacts associated with the project;
- Identify infrastructure strategies to counter identified local area transport impacts;
- Develop potential traffic improvement schemes and develop a range of strategic cost estimates to inform future discussions;
- Provide a priority list of potential routes to receive interventions.

The LAIS provides IWC with an indication of the predicted impact of WestConnex within the context of the IWC LGA and propose mitigations measures and strategies to protect local area neighbourhoods.

To achieve this, the following two broad stages were incorporated:

- Inner West community consultation, achieved by inviting comments and feedback online and at a drop-in session; and
- Assessment and development of the LAIS through application of a qualitative and quantitative assessment methodology.

The **community consultation** revealed key concerns of residents. The main concern of local residents was safety, specifically for pedestrians and cyclists, in sensitive areas of the LGA. This prime concern is followed by concerns over increasing traffic volumes and traffic speeds, which residents want to see mitigated.

The results of the **transport modelling** largely echoed the concerns of the community in highlighting key locations where Westconnex will have a negative impact on road traffic; primarily focused around surface road connections to Westconnex at Ashield, Haberfield, west Leichhardt, north Johnston Street and at St Peters.

However, perhaps more unexpected is that Stage 3 of Westconnex, which links the new M5 alignment with the eastbound extension of the M4, brings benefits to the surface road network in IWC LGA in a number of areas, reducing traffic generated by Stage 1 & Stage 2 of Westconnex. The main reason for this impact is that Stage 3 will take traffic underground, including at the proposed Rozelle and St Peters interchanges, meaning that surface impacts are reduced. Nevertheless, some areas with the IWC LGA, notably at

Ashfield/Haberfield and near the Rozelle Interchange at Annandale, and it should be noted that reduced traffic volumes could have the inverse effect of increasing traffic speeds.

The IWC LGA has an existing pallete of **road treatments** to mitigate rat-running, reduce vehicle speeds and encourage good driver behaviours and, in order to remain consistent with the existing treatments, a range of treatment types was developed for this study. The types of treatments proposed is also consistent with those recommended by the community, increasing the likelihood of acceptance of these interventions. These treatment types were categorised as follows:

- Treatment Type 1 – Integrated Traffic Calming, with Pedestrian and Cyclist Facilities, to discourage rat-running and to reduce traffic speeds;
- Treatment Type 2 – Intersection Modifications to prioritise non-rat running routes as well as prioritising pedestrian and cyclist movements;
- Treatment Type 3 – Traffic Diversions, aimed at physically preventing rat-running and restricting vehicle through-movements.

Based on the results of the transport modelling undertaken by Veith Lister Consulting as well as a workshop with IWC, a series of sub-LGA **area precincts** were defined in which the strategy for implementation of treatments can be targeted. These precincts were defined as being at Ashfield, Haberfield, West Leichhardt, around Johnston Street at Annandale and around Edgeware Road at St Peters.

The strategy for implementing the various treatment types within each precinct is to firstly apply them on the main routes identified to be impacted by Westconnex, the core routes. Secondly, where implementing on the core routes could lead to rat-running being shifted to peripheral adjacent routes, these were also determined as requiring treatment. Roads which either through geometry or lack of connectedness were unlikely to become rat-runs were excluded from the strategy.

The strategy for the treatments of each type within each precinct is shown below:

	Core Impact Area			Peripheral Area		
	Treatment Option 1	Treatment Option 2	Treatment Option 3	Treatment Option 1	Treatment Option 2	Treatment Option 3
Ashfield Precinct	14	13	3	6	3	1
Haberfield Precinct	12	22	5	13	25	6
Leichhardt West Precinct	5	18	6	11	9	4
Johnston Street Precinct	12	18	6	15	13	3
St Peters Routes	4	8	0	3	4	0

A range of **strategic cost estimates** were developed based on applying current market rates on materials and labour to the number and type of treatments proposed. Due to having various treatments in each type and the fact that quantities for each will vary a range of costs were developed. At the strategic level this range covers a lowest total strategic cost estimate of $6.8 million to a highest estimated cost of $28.9 million to implement all potential treatments.

Contents

Appendices

1 Introduction

1.1 Project Purpose

Beca Pty Ltd (Beca) has been engaged by the Inner West Council (IWC) to develop a Local Area Improvement Strategy (LAIS) in response to predicted local area traffic issues associated with the WestConnex project. Figure 1.1 illustrates the implementation process associated with local area improvements. This study is confined to the strategy stage of this process.

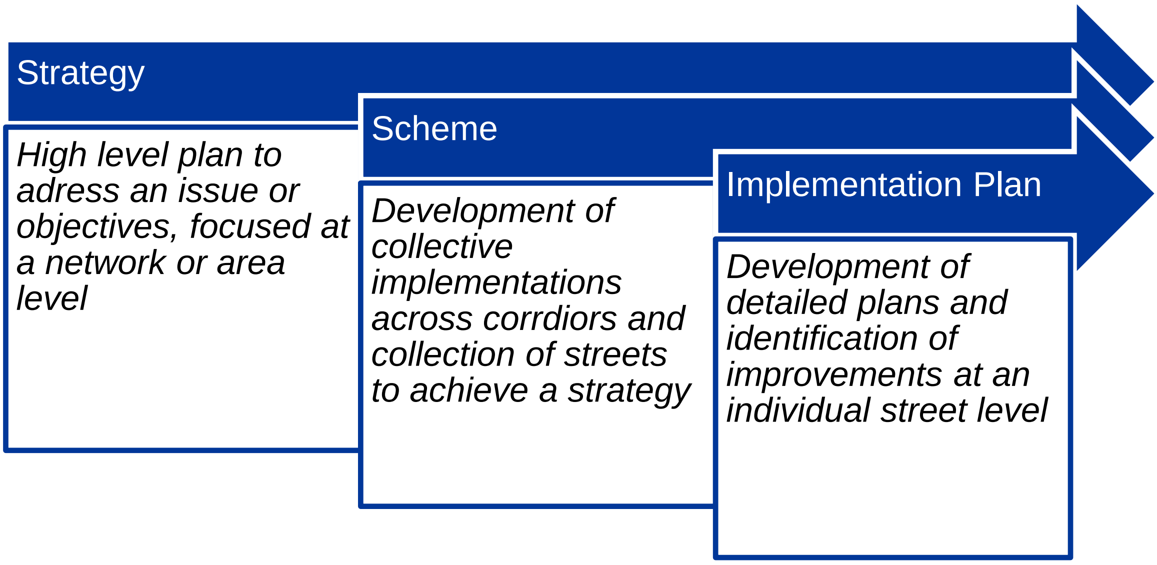


Figure 1.1 – Local Area Improvement Implementation Process

As with any major transport infrastructure project, although the overarching intention is to improve the transport network; there are often impacts, some expected, but others unforeseen. The WestConnex project will undoubtedly be subject to these impacts, having an effect on traffic flows and on residents and businesses within the areas of Sydney through which it travels. In addition to changes in traffic patterns, the study also investigates issues regarding road safety, pedestrian and cycling facilities, and other environmental issues (e.g. noise).

It is therefore essential, as part of the planning of the WestConnex, that wider traffic and other effects are identified and solutions and mitigations, if required, are implemented. Within the Environmental Impact Statement (EIS) issued as part of the individual stages of the WestConnex, limited information regarding effects on local area traffic is provided. On 16 October 2017, IWC submitted their comments regarding the latest EIS issued associated with Stage 3, the M4-M5 Link.

In response to impacts from WestConnex, the IWC has commissioned this independent study to identify the local area traffic effects and to develop through a collaborative and inclusive project with the community, a strategy to address these effects.

1.2 Project Context

As a result of the WestConnex project, IWC is concerned that ‘rat-running’ will occur as motorists either seek to avoid WestConnex tolls or where WestConnex has missing links. For example, upon completion of Stage 1, there are still missing linkages to key destinations, including the Sydney CBD, Sydney Airport and Port Botany. This could result in significant and potentially permanent adverse impacts on the amenity of Inner West residential neighbourhoods.

Conditions of approval for WestConnex Stages 1 and 2 acknowledge the need for monitoring and treatment of affected roads around WestConnex. These include Stage 1 Condition E36 and Stage 2 Condition E40, which require the preparation of a Road Network Performance Review Plan; which includes assessing the impacts of WestConnex on local roads. Development of this plan however, would not commence until 12 months after the project is operational. This could potentially result in any adverse effects not being addressed for a notable period of time/ IWC’s position is that this is unacceptable, arguing that impacts should be projected through traffic modelling, and other prediction techniques and remediation measures put in place to avoid the impacts before they occur.

No assessment of potential changes to road hierarchy as a result of WestConnex has been provided in the EIS to indicate the various levels of roads within the areas impacted by Stages 1, 2 and 3 of WestConnex. This will assist in being able to assess how the changes of existing traffic conditions on various routes, the function of growth and the impact of the WestConnex Project will have on the hierarchy changes. It is important to define the impact of any changes in road hierarchy and how potential discrepancies in the hierarchy will be identified and subsequent operational performance and road safety issues be addressed.

In response, IWC have commissioned independent traffic modelling, using the ‘Zenith’ model, developed by Veitch Lister Consultants (VLC). Roads and Maritime has assisted IWC with information from its WestConnex Road Traffic Model (WRTM), which applies to main roads. Further details regarding the traffic modelling undertaken as an independent commission to this study are provided in Section 3.2.

Within the IWC’s submission on the review of WestConnex Stage 3, M4 – M5 Link EIS, the following recommendation was submitted:

“That Council (IWC) writes to the NSW Premier and/or relevant ministers seeking a continued commitment from RMS (Roads and Maritime Services) and other agencies to Council’s (IWC’s) efforts to identify and protect local streets that may be affected by WestConnex traffic. As increased traffic flows are related directly to WestConnex, RMS should fund implementation of traffic calming works to protect these streets.”

1.3 Project Objectives

In response to the concerns described above, the following project objectives have been developed:

- Understand and benchmark the transport system that currently exists within the IWC area.
- Understand the extent of WestConnex and identify potential issues associated with its implementation.
- Identify a strategy to mitigate effects to be incorporated into the delivery of WestConnex.

1.4 Project Scope

Based on the problems identified, the scope of this strategy is to:

- Undertake a literature review and analysis to base line the current local area transport network;
- Review and incorporate WestConnex in the context of the IWC boundary and determine area of influences;

- Undertake a high level assessment of current local area transport measures;
- Undertake a high-level peer review of the Zenith Modelling undertaken by Veitch Lister Consulting.
- Review strategic modelling outputs to identify potential rat-running and traffic growth routes associated with each stage of WestConnex;
- Undertake Community Consultation to gauge community concerns regarding potential impacts associated with the project.
- Identify infrastructure strategies to counter identified local area transport impacts;
- Develop potential traffic improvement schemes and develop a range of strategic cost estimates to inform future discussions.
- Provide a priority list of potential routes to receive interventions.

1.5 Project Methodology

The primary focus of this LAIS is to assess the impact WestConnex will have on the amenity of local streets and neighbourhoods in the vicinity of and beyond tunnel portals and interchanges. This is expected to occur in the vicinity of Haberfield, St Peters and Annandale/Camperdown, as stages of WestConnex are implemented.

The LAIS will aim to provide IWC with an indication of the predicted impact of WestConnex within the context of the IWC LGA and propose mitigations measures and strategies to protect local area neighbourhoods.

To achieve this, the following two broad stages will be incorporated:

- LAIS Community consultation; and
- Assessment and development of the LAIS.

1.5.1 Community Consultation of the Local Area Improvement Strategy (LAIS)

To assist in ensuring the ultimate success of the project, the project team has worked closely with the IWC to maximise the participation of the community as part of the ultimate strategy. This involved ensuring that the time and effort invested by the community is maximised to provide the best outcome for them.

To maximise this participation, and to ensure the conversation and input was focused on the context of the LAIS associated with the WestConnex project, the participation approach adopted included:

- Allow as many participants as possible to express their view; and
- Focus the input of the public on those issues that are vital to the outcomes of the study.

A specialist community consultation facilitator was utilised on the project. Their role was to drive open and proactive engagement with the community for this LAIS development with the purpose of:

- Highlighting the issues of the community and other stakeholders;
- Meeting stakeholder and community needs in regard to information on the project; and
- Ensuring community and stakeholder input is used to define issues, identify opportunities and inform relevant aspects of the project.

The community and stakeholder consultation process was designed to:

- Provide the community the opportunity to comment on their existing concerns regarding the local area traffic, and how this is influenced by WestConnex.
- Alert the community and stakeholders to the potential impact of the WestConnex and the role of this project to investigate improvement to local area traffic.

- Ensure accurate and timely information is provided to community and stakeholders and provide timely response to improve and enhance the outcomes of the LAIS.
- For further information on the community and stakeholder consultation process please refer to section 4

1.5.2 Assessment and Development of the LAIS

From the focus areas discussed above, specific precincts were defined to assess and develop the LAIS. Each precinct was then assessed in terms of its traffic conditions and includes an assessment of:

- Road Network Classification;
- Traffic Composition (volumes, speeds and heavy vehicle percentages);
- Crash statistics;
- Pedestrian and cyclist desire lines, current and future;
- Review of existing traffic management schemes within the IWC;
- Review of current and future landuse information; and
- Consideration of other infrastructure proposed within the extent of the study area.

In collaboration with the IWC, the project steps to develop the LAIS is summarised below:

1. • Define the LAIS Strategic Context and key Issues - **Section 2.**
2. • Data collection, assessment and problem identification - **Section 3.**
3. • Community Consultation - **Section 4**.
4. • Transport Impacts and Precinct Plans development - **Section 5**.
5. • Potential traffic improvements schemes - **Section 6**.
6. • Strategic cost estimate - **Section 7**.

1.5.2.1 Define the LAIS precincts and key Issues

This stage involves identifying the study area (Section 1.6) and then the strategic context (Section 2) of and areas influenced by the various stages of WestConnex. It describes the different stages and specifically the impact the Stage 3 projects of WestConnex will have on the IWC road network.

As part of the strategic context, other infrastructure projects are also discussed in Section 2.2 and specific Council Strategies in Section 2.3.

It involves identifying the routes that would likely be affected and then bench-marking them in terms of their current function and context within the IWC.

1.5.2.2 Data collection, assessment and problem identification

Strategic traffic modelling information was obtained from VLC from their Zenith model. Traffic flows outputs associated with various scenarios incorporating the stages of WestConnex were interrogated to identify routes where transport conditions may change as a result of WestConnex projects.

Based on the classification of specific roads and the function and relative ownership, this informs the level of intervention in regard to the infrastructure required to mitigate the effects. This in turn feeds into the development of the Local Area Improvement Strategy (LAIS) for each of the precincts that identifies infrastructure interventions. See Section 3 for details.

1.5.2.3 Community Consultation

As per section4, to ensure the ultimate success of the project involves and maximises the participation of the community as part of the Local Area Improvement Strategy.

1.5.2.4 Transport Impacts and Precinct Plans development

Once the precincts requiring infrastructure improvements are identified, the type of infrastructure were chosen, and the development of the Local Area Improvement Strategy was undertaken. See Section 5 for details.

Austroads Guide to Traffic Management, Part 8: Local Area Traffic Management (Austroads, 2016) indicates that in both existing and proposed local networks and precincts, there are three broad planning aspects to developing Local area transport infrastructure opportunities:

- Local traffic as a planning rather than just an engineering issue;
- The need to see neighbourhoods as systems that are part of a wider network; and
- The need to follow a systematic planning process when designing or especially redesigning a locality.

The development of options was undertaken in collaboration with IWC officials in the form of a workshop. At this workshop, the issues identified within the various study areas were used to establish intervention that would be effective at mitigating these effects. These in turn were taken forward in the development of schemes for the development of strategic cost estimates.

In order to establish the most appropriate LAIS solution for the context of each of the precincts, an evaluation framework, which could inform priorities of interventions and relative effectiveness was developed. Features included in the framework for the development of solutions contained:

- Objective assessment of street conditions compared with standards, acceptable thresholds or comparative conditions elsewhere in the precinct;
- Anticipation of changed conditions resulting from the WestConnex project, or planned land use or activity changes; and
- Concerns and suggestions from members of the community.

1.5.2.5 Potential traffic improvement schemes

For the prescient study areas defined, various treatment strategies are available to mitigate the identified problems. See Section 6 for details.

These potential improvement strategies have been developed to a standard to inform strategic cost estimates, articulate the treatment option and establish the effectiveness of the measure.

1.5.2.6 Strategic cost estimate

The treatments identified for each precinct were prioritised in collaboration with the IWC and as part of community consultation, which were used to develop Prescient Strategic Plans. These plans for each precinct were then consolidated to create an overall LAIS Strategy for the LGA.

To assist in this process and to identify a prioritisation programme, high-level cost estimates using industry unit rates was undertaken. Further details are provided in Section 7.

1.5.3 Local Area Improvement Strategy (LAIS) deliverables

The final output of this project will be a Local Area Improvement Strategy (LAIS) report. The intention of this report is to provide IWC with a LAIS planning framework to:

- Inform and facilitate appropriate feedback to WestConnex regarding traffic improvements required for the community and road users within the Inner West Council;
- Coordinate traffic planning and engineering works with the projected Council budgets and road maintenance programs;
- Give a logical reason for a program of works in each precinct; and
- Assist in decreasing the pressures and complaints from local residents.

1.6 Study Area

The study area associated with this study are the precincts within the IWC where WestConnex interacts with the local transport network. Figure 1.2 illustrates that make up the IWC.

Figure 1.2 – Inner West Council

Areas expected to be influenced by WestConnex, and hence form the basis of the study area include:

- Haberfield – Associated with the Wattle Street Interchange in Stage 3 of WestConnex;
- Lilyfield/Rozelle – Associated with the Rozelle Interchange in Stage 3 of WestConnex; and
- St Peters – Associated with the St Peters Interchange in Stage 3 of WestConnex.

More details on the areas of impact are discussed in **Section 2.1**. In addition specific prescient study areas defined by the problem definition exercise is provide in **Section 5.5**.

1.7 Possible Local Area Improvement Projects

A summary of the local area improvement projects currently applied in IWC and possible application of these strategies are indicated below. Details of these strategies are provided in **Appendix A**.

A desktop assessment and site visit of existing Local Area Traffic Management (LATM) was conducted as part of this study. The desktop assessment focussed on existing LATM in the former Marrickville LGA and concentrated on the type of LATM implemented for various road classifications. In contrast, the site visits were conducted across the entire IWC LGA, focusing on the areas in close proximity to the proposed M4-M5 connections to the surface road network (i.e. St Peters, Ashfield/Haberfield and Leichhardt/Annandale/Camperdown).

1.7.1 Existing Local Area Traffic Management (LATM) – former Marrickville LGA

Table 1.1 provides a summary of the routes investigated as part of the desktop assessment, including a description of the type of Local Area Traffic Management implemented. Further details are provided in **Appendix A**.

Table 1.1 – Existing LATM in former Marrickville LGA

Route	Road Network Classification	Description of Existing LATM
Marrickville Road	Regional Road	A number of raised pedestrian platforms along the route, as well as wombat crossings on side streets A small number of horizontal devices (kerb extensions) and line markings around school zones
Wemyss Street	Local Road	Primarily vertical devices in the form of raised platforms.
Cannon Street	Local Road	Primarily mixture of horizontal/vertical devices in the form of raised platforms and kerb extensions, as well as line marking treatments (Zig-Zags)
Terrance Road	Local Road	Primarily horizontal devices in the form of kerb extensions and chicanes, which also utilise plants.
Calvert Street	Local Road	Mixture of horizontal (kerb extensions) and vertical (raised platforms and wombat crossings) devices. There is also the use of diagonal on street parking, which creates side friction.
Northumberland Avenue	Local Road	Mixture of horizontal (kerb extensions) and vertical (raised platforms and wombat crossings) devices. Also includes a roundabout intersection.
Alice Street	Regional Road	Primarily horizontal (kerb extensions and pedestrian crossings) devices, including visual markings (zig-zags and dragon teeth).
Bailey and Station Street	Local Road	Wide variety of treatments implemented, include: ■ Horizontal devices: kerb extensions with platforms;

Route	Road Network Classification	Description of Existing LATM
		■ Vertical devices: raised platforms; ■ Traffic diversions: one lane sections; and ■ Surface treatments.
Darley Street	Local Road	All vertical devices (raised platforms)
Railway Avenue	Local Road	Primarily horizontal (kerb extensions with plantings) devices. There are also vertical (road cushions) devices along the route, some are integrated with the horizontal devices.

The information gathered from a sample of existing LATM's in the former Marrickville LGA indicates that there are a number of treatments used, these are primarily based around the core implementation of horizontal and vertical . These methods, coupled with other design features are intended to alter driver behaviours and create more resistance along certain streets, with the aim of decreasing traffic speeds or volumes.

1.8 Reference Material

The following reference material has been incorporated into this strategy:

- WestConnex, M4 East Environmental Impact Statement (EIS): Traffic and Transport Assessment Reports (*WestConnex Delivery Authority; 2015);*
- WestConnex, The New M5 Technical Working Paper: Traffic and Transport (*Roads and Maritime; 2015);*
- WestConnex, Stage 2 Environmental Impact Statement (EIS): Review of Traffic, Transport and Modelling (*City of Sydney*, 2016);
- WestConnex, M4-M5 Link Environmental Impact Statement (EIS): *Traffic and Transport Components (When Available) (Authors; Year);*
- Marrickville Integrated Transport Strategy (Marrickville Council, 2007);
- Marrickville Bicycle Strategy (Marrickville Council, 2007);
- Marrickville Pedestrian Access and Mobility Plan (Marrickville Council, 2009);
- Marrickville Local Environmental Plan (Marrickville Council, 2011);
- Marrickville Development Control Plan (Marrickville Council, 2011);
- Leichhardt Local Environmental Plan (LEP) (Leichhardt Council, 2013);
- Leichhardt Development Control Plan (DCP) (Leichhardt Council, 2013);
- Leichhardt Council Pedestrian Access and Mobility Plan – Review & Update (Leichhardt Council, 2013);
- Leichhardt Integrated Transport Plan (Leichhardt Council, 2014);
- Leichhardt Bike Plan (Leichhardt Council, 2016);
- Leichhardt Functional Road Hierarchy Review (Leichhardt Council, *Year);*
- Ashfield Local Environmental Plan (LEP) (Ashfield Council, 2013);
- Ashfield Interim Development Assessment Policy (Ashfield Council, 2013);
- Ashfield Pedestrian Access and Mobility Plan (Ashfield Council, *2016);*
- Draft North Annandale Neighbourhood Movement Plan (Leichhardt Council, 2016);
- Tomorrow's Dulwich Hill (Marrickville Council, 2015);
- Crash Statistics 2010 – 2015 (Inner West Council, 2017); and
- Austroads, Guide to Traffic Management, Part 8: Local Area Traffic Management (Austroads, 2016).

2 Strategic Context

2.1 WestConnex

The WestConnex project was announced in 2012 by the New South Wales (NSW) Government and is currently the largest transport infrastructure project in Australia. The ultimate project objectives are to: provide more reliable vehicular trips for people, businesses and freight.

Figure 2.1 illustrates the various stages associated with the proposed WestConnex project.

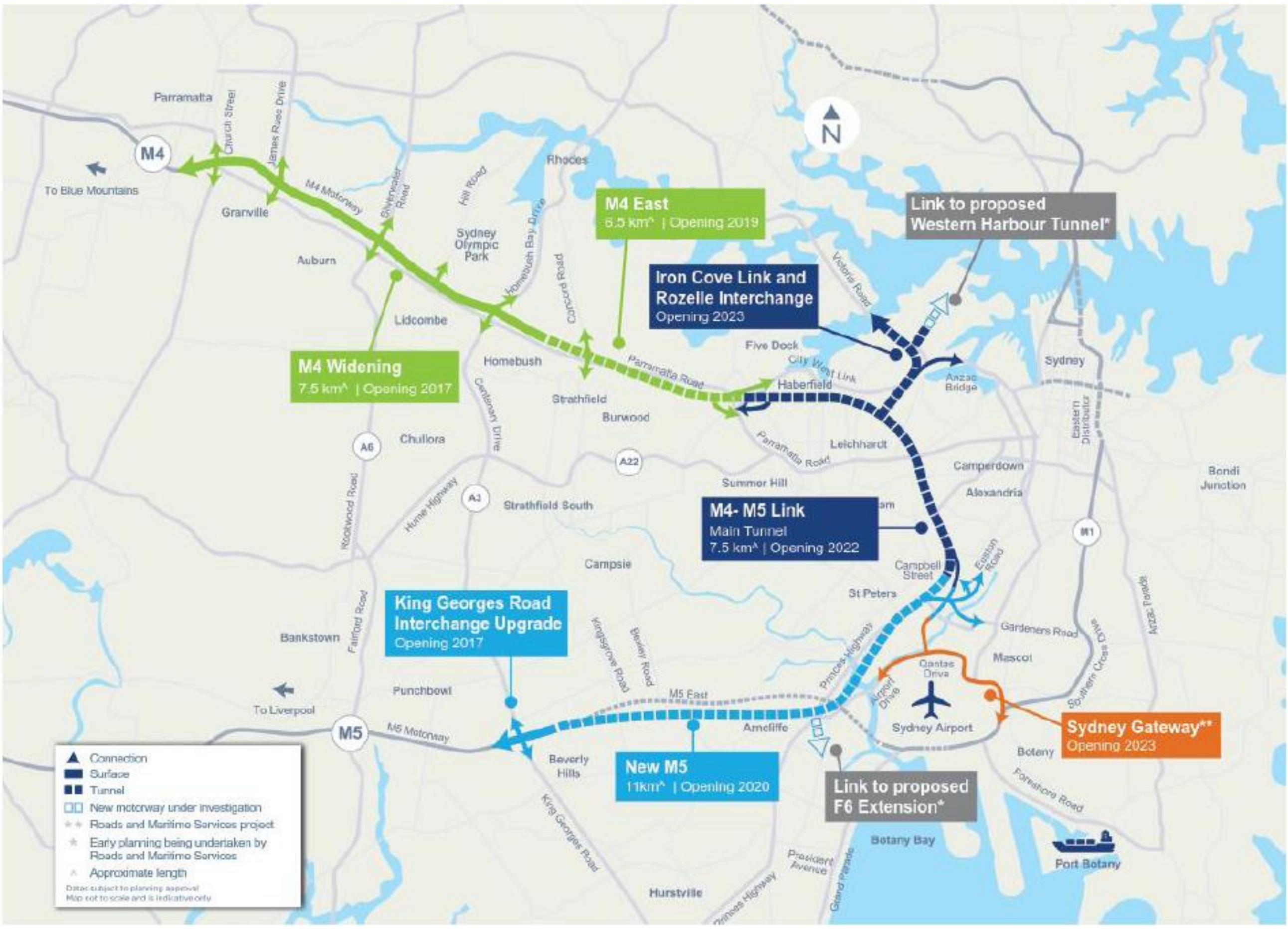


Figure 2.1 – Regional Context and Stages of WestConnex[1]

Projects associated with WestConnex, as illustrated in Figure 2.1 include:

- M4 Widening – Widening of 7.5km of existing M4 between Parramatta and Homebush – expected completion: 2017;
- King Georges Road Interchange Upgrade – Increase capacity at M5 interchange in Beverly Hills – expected completion: 2017;

[1] Source: WestConnex M4-M5 Link – Addendum State significant infrastructure application report – Addendum 2

- M4 East – Extension of M4 providing additional 6.5km of motorway between Homebush and Haberfield - expected completion: 2019;
- New M5 – New alignment for 11km of M5 corridor between Beverly Hills and St Peters, including the St Peters Interchange, providing connections to Sydney Airport and Port Botany – expected completion 2020;
- New M4-M5 Link – new 9.2km tunnel linking M4 at Haberfield and the M5 at St Peters – expected completion 2023; and
- Upgrade Sydney Gateway – connecting Sydney Airport and Port Botany– expected completion 2023.

In addition to the core components of WestConnex discussed above, the project has also allowed for the provision of two additional motorway projects. These include the Western Harbour Tunnel and the F6 Extension. Both of these projects are in early stages of planning, but have been incorporated into the WestConnex documentation.

Detailed below are specific features of WestConnex relevant to the IWC transportation network.

2.1.1 M4 Widening Extent of Works

Stage 1 of WestConnex involves the widening of the M4, details of which are found in the WestConnex M4 Widening: Environmental Impact Assessment (SMEC Australia, 2014). This document has been investigated to establish the proposed infrastructure associated with this stage of the project. The key local transport links associate with this stage of the project include:

- Upgrades to the James Ruse Drive Interchange at Granville;
- Upgrades to the Silverwater Road Interchange at Auburn;
- New Olympic Park connection onto Hill Road at Lidcombe; and
- Improved westbound access at the Homebush Drive Interchange at Sydney Olympic Park.

No works associated with this stage of WestConnex are expected to affect the IWC local area transport network.

2.1.2 M4 East Extent of Works

In addition to the widening of the existing M4, Stage 1 also involves the extension of the M4. The WestConnex M4 East: Environmental Impact Statement (AECOM Australia/ GHD, 2015) has been identified the high-level infrastructure associated with this stage of the project. This includes:

- New M4 Alignment tunnelled between Homebush West and Haberfield.
- Upgrades to the Homebush Bay Drive Interchange at Homebush West.
- New westbound on ramp to M4 at Powells Creek at Homebush.
- New interchange onto Concord Road at North Strathfield.
- New interchange onto Wattle Street (City West Link) at Haberfield.
- New interchange onto Parramatta Road at Haberfield.

In addition to the major infrastructure identified above, there is also likely to be additional supporting infrastructure, as well as temporary works, each with possible effects on the IWC local road network.

Due to the locality of the Wattle Street and Parramatta Road Interchange at Haberfield, this is going to place increased demand on the IWC local road network. Specific infrastructure identified for upgrades within the IWC network include:

- Modifications to the following intersections along Wattle Street: Waratah Street, Martin Street and Ramsay Street.
- Modifications to the following intersections along Parramatta Road: Bland Street, Chandos Street, Orpington Street and Rogers Avenue,
- Possible temporary road closures along Parramatta Road during construction.

The associated transportation effects on the IWC local area transport network will be explored as part of this study.

2.1.3 New M5 Extent of Works

Stage 2 of WestConnex involves the creation of a new M5 link, details of which are included in the WestConnex New M5 Environmental Impact Statement (AECOM Australia, 2015). Major infrastructure associated with the New M5 includes:

- New M5 Motorway alignment tunnelled between Kingsgrove and St Peters.
- Upgrades to the King Georges Road Interchange at Kingsgrove.
- Surface works on the existing M5 in the vicinity of the Western Portal at Kingsgrove.
- New St Peters Interchange onto Burrows Road at St Peters.
- Local road and intersection improvements along Euston Road, Campbell Road, Gardeners Road and Sydney Park Road.

The location of the St Peters Interchange onto Euston Road, this would be expected to place additional demand on the IWC local road network. Specific infrastructure identified for upgrades within the IWC network include:

- Two new road bridges at the St Peters interchange connecting to Gardeners Road and Bourke Road in Mascot.
- Widening of Campbell Road in each direction.
- Upgrading of Euston Road/Campbell Road, Unwins Bridge Road/Campbell Street Intersection and Euston Road/Sydney Park Road Intersection.

2.1.4 Stage 3: M4 – M5 Link

The proposed M4-M5 Link, assuming it is approved, will provide a subterranean bypass of the Sydney Central Business District (CBD). It includes new underground twin tunnels that will link the New M4 tunnels at Haberfield with the New M5 at St Peters (refer to Figure 2.1). This connection is known as the mainline tunnel and once joined, effectively complete the main motorway component of WestConnex.

The M4-M5 Link includes an interchange at Rozelle (the Rozelle Interchange) providing connections to the surface road network at City West Link, Victoria Road and ANZAC Bridge. It also includes a new toll-free tunnel connection between the Rozelle Interchange and Victoria Road near the Iron Cove Bridge (the Iron Cove Link).

The M4-M5 Link will be built in two stages. The main tunnels will be constructed separately to the Rozelle Interchange and Iron Cove Link, which will allow for completion of the main WestConnex motorway ahead of the original schedule. The main tunnels of the M4-M5 Link are about eight kilometres in length and will link the southern end of the New M4 at Haberfield to the northern end of the New M5 tunnels at St Peters. The scope of work includes:

- twin tunnels, each four-lanes wide linking Haberfield to St Peters
- ramps between the main tunnels and the surface interchange at St Peters

- tunnel stubs so the main tunnels can connect to the Rozelle Interchange and proposed Western Harbour Tunnel
- ramps between the main tunnels and the surface connection at Wattle Street
- a ventilation facility at St Peters
- Integration with the ventilation facility at Haberfield.

Pending project approval, Sydney Motorway Corporation expects to start construction of the main tunnels in 2018. Once the M4-M5 Link is complete, the WestConnex motorway will include 23 kilometres of subterranean tunnels.

The local areas that will most likely be impacted by WestConnex are located around the tunnel portals at the proposed interchanges for the M4 – M5 Link (WestConnex Stage 3). These indicative areas are shown in Figures 2.2 below.

2.1.4.1 Haberfield Interchange

The proposed Haberfield Interchange links the M4 East (Stage 1) with the M4-M5 Link (Stage 3) and connects to the City West Link. Modifications will need to be made to Wattle St and the intersections at Waratah St, Martin St and Ramsay St. Parramatta Road is linked to the new M4 East via the proposed Parramatta Road Interchange. This triggers the need for intersection modifications at Bland Street, Chandos Street, Orpington Street and Rogers Avenue. This could include potential road closures along Parramatta Road, which includes a number of commercial and industrial premises.

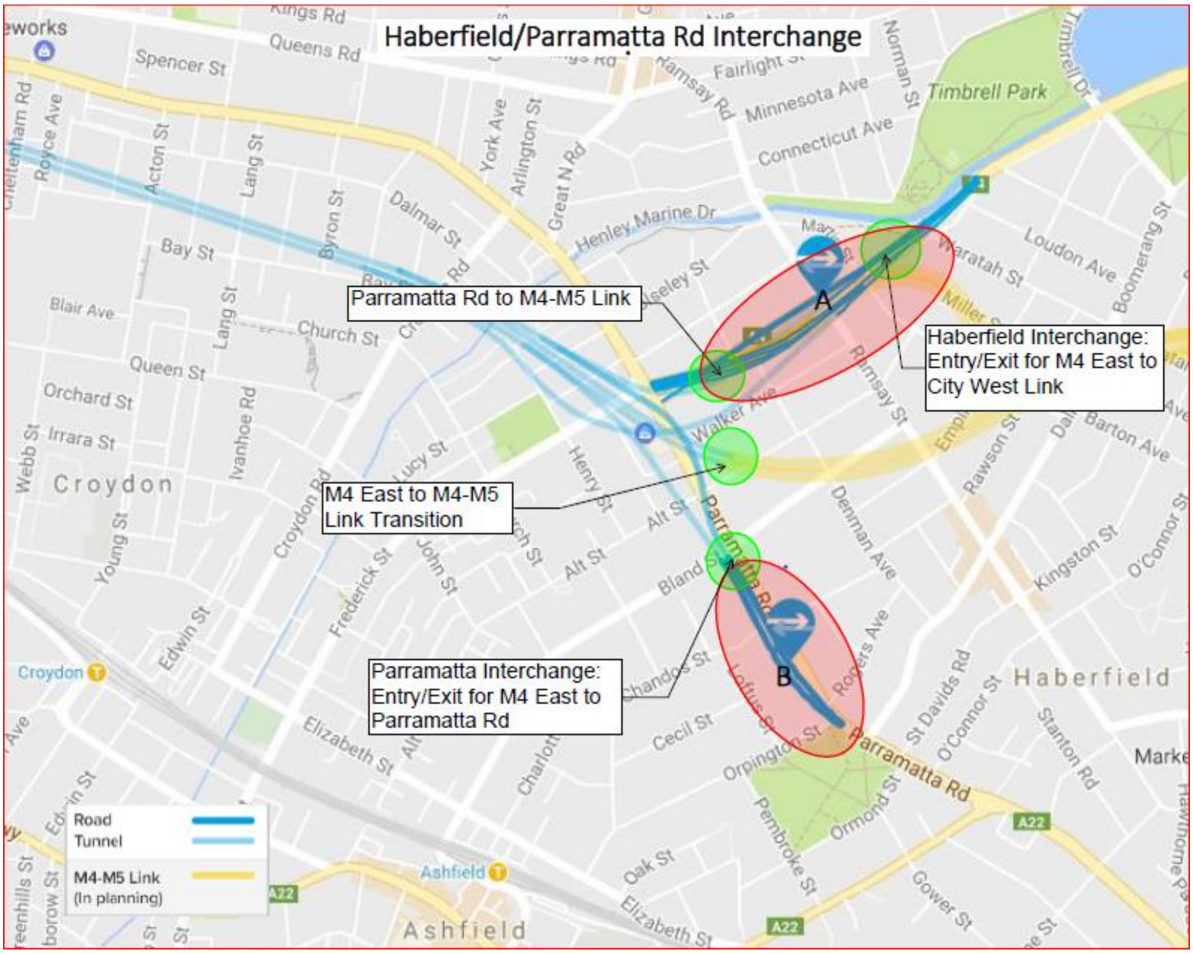


Figure 2.2 – Indicative areas of impact around Haberfield Interchange

2.1.4.2 Rozelle Interchange

The proposed Rozelle Interchange is to connect with the surface road network between the City West Link, The Crescent, Victoria Road and the ANZAC Bridge. This triggers the need for intersection modifications at the City West Link and The Crescent.

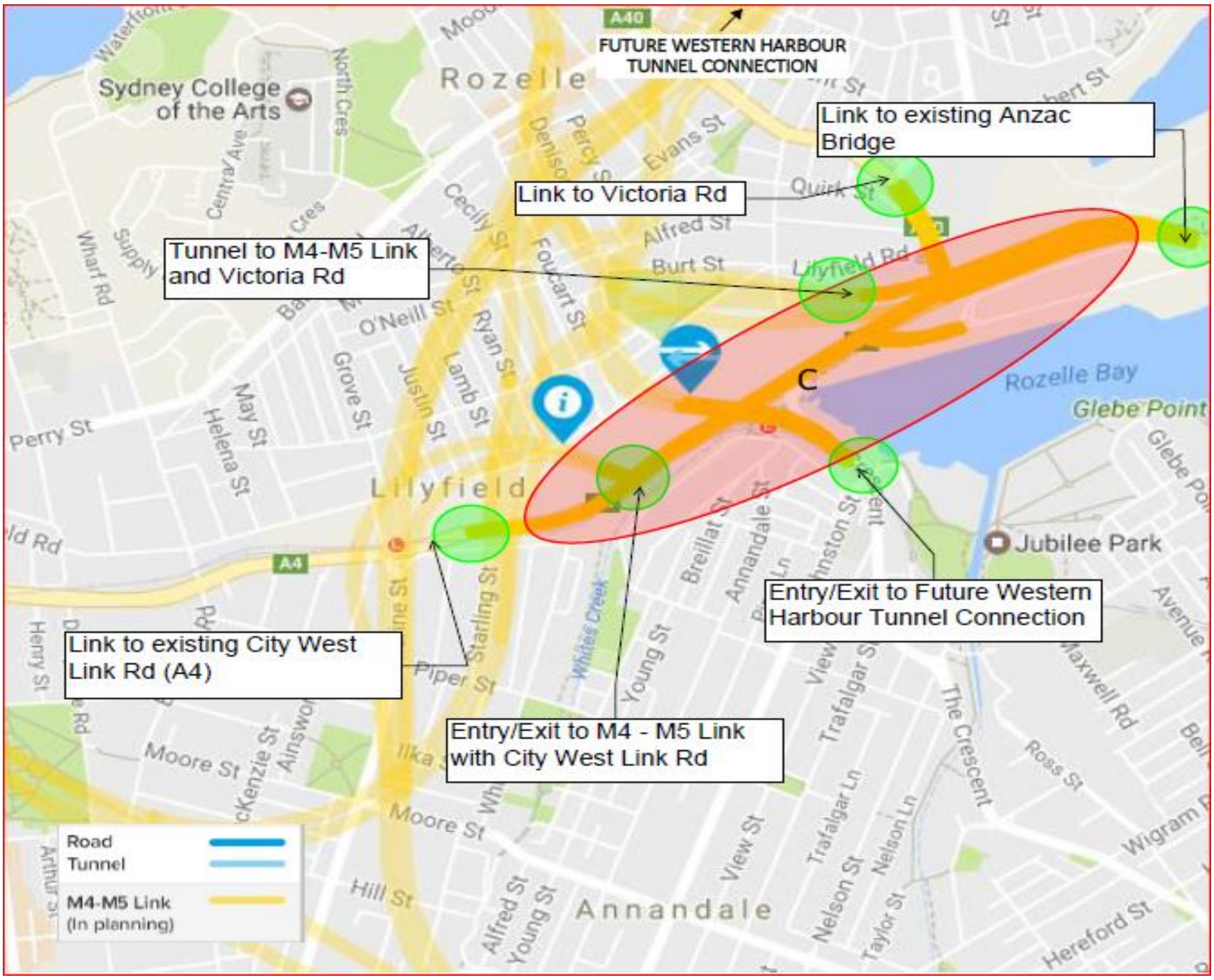


Figure 2.3 – Indicative areas of impact around Rozelle Interchange

2.1.4.3 St Peters Interchange

At the St Peters Interchange, where the M4-M5 Link (Stage 3) connects with the New M5 (Stage 2), a number of works are proposed:

- New public space around the St Peters Interchange.
- New pedestrian bridge linking Sydney Park to the new public space.
- Campbell Street to be widened in each direction, with a 60km/hr speed limit imposed.
- Separated cycle path and footpath along Campbell Street.
- New connection to Mascot via the Campbell Road Bridge.

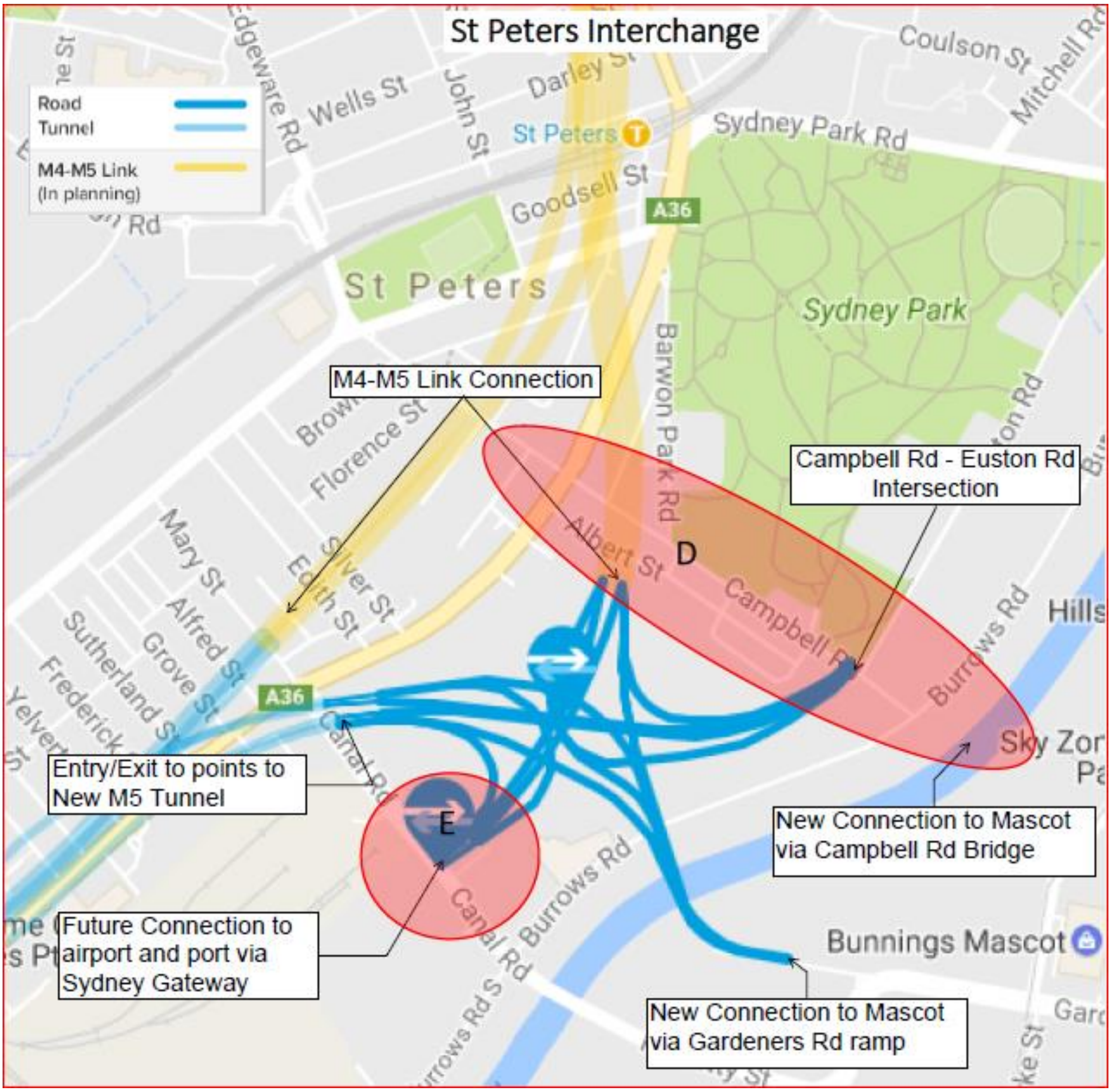


Figure 2.4 – Indicative areas of impact around St Peters Interchange

2.2 Other Infrastructure Projects

Other WestConnex and related transport projects that will have an impact on how people will travel through the IWC area are summarised below:

2.2.1 Alexandria to Moore Park Connectivity Upgrade

The preliminary concept design for road upgrades along Euston Road, McEvoy Street and Lachlan Street was displayed on June 2017. This project involves new clearways, widenings and intersection upgrades which will improve east-west capacity in the region.

The western end of this project will connect into Euston Road and the St Peters interchange. This will help carry WestConnex traffic away from the St Peters interchange more efficiently, but it may also bring more traffic from the east into the IWC local road network.

2.2.2 Western Harbour Tunnel and Beaches Link

As part of the M4-M5 link, provisions were made at the Rozelle interchange to allow a future Western Harbour Tunnel to connect with WestConnex. The Western Harbour Tunnel would cross underneath Sydney Harbour and connect with the Warringah Freeway at North Sydney. From this interchange, the Beaches Link will proceed from North Sydney, cross underneath Middle Harbour and connecting with the Northern Beaches region at Balgowlah.

This project would create a major new north-south route that bypasses the CBD, placing additional demand on the WestConnex project freeways. If these freeways become congested, the IWC local road network may have to handle rat-runners originating from northern Sydney. Additionally, with the orientation and functionality of the Rozelle Interchange, this could feed traffic directly into Johnston Street and the Crescent.

2.2.3 F6 Extension

An F6 extension is a new freeway that would connect the existing F6 freeway to the WestConnex New M5 freeway. This project would further enhance north-south connectivity southwards towards the Illawarra region. This project would also place additional demand on the WestConnex project freeways, again potentially creating new rat-run routs through the IWC region.

2.2.4 Sydney Metro City and Southwest

As part of the Sydney Metro City and Southwest, train stations at Dulwich Hill, Marrickville and part of Sydenham will be converted to metro standards. This will result in increased public transport capacity, enabling higher density development and other land use changes.

As part of the construction of this project, these stations will also be shut down for six months and replaced with buses. This will strongly discourage public transport use during this period, increasing private vehicle usage and combined with the rail replacement buses will have a large impact on the IWC local road network.

2.2.5 Sydney Metro West

A proposed new metro line running from the CBD to Parramatta is expected to pass under the IWC area, due for completion in the late 2020s. It is expected there will be a few new metro stations in the IWC area, with the likelihood of a station at the Bays Precinct to form part of the urban renewal project.

Station locations would be crucially important when determining where future land use changes will occur. As a major origin or destination, it will change pedestrian, cycle and vehicle routes.

2.2.6 Greenway Transport and Environmental Corridor

The Greenway is a single connection active transport and environmental corridor that connects the Cooks River to Iron Cove, largely following alongside Hawthorne Canal and the Inner West Light Rail route. This will create a major new north-south route for pedestrians and cyclists. The project is currently 50% complete.

2.2.7 Parramatta Road and Victoria Road revitalisation

Touted as a major benefit of WestConnex, the reduction of traffic along Parramatta Road would allow the area to be revitalised. This may include new bus lanes, higher density developments and other changes along Parramatta and Victoria Roads.

2.2.8 King Street Gateway

Proposed to be delivered in parallel with Stage 2 of WestConnex, the King Street Gateway Project looks to reallocate road space across various modes along the extent of the project. The project incorporates a corridor encompassing Princess Highway and Sydney Park Road between Campbell Street and Euston Road. To date the following principles are proposed for the scheme:

-
- Improve the 'gateway' to King Street by changing the area around the entry to St Peters station, the entry to Sydney Park and the movement between these areas to provide a better pedestrian environment.
- Downgrade Princes Highway and Sydney Park Road by limiting capacity of Princes Highway north of Campbell Street to achieve a balance for all users including road (vehicles, Cyclist and buses) and pedestrian.
- Support future retail and commercial activity along Princes Highway south of King Street by mirroring the existing activity mix that exists along King Street.
- Utilise roadway space outside of trafficable lanes as bus lanes, parking or landscaping.
- Improve the footpath environment through widening (where possible and consistent with other objectives) and other measures.
- Improve the environment for cyclists and pedestrians
- Reduce lane widths on Princes Highway north of Campbell Street and on Sydney Park Road and increase space for pedestrians and cyclists consistent with proposed road usage and place making.
- Consider, in consultation with Transport for NSW, bus prioritisation in non-trafficable lanes on Princes Highway north of Campbell Street and on Sydney Road.
- Improve at-grade pedestrian and cyclist access to Sydney Park across the Princess Highway (north of Campbell Street) and across Sydney Park Road, including amendments to ensuring these are single-leg crossings for pedestrians. Include new mid-block crossings on Princes Highway and Sydney Park Road aligned to pedestrian and cyclist desire lines.
- Design left turns at intersections, including minimising use of slip lanes, to balance the needs of all road users and pedestrians.
- Utilise residual land to improve the environment of places by the introduction of suitable hard and soft landscaping and encouragement of greater pedestrian activity.
- Minimise relocation of existing utilities and underground stormwater.

Consideration of these potential schemes will be taken into consideration when contemplating proposed strategies within the St Peters area.

2.3 Council Strategies and Growth

2.3.1 Inner West Council Background

The Inner West Council is a new council that was formed by the merger of the former Ashfield, Leichhardt and Marrickville Councils. The new council was established on 12 May 2016.

As a fairly new council, the majority of each former council's policies, procedures and services have not yet been fully merged into a single structure.

2.3.1.1 Council's Operational Plan Priorities

Extensive community and staff input was involved in the development of the Statement of Vision and Priorities between September 2016 and March 2017. The community and staff were asked for their vision of the "best inner west" five years into the future, what they thought the key priority areas should be for Council over the next 12 to 18 months, and what the key challenges were for the inner west.

Each of the service areas and key initiatives within the Operational Plan has been aligned to one or more relevant Priorities. Some of the priorities most relevant to the LAIS project can be summarised as follows:

- Strategic planning formation and stakeholder engagement, including with State government departments /agencies and the University of Sydney, to develop an implementation framework for Parramatta Road Urban Transformation Strategy;
- Provide ongoing advice and advocacy on WestConnex related matters through Council's WestConnex Unit;
- Prepare a draft Inner West Integrated Transport Plan;
- Advocate for and provide advice on a Parramatta Road Public Transport Opportunity Feasibility Study;
- Develop and implement precinct parking strategies;
- Work with regional partners to progress the activation of Parramatta Road as a creative and cultural destination; and
- Provide advice and advocacy on WestConnex related matters.

3 Data collection, assessment and problem identification

3.1 Road Hierarchy

The existing road network classification within the Inner West Local Government Area (LGA) overlaid with the indicative location of WestConnex is illustrated below in Figure 3.1. Also illustrated is a two kilometre buffer of the St Peters, Haberfield and Rozelle Interchanges, expected focal points of traffic changes as a result of WestConnex.

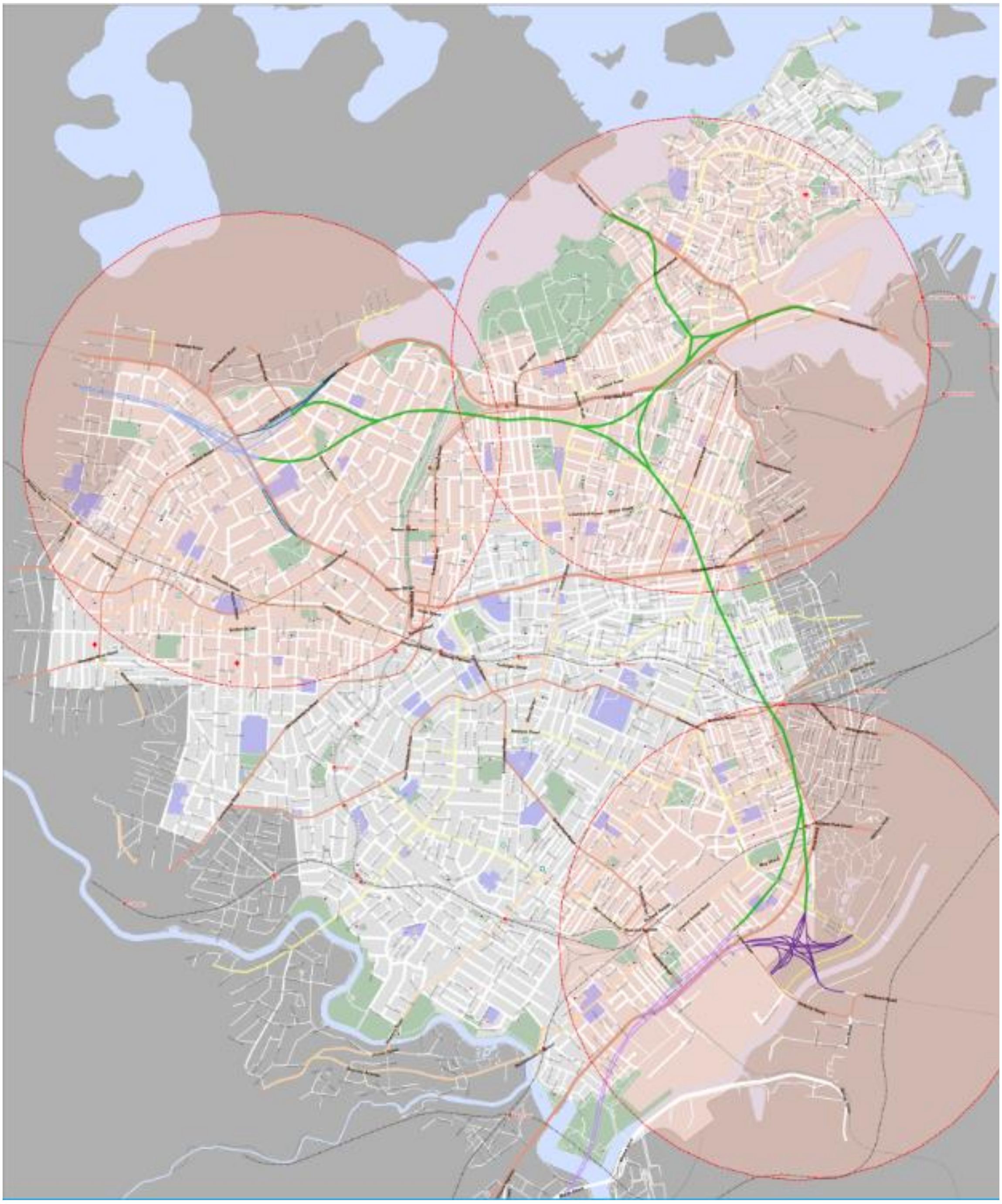


Figure 3.1 – Road Classification within the Inner West LGA overlaid with WestConnex

Within the information presented in Figure 3.1 the various stages of WestConnex are shown in Blue (Stage 1), Purple (Stage 2) and Green (Stage 3). Also shown are the major roads (State/Auslink) controlled by Roads and Maritime Services. These include:

- Victoria Road;
- Balmain Road;
- City West Link Road;
- Parramatta Road;
- Frederick Street;
- Liverpool Road (Hume Highway);
- King Street;
- Canterbury Road;
- Johnston Street;
- Pyrmont Bridge Road;
- Princess Highway;
- The Crescent

In addition to these roads, there are two other classifications of roads within the IWC, these are:

- Regional Roads (Yellow) – Roads that are shared control between Roads and Maritime Services and the IWC (50/50); and
- Local Roads (White) – Roads that are controlled by the IWC.

As indicated previously in **Section 1.2**, changes to this road classification as a result of WestConnex are yet to be defined in the project documentation. When considering the change in traffic conditions associated with the various stages of WestConnex, the associated road classification and the potential road function will be taken into account.

3.2 Data from Traffic Modelling

Strategic traffic modelling information was obtained from Veitch Lister Consulting (VLC) from their Zenith model. Traffic flows outputs associated with various scenarios incorporating the stages of WestConnex were interrogated to identify routes where transport conditions may change as a result of WestConnex projects.

3.2.1 Traffic Modelling Approach

To inform the potential changes to traffic patterns on local roads associated with WestConnex, VLC has been independently commissioned by the IWC to undertake a transport modelling study. The specific aim of their assessment was to:

- "Investigate the potential rat-running of vehicles accessing/egressing from WestConnex Interchanges"
- "Assess the level of service on roads more sensitive to an increase in traffic due to adjacent land use (e.g. schools, shopping strips, and suburban streets)".
- "Highlighting roads where a reduction in traffic provides an opportunity to reclaim road space to improve local amenity".

Full details regarding the modelling undertaken by VLC are provided in their report: *Traffic Modelling for Inner West Council,* Veitch Lister Consulting (2017); which is attached in **Appendix B.**

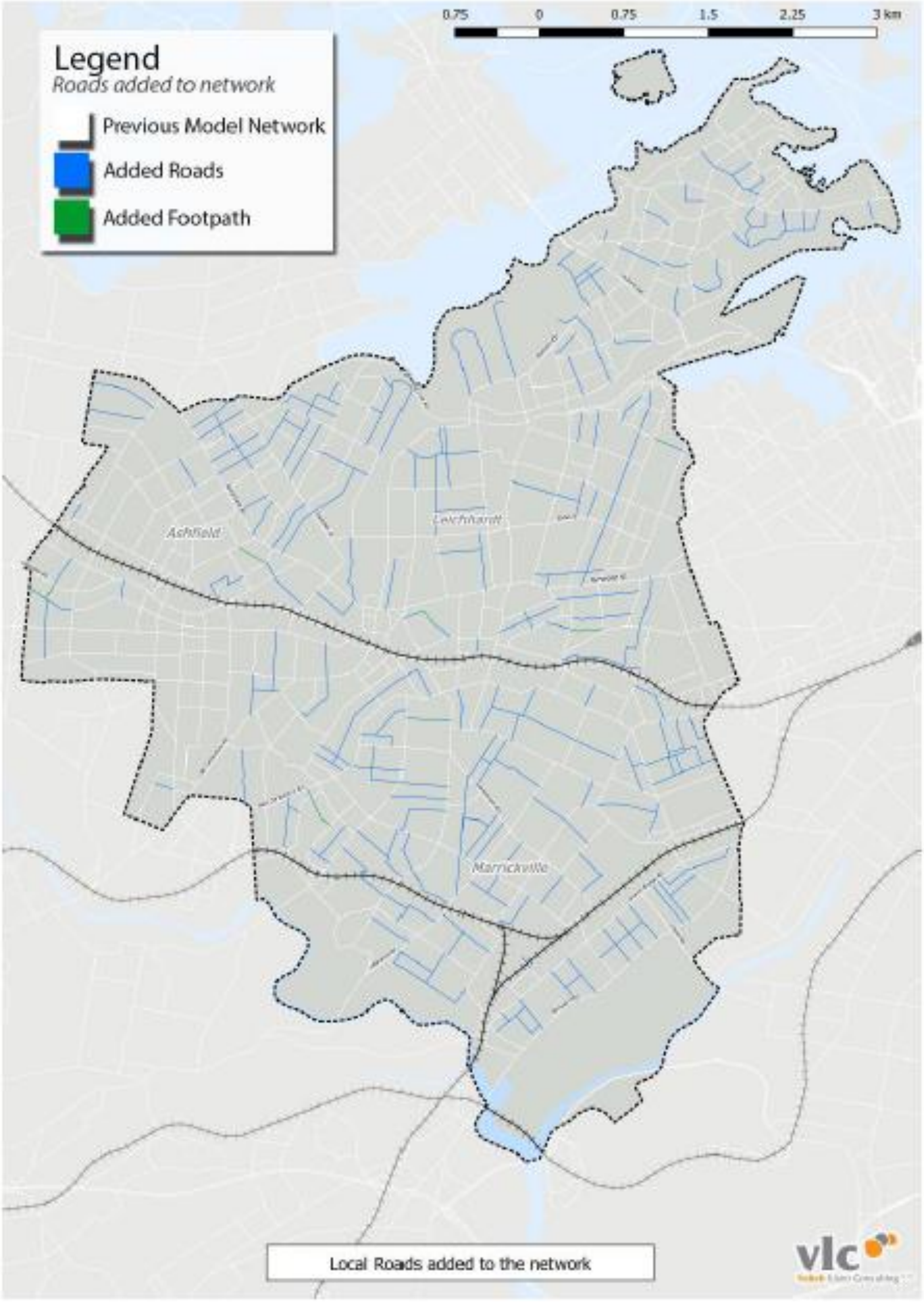


Figure 3.2 – Road Network Modelled by VLC

The Zenith model is stated to be "designed for strategic evaluation of travel behaviour in response to changes in land use, transport infrastructure, services or policy". To undertake the assessment for IWC, VLC modified their Zenith model, with the key modifications to the model being the addition of local streets within the Inner West LGA, defined as the study area.

With all strategic transport models, there are a number of assumptions that need to be made, as well as a number of limitations. Some of the specific limitations identified by VLC include:

- Observed travel data – "Models are calibrated to observed measures of travel demand that are considered to represent travel on a 'typical' weekday in a given base year. However, the nature, duration and location of activities in which people participate can vary significantly from one day to the next, resulting in uncertainty in observations".
- Traffic queuing – "Strategic models, including Zenith, are link-based models and measure congestion as a function of the total traffic volume on a link relative to its hourly capacity. Congestion measures, such as queues, are not represented specifically in strategic models".
- Modelling of static time periods – "Strategic models deal with traffic in static periods and treat trips within a time period as simultaneous. The model is calibrated to provide average levels of traffic and passenger volumes, congestion and travel times over each period of the model".
- Interactions between trip-makers within the same household – "The Zenith trip generation models are calibrated to reflect the current rates of travel observed in the base year in each region. At present, the models do not include individual activities, schedules and interactions between household members in the associated travel decisions."

Further details regarding the assumptions made, including assumed transport infrastructure in the Sydney Greater Metropolitan Area (GMA) is provided in **Appendix B**.

3.2.2 Scenarios Tested

In order to evaluate the effect of WestConnex on the local road network within the Inner West LGA, the following network scenarios were tested:

- 2021 Base – No WestConnex
- 2021 Project – WestConnex Stage 1 and 2 Completed
- 2031 Base – WestConnex Stage 1 and 2 Completed
- 2031 Project – All three stages of WestConnex and Western Harbour Tunnel Completed.

In regard to the stages of WestConnex, for the model, these have been defined as:

- Stage 1 – "consists of widening the M4 motorway and providing the M4 East tunnel which connects onto Parramatta Road and Wattle Street".
- Stage 2 – "consists of intersection upgrades on the M5 and the new M5 tunnel from king Georges Rd to the St Peters Interchange".
- Stage 3 – "connects the first two stages, via a new underground link. It connect(s) two new interchanges at Rozelle and St Peters",

The Western Harbour Tunnel is expected to connect WestConnex with the Warringah Freeway in North Sydney.

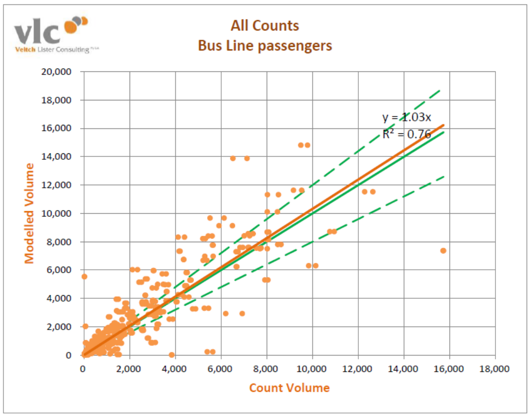
3.2.3 Compliance with RMS Guidelines

As part of the scope of this study was to undertake a high level review of the modelling produced by VLC. This review was isolated to reviewing the process performed by VLC and conformance with RMS Modelling

Guidelines (2013). Detailed in Table 3.1 are the comments raised as part of the review, as well as VLC's responses.

Table 3.1 – High Level Review Comments and Responses

Beca Comments	VLC Responses
Comparison of the traffic assignment at the boundary of the wider area model (WAM) and our study area (SAM) are shown to be closely correlated on a daily flows. However, we do not know how they compare during the AM and PM peak periods?	We have provided some details on peak validation in questions below. However, the model represents all travel across the boundary well.
A comparison of total trips between the WAM and SAM would be useful to ensure trip generation has not been affected by the inclusion of local roads and the splitting of zones to accommodate them	There were significant changes in the demography in the area. Firstly, the population and households were split into smaller zones. With the smaller zones, the average characteristics of households (such as no. of cars per household, size of households, number of workers, dependents, students of households) changed because of the differences in demographics between the averaged larger zones and more varied smaller zones. Overall though, the numbers of trips generated within the study area for the SAM was within 3% of that for the WAM and we are confident that the changes in the model have not impacted significantly on the characteristics of any of the stages in the model.
Traffic assignment convergence could indicate lack of stability of route choices on the local roads. Is there any further assessment of stability of assignment undertaken, particularly during the PM peak?	We assume that this comment refers to Table 1-2 of the validation report, and refers specifically to the PM Peak value of 2.8%. Our primary indicator of convergence is the Relative Gap, for which a value of less than 1% is generally required in most guidelines. WEBTAG requires 0.1%. The RGAP for our assessment is far below these targets. In addition, our convergence satisfies additional criteria required in Victoria and NSW. We are confident that the assignment for all periods is stable.
Model-wide validation, based on aggregate traffic flows, appear to be closely correlated with observed. But, not for the SAM where RMS criteria not meet by significant margins.	Our issue here was that the model represents transport movement on a typical workday, generally represented as a normal working Tuesday, Wednesday or Thursday during the second or third school term. Inner West Council provided a great number of counts for use in the validation, but most of these data were for the average day, including weekends. In addition, some of these counts were taken in months like December or January, which are not typical months. To convert from average daily to average weekday counts, we estimated a conversion factor based on a few counts where average weekday and average daily volume were available. An average all vehicle factor of 1.05 was applied to all of the daily counts in the validation data. Subsequent work has shown that this factor varies across the region from 0.96 to 1.14, with an average close to 1.05. For heavy vehicles this factor was estimated to be 1.16. Because of the broad average factors used, it is unlikely that the observed values are well represented. Consequently, a high level of judgement was needed in assessing the validation. We are confident, however, that the model is fit for purpose

<table>
<tr><th>Beca Comments</th><th>VLC Responses</th></tr>
<tr><td>There is no reporting on how the models validate against individual screen-line counts; has this been assessed and what were the results?</td><td>Screenline validation was assessed, but not reported. In order to assess closed/complete screenlines, we used counts that were provided to us by a client. We are prevented from quoting these by commercial confidentiality.
For all counts across the screenline, the overall regression statistics are as follows:
• All vehicles, daily: Slope = 0.98, R^2 = 0.99
• Commercial vehicles: Slope = 1.05, R^2 = 0.97
• All vehicles, AM Peak: Slope = 1.0, R^2 = 0.996
• All vehicles, PM Peak, Slope = 1.01, R^2 = 0.997
We are confident that the screenline validation indicates a well-calibrated trip distribution and a good highway assessment.</td></tr>
<tr><td>Has a GEH assessment on traffic volumes been undertaken? And what % falls within the bands (i.e. 85% with < 5, 100% with GEH < 100%)</td><td>We have not assessed GEH statistics for this model, given the potential errors in the counts and that most of the local counts are daily rather than hourly.</td></tr>
<tr><td>What data was used in the model calibration process and was this data excluded from the validation process?</td><td>The validation of this model and calibration of the Sydney model were completely separate and independent exercises.</td></tr>
<tr><td>How significant is the lack of Public Transport validation and how would that impact private vehicle trips?</td><td>We wouldn't agree that there is a lack of public transport validation. Validation details were provided for all stations in the Sydney Greater Metropolitan area and for ferries. In addition, patronage on buses by bus routes was validated but not documented in the validation report, because we were not certain of the status of the observed data. However, we may amend the report to include it</td></tr>
<tr><td>Was the validation done only daily, or also for the AM and PM peaks, to verify that the model reflect tidal nature of flows within these peaks?</td><td>All time periods were validated.</td></tr>
<tr><td>Bus services, possibly more relevant to our study area, were not included in the PT validation</td><td>We have already addressed this question above. For information, the validation chart for passengers ios shown below/


This comparison is considerably better than bus validation in most strategic models and we are confident that the model represents a good indication of bus</td></tr>
<tr><td>For SAM validation of traffic volumes, 38 counts of the possible 542 were used for the daily validation, are these locations only major roads or do they include the local roads added to the SAM?</td><td>These locations are on the only roads where peak counts were available for the validation. They are a mixture of local and major roads.</td></tr>
</table>

Beca Comments	VLC Responses
SAM RMSE values are at variance with RMS validation criteria, with modelled flows being higher than observed; is this overestimation on major roads, with associated underestimation on trips on the local roads?	Please see our answer to the earlier question on SAM Validation and RMS Criteria.
Does the R2 values for private traffic in AM and PM peaks meet RMS criteria?	Yes. For the Study area, however, where only average daily counts are available, the match between modelled volumes and counts not as close. Nevertheless, we are confident that the model represents travel patterns in the peaks well.
How should the poor validation of commercial vehicles be addressed in our study; i.e. is the model over or under-estimating CV's?	While it's true that the CV validation is less than ideal, modelling of commercial vehicles in strategic models is notoriously unreliable and we believe that we have an uncommonly better validation. The commercial vehicle loads should not be taken as definitive (as with any model result) but should be used as a guide highlighting demand for CV trips. Operational factors will influence observed CV route choice so some judgement should be used on the sensibility of modelled routes. For example, if one street becomes operationally cumbersome (due to heavy vehicle bans, low branches/powerlines, etc) CVs will likely shift to a nearby competing parallel street. While we have taken pains to ensure that our model include turn bans and banned roads for heavy vehicles, this alone does not help. While we are conducting a site visit, we observed lack of compliance of heavy vehicle bans. This is not something we can account for in the model.
Has the LOS assessment been compared against actual volumes? Two maps are compared in the validation report. These maps appear to compare 2017 observed against 2011 model, is this correct?	The comparison referred to in this questions is a comparison between the levels of services estimated from the model in 2011 compared to the live traffic provided by RMS, which is based on travel times. On that basis we agree that this is a comparison between 2011 and 2017 conditions. However, this comparison was included purely to as an indication of the way the model can represent real conditions. It is not intended as a formal validation tool. As a further comment on this, the plot of 2021 base case levels is similar to the 2011 plot, and could be used interchangeably for this comparison.

Based on the comments provided, it is up to IWC's discretion whether the model achieves their intended project objectives. In the context of this study, these traffic volumes are an input used to help define the problem.

4 Community Consultation

4.1 Community Consultation Process

A key part of the development of this local area improvement strategy is to understand community concerns. These concerns were focused to issues related to current transport performance and how this could be influenced by WestConnex. The focus of the consultation was not regarding any construction related impacts associated with the implementation of WestConnex.

The community consultation was undertaken in two ways:

- Information and comments posted online atYour Say Inner West website.
- Information and comments received at a drop in session conducted in Leichhardt,

The use of the Your Say Inner West website allowed residents of the community the opportunity in their own time to post comments onto maps expressing their concerns. To focus the comments, comment criteria and areas were specified. The areas canvassed were identified within the traffic modelling as being sensitive to changes as a result of WestConnex. Criteria for comments were specified for two reasons: it allowed for ease of processing comments and provides a prompt for the community regarding the types of comments expected. The criteria used included:

- Traffic Volumes – comments related to concerns specifically associated with changes in traffic volumes;
- Traffic Speeds – comments related to concerns specifically associated with changes in traffic speeds;
- Safety – comments related to concerns specifically associated with safety,
- Pedestrian and Cyclists – These are comments related specifically to provisions provided for pedestrians and cyclists.
- Heavy Vehicles – comments related to concerns regarding heavy vehicles, including if there are expected changes to heavy vehicle routes associated with the project.
- Noise – comments specifically related to noise associated with the project, the focus being related to operational noise post project completion.
- Parking – comments specifically related to parking provisions provided within the Inner West LGA, specifically associated with operational considerations.
- Other – any comments that done specifically fit with the categories listed above.

Figure 4.1 illustrates the areas canvassed as part of the consultation process and where comments were received. These are also the areas where the ability to provide comments was confined to (shown in yellow). ‘Postal information’ informing them of the Your Say website was also provided to households within this extent. Comments on the website were freely open to the public.

Figure 4.1 – WestConnex affected areas as provided on Your Say website

In addition to the information provided above, other information intended to inform the public and give them as much context as possible was made available on the website.

4.2 Community Feedback Received

In total, 510 individual responses were received regarding the project, provided in a mixture of online comments and those received as part of the drop-in session. As indicated previously, a number of comments received were related to WestConnex construction or other compliance issues within the Inner West LGA.

Although important, these are not specifically related to the scope of this project. Therefore, the first step when considering the feedback received from the community was to filter the comments to determine whether they are in fact relevant to the scope or not.

Of the 510 comments received, 111 were considered outside of the scope of this project and therefore not progressed further. These comments however were not discarded and have been recommended to be considered further by IWC representatives, including during ongoing engagement regarding construction activities associated with WestConnex. All comments received, including their groupings are provided in **Appendix C**.

For the remaining 399 comments, the next stage of the interpretation process was to determine any primary and secondary concerns raised within the comments. These may differ from the category specified on the You Say website, but the rationale for this step was to group the concerns into common issues expressed, which can then be focused towards specific options, which are discussed in a later section of this study.

From the comments received and the concerns raised, the filtering was based on the comments relating to:

- Access – ability of residents to safely and efficiently to get to their property or intended destination;
- Amenity – community or heritage amenity associated with their area of the Inner West LGA;
- Compliance – with Council or government bylaws or laws (e.g. heavy vehicle ban bylaws);
- Environmental – pollution, dust or similar environmental concerns;
- Heavy Vehicles – heavy vehicles operating on local streets;
- Noise – as caused by WestConnex;
- Parking – availability and provision of on-street parking;
- Safety – safety issues within the Inner West LGA.
- Traffic Performance – performance of traffic within the study area, specifically related to WestConnex.
- Traffic Speeds – traffic speeds on local streets.
- Traffic Volumes – traffic volumes associated with the various stages of WestConnex.

It is noted that numerous comments are not mutually exclusive and hence a concern could be categorised in two or three categories. This brings about the need to use primary and secondary concerns. Additionally, some of the concerns are interdependent, for example, safety is often influenced by changes in traffic volumes or speeds. The intention of the filtering is to narrow the focus of the comments and align them to potential infrastructure interventions, therefore their categorisation will not prejudice the final outcome of the study. Further details regarding the associated infrastructure interventions are discussed in **Section 6.**

The majority of comments were associated with Safety, Traffic Volumes and Traffic Speeds (in this order), with the quantity and scale of comments reflected in Figure 4.2. Following these, but less frequent was Access (43 comments) and Traffic Performance (38 Comments). The illustration also represents the co-dependent nature of comments through the use of the connecting arrows.

Figure 4.2 – Prominent concern categories documented from community consultation

Some other key trends of note identified from the comments include:

- The majority of comments came from the Leichhardt/Annandale area, accounting for approximately 40% of the comments, this is followed by Haberfield with 33% and St Peters with 27%.
- The data received is somewhat biased by a small number of contributors, with 100 of the responses (~20%) from four login accounts, this excludes the comments received during the drop-in session.
- At an individual route level, the highest number of comments were from Edgeware Road and Mary Street (both in St Peters), followed by Darley Road in Leichhardt.

Detailed below is further information regarding specific comments obtained in the various areas canvassed as part of the consultation.

St Peters Community Consultation

Of the comments received from the St Peters that are relevant to the scope, safety was identified as the primary concern, followed by traffic volumes and environmental issues. Of these concerns, the types of infrastructure that could address the specific issues were identified as:

- Pedestrian and Cyclist Facilities – 44 comments – infrastructure that could enhance the safety, amenity and access provisions for pedestrians and cyclists.
- Traffic Calming – 39 comments – infrastructure that promotes reduced speeds and traffic volumes.
- Traffic Diversions – 32 comments – infrastructure that promotes a clear hierarchy and influences traffic volumes.
- Intersection Modifications – 30 comments - amendments to intersections to enhance facilities for pedestrians and cyclists, as well as promoting local area traffic movements.

Further details regarding the types of infrastructure available and their associated intended outcomes are documented in **Section 6**.

Table 4.1 provides some details regard specific routes within the St Peters area where the largest number of comments were received.

Table 4.1 – Specific route comments related to St Peters

Route	Environmental	Safety	Traffic Volumes	Total	Comment
Edgeware Road	8	10	5	32	Schools, TAFE, day-car centre and access to Marrickville Train Station along route. There is a desire for traffic calming, speed limit reduction and cycle and pedestrian facilities.
Mary Street	-	10	6	26	Desire for intersection modification at Princess Hwy Intersection, particularly the 2 to 1 merge. As well as Pedestrian and Cycling facilities and Traffic Calming.
Campbell Road	5	4	2	15	Is a State Road. There is a desire for safe pedestrian crossings. There is also concern regarding pollution next to schools.
May Street	1	6	2	13	Desire for pedestrian crossing to access the train station and the park.
Princess Highway	1	3	2	11	Is a State Road. There is a desire for pedestrian crossings and protected cycle paths.
Canal Road	1	1	3	7	There is a desire for traffic diversions, and a one way system like Mary Street.
Hutchinson Street	-	-	4	6	Concern that rat-running occurs, there is a desire for traffic diversions to stop this. Also, there is a desire for safe pedestrian crossings at intersection.
Applebee Street	-	-	2	5	There is concern that rat-running could occur along this route.
Brown Street	-	2	2	5	There is concern that increased traffic will reduce access, amenity and safety.
Unwins Bridge Road	-	3	-	5	Is a State Road. There is a desire for traffic signals, traffic calming and pedestrian crossings to maintain access and safety.
Church Street	-	-	3	3	Is identified as an existing rat-running route. There is a desire for traffic diversion and traffic calming.

Haberfield Community Consultation

For the comments received from the community within the Haberfield that are relevant to the scope, safety was identified as the primary concern, followed by traffic volumes and traffic speeds. Of these concerns, the types of infrastructure that could address the specific issues were identified as:

- Traffic Calming – 94 comments – infrastructure that promotes reduced speeds and traffic volumes.
- Traffic Diversions – 76 comments – infrastructure that promotes a clear hierarchy and influences traffic volumes.
- Pedestrian and Cyclist Facilities – 47 comments – infrastructure that could enhance the safety, amenity and access provisions for pedestrians and cyclists.

- Intersection Modifications – 23 comments - amendments to intersections to enhance facilities for pedestrians and cyclists, as well as promoting local area traffic movements.

Further details regarding the types of infrastructure available and their associated intended outcomes are documented in **Section 6**.

Table 4.2 provides some details regard specific routes within the Haberfield area where the largest number of comments were received.

Table 4.2 - Specific route comments related to Haberfield

Route	Safety	Traffic Speeds	Traffic Volumes	Total	Comment
Hawthorne Parade	4	3	4	17	Identified as a current rat-run. There is a desire for pedestrian and traffic calming facilities.
Ramsay Street	2	2	4	15	Desire for more pedestrian and cycling facilities, particularly near retail and childcare facilities.
Bland Street	7	4	1	14	Desire for pedestrian and cycling facilities, as well as traffic calming, particularly near schools.
Waratah Street	4	2	5	13	Desire for traffic diversions and traffic calming, there is also a number of request for street closure at one end.
Dalhousie Street	6	2	3	12	Desire for pedestrian and traffic calming facilities.
Alt Street	3	3	3	11	Currently identified as a rat-run. There is a desire for traffic diversion and traffic calming.
Parramatta Road	2	-	1	10	Is a State Road
Marion Street	1	-	4	5	Primary concern is traffic performance

Leichhardt/Annandale Community Consultation

As with St Peters and Haberfield, with the comments received from Leichhardt/Annandale, safety was identified as the primary concern. This was followed by Traffic Volumes and Traffic Speeds.

Of these concerns, the types of infrastructure that could address the specific issues were identified as:

- Pedestrian and Cyclist Facilities – 64 comments – infrastructure that could enhance the safety, amenity and access provisions for pedestrians and cyclists.
- Traffic Calming – 62 comments – infrastructure that promotes reduced speeds and traffic volumes.
- Traffic Diversions – 59 comments – infrastructure that promotes a clear hierarchy and influences traffic volumes.
- Intersection Modifications – 13 comments - amendments to intersections to enhance facilities for pedestrians and cyclists, as well as promoting local area traffic movements.

Further details regarding the types of infrastructure available and their associated intended outcomes are documented in **Section 6**.

Table 4.3 provides some details regard specific routes within the Leichhardt/Annandale area where the largest number of comments were received.

Table 4.3 – Specific route comments related to Leichhardt/Annandale

Route	Safety	Traffic Speeds	Traffic Volumes	Total	Comment
Darley Road	19	1	2	22	Desire for pedestrian crossings at the Intersection of Canal Road, as well as the accesses to the Hawthorne and Leichhardt LR stops. There is also a desire for reduced speed limits.
William Street	9	4	4	17	There is a desire for improved safety for children at St Columbia's, including traffic calming, traffic diversions and pedestrian crossings. There is also a desire for a pedestrian crossing at the Henry Street Intersection and traffic calming at William Street Intersection.
Johnston Street	3	1	6	10	There is a desire for pedestrian crossings near schools, as well as traffic calming and traffic diversions. Also, there is a desire for enhancements to the intersections with the Crescent and Parramatta Road.
The Crescent	4	-	4	8	There is a desire for pedestrian and cycling facilities accessing the light rail station, child care centres and parks.
Catherine Street	3	1	3	7	There is a desire for improved pedestrian and cycling facilities, as well as traffic calming and enhancements to intersections.
Flood Street	2	1	2	5	There is a desire for traffic calming at the intersection of Flood Street and Lords Road. Also, traffic diversions to deter rat running between Parramatta Road and City West Link.
Booth Street	2	1	1	4	There is a desire for a cycle lane along Booth Street and Johnston Street. Also an appetite for traffic diversions to deter rat running as well as more traffic calming. A pedestrian crossing at the Wigram Road roundabout.
Elswick Street	2	1	1	4	Request for traffic calming to deter rat running as well as more traffic calming.
Marion Street	-	1	3	4	There is a desire for traffic calming, especially near the Marion LR station and the Leichhardt Public School.
Balmain Road	2	-	1	3	There is a desire for the provision of pedestrian and cyclist infrastructure.
Parramatta Road	2	-	1	3	There is a desire for the provision of pedestrian and cyclist infrastructure.
Trafalgar Street	3	-	-	3	There is a desire for enhanced traffic calming and pedestrian facilities around the Annandale School.

5 Transport Impacts and Precinct Plans development

This section of the report documents some of the potential changes in traffic conditions expected as a result of the proposed changes to the road network associated with the various stages of WestConnex. It focuses on specific geographic areas which are particularly sensitive to changes and provides quantifiable information regarding the expected state of these regions. It then identifies extents for further development of possible improvement strategies. This process has been undertaken in close collaboration with IWC, the details of which are discussed further below.

5.1 Identified Sensitive Routes

The information received from the community consultation, as well as the work undertaken by VLC, has assisted in identifying areas where changes may be problematic and warranting further interrogation and consideration. The areas and specific routes below are not intended to be a definitive extent of areas where LAIS may be implemented if suitable funding sources are obtained. They are intended to be used to be able to develop possible LAIS for the purpose of developing strategic cost estimates.

Within the VLC modelling, a number of areas were identified as having either short (2021) or long (2031) term effects. These correlated to Stage 1 and 2 (short term) and Stage 3 (long term) of WestConnex. The scenarios tested being:

- 2021 Base – No WestConnex;
- 2021 Project – WestConnex Stage 1 and 2 completed;
- 2031 Base – WestConnex Stage 1 and 2 completed; and
- 2031 Project – All three stages if WestConnex and Western Harbour Tunnel completed.

These identified areas are based on changes in traffic flows, potential impact on local environment and safety. During network peaks. Some key things to note regarding the modelling are:

- Capacities for various routes have been assumed; and
- Other limitations noted with strategic modelling, as indicated previously in **Section 3**. These factors ultimately influence the accuracy of traffic modelling outputs.

Figure 5.1 below illustrates the areas where short term effects have been identified within the VLC report.

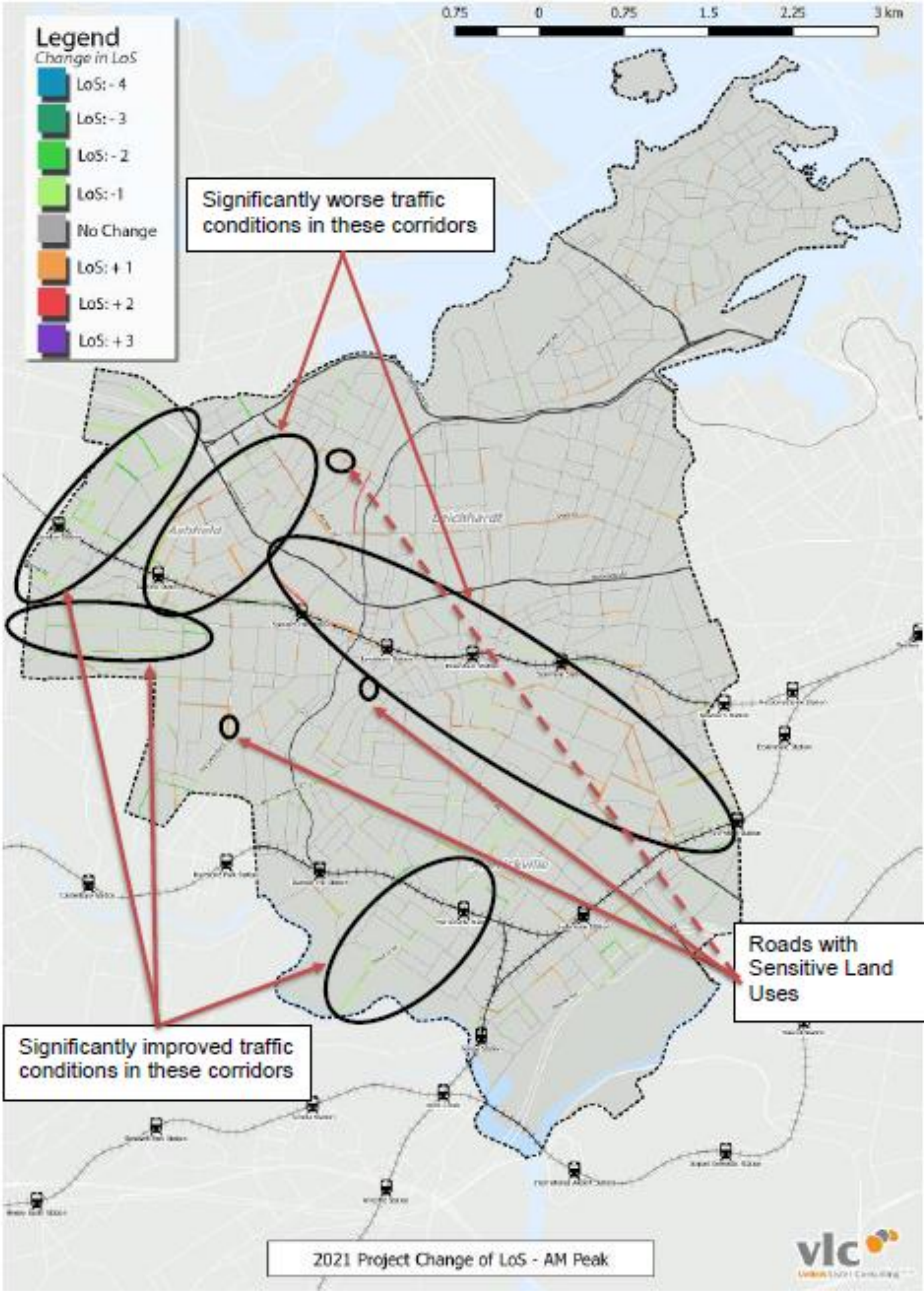


Figure 5.1 – Identified area of short term effects (Source: VLC)

The information within Figure 5.1 associated with Stage 1 and 2 of WestConnex has identified the following areas as being sensitive to change in the short term:

- Haberfield/Ashfield area, both sides of Parramatta Road. This is particularly around the Ramsay Street/Wattle Street area and the routes connecting the two. This is associated with the M4 East interchange connecting at Wattle Street.
- Routes connecting into the St Peters Interchange, these include Edgeware Road and Stanmore Road, including routes running parallel (e.g. Juliet Street).
- In addition to this, areas of sensitive land uses including schools and shopping centres were identified, these include:
  - Trinity Grammar School on Prospect Road;
  - Petersham Primary School on Hunter Street;
  - Ramsay Street shopping strip; and
  - St Pius School on Edgeware Road.
- There are also identified areas of reduced traffic, which could have the inverse effect of raising traffic speeds. These areas include:
  - Road south and west of the St Peters and Haberfireld interchanges. These are perceivably trips that have diverted off the local road network and onto WestConnex.

Figure 5.2 illustrates the identified areas of long term effects identified within the VLC report.

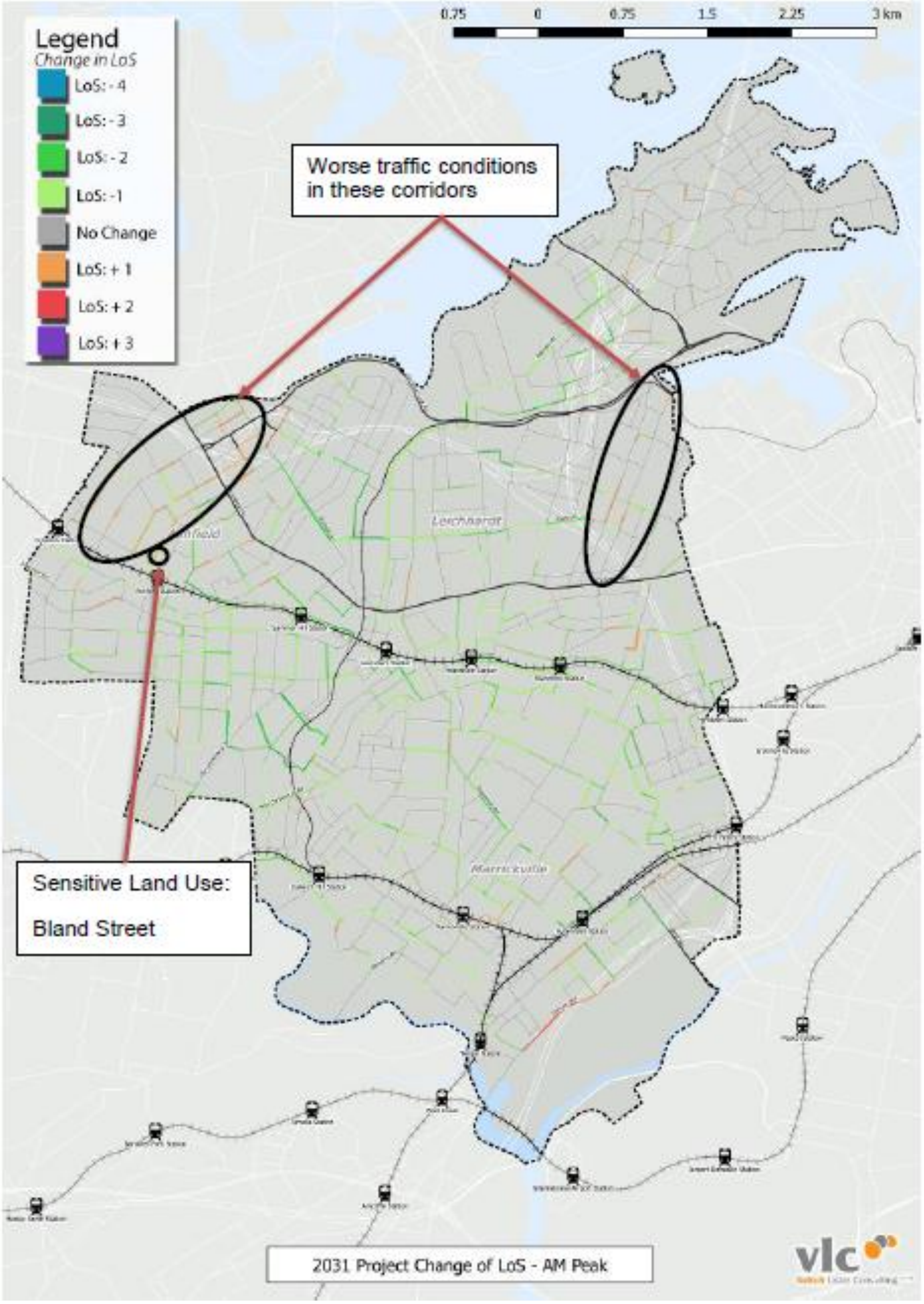


Figure 5.2 – Identified areas of long term effects (Source: VLC)

The information within Figure 5.2 and associated with Stage 3 of WestConnex has identified areas where traffic is expected to increase in the long term:

- Haberfield/Ashfield area, both sides of Parramatta Road and the areas around the Wattle Street Interchange.
- Leichhardt/Rozelle, routes between Parramatta Road and City West Link and connecting into the Rozelle Interchange.
- In addition to this, areas of sensitive land uses around Bland Street were identified, these include:
  - De La Salle College;
  - Bethlehem College; and
  - St Vincent's Catholic Primary School.
- A large number of the routes within the IWC network are expected to have a reduction in traffic volumes, this could lead to the inverse effect of increased traffic speeds, potentially creating safety issues.

Using this information, as well as that discussed previously and working collaboratively with the IWC, a list of potential rat-running routes have been identified. A site visit of these routes was undertaken by representatives of both IWC and Beca. These routes also correlate to the sensitive areas identified in the VLC modelling and identified above.

The next few sections provides further details regarding the routes identified, which are concentrated in the St Peters, Haberfield and Leichhardt/Annandale areas.

5.2 St Peters Routes

St Peters will be the location of the new St Peters Interchange, a complex interchange connecting the New M5 (Stage 2 WestConnex) with the M4-M5 Link (Stage 3 WestConnex) with the Sydney Gateway, Campbell Road and Gardeners Road. Edgeware Road and Unwins Bridge Road are two major arterials that provide access to the St Peters Interchange from catchments in the west.

Figure 5.3 illustrates the routes identified in St Peters.

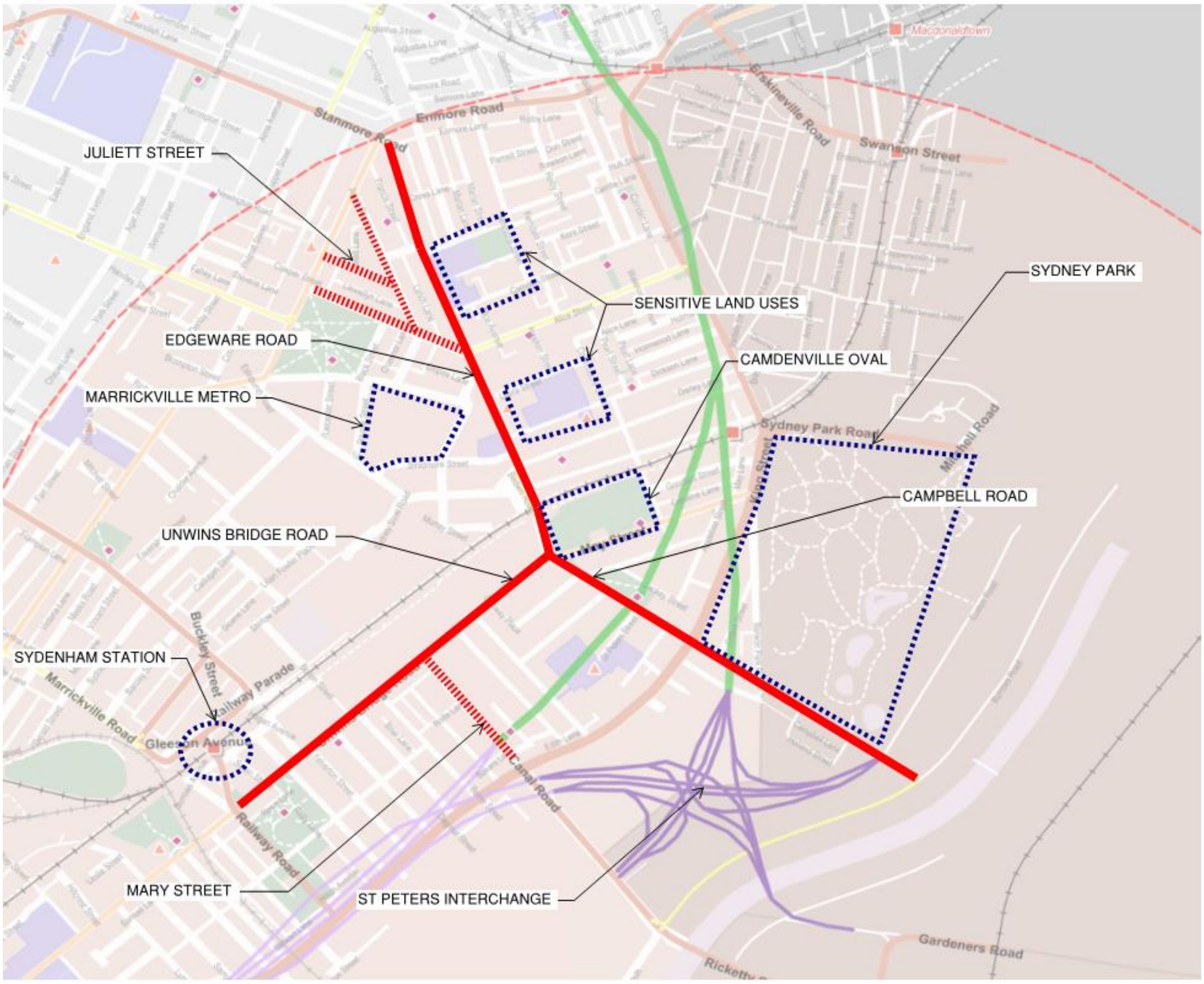


Figure 5.3 – Potentially impacted routes at St Peters

It is anticipated that the majority of the roads affected in this area will be in the City of Sydney LGA, with lesser effects in the IWC.

Within the IWC, the routes identified as potentially impacted by the project (as illustrated in Figure 5.3):

- Edgeware Road, route connecting to Bedwin Road and the upgraded Campbell Street.
- Unwins Bridge Road, route between Campbell Street and Railway Road, with Mary Street connecting midway.

Sensitive areas identified in this zone are:

- Enmore TAFE;
- St Pius V Catholic Church and Primary School; and
- Camdenville Public School.
- Campenville Park.
- Marrickville Metro.
- Sydenham Train Station.
- Sydney Park.

5.2.1 Edgeware Road

The introduction of the New M5 (Stage 2 WestConnex) will see traffic flows increase on Edgeware Road as vehicles use it to access the new motorway. The opening of the M4-M5 Link will provide an alternative route for this road, but the traffic volumes will be higher than those expected in the 2021 base scenario.

Overall, traffic volumes on Edgeware Road are expected to increase as it becomes a major access route to the St Peters Interchange. Figure 5.4 illustrates the expected traffic volumes on Edgeware Road under the scenarios tested.

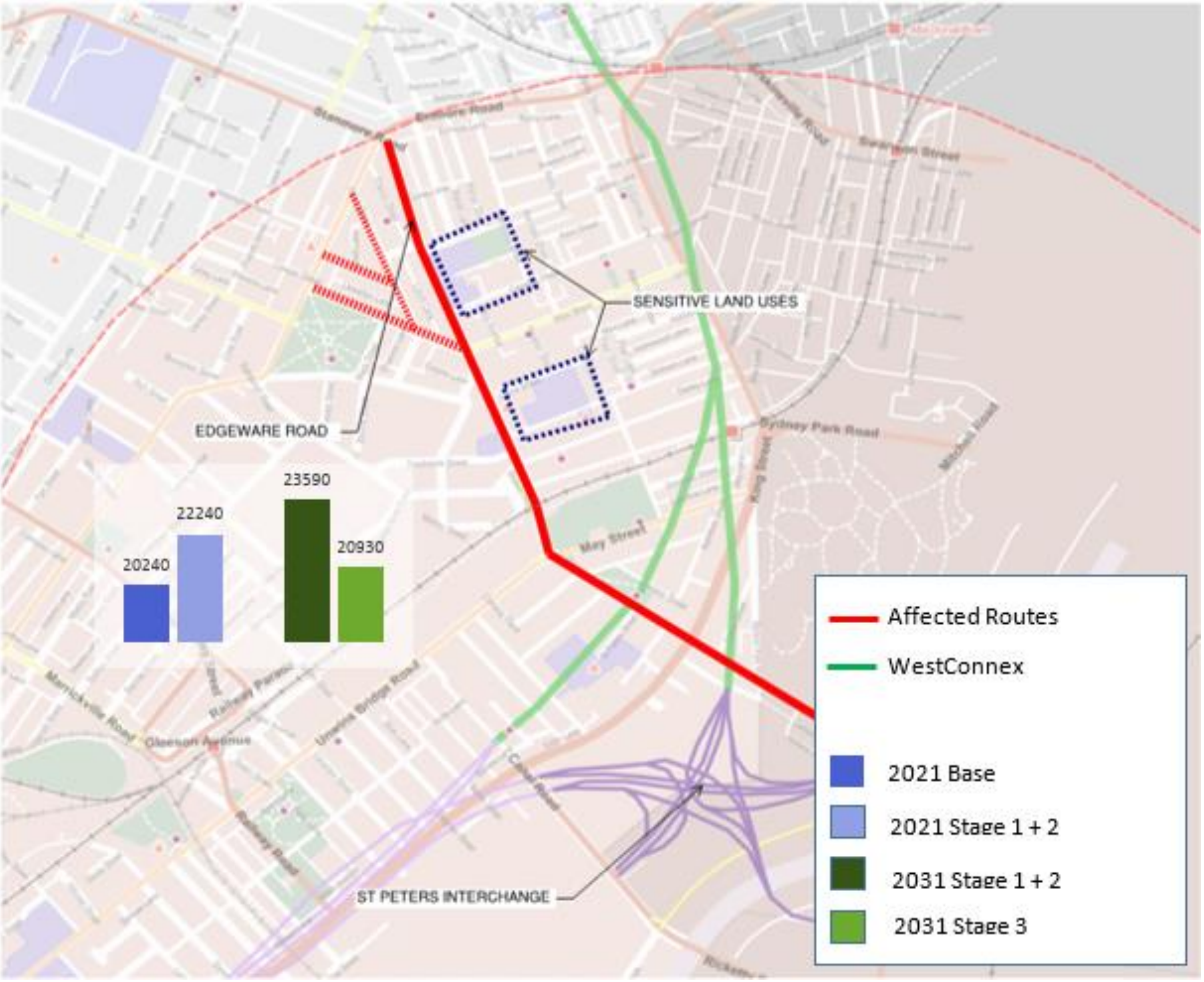


Figure 5.4 – Expected traffic volumes on Edgeware Road

The 2021 project scenario (Stage 1 and 2 WestConnex) is expected to see potential increases in traffic on Bedwin Road by approximately 27% and Edgeware Road by 10%. The modelling has indicated a deterioration in LOS along the route from C/D to F in a number of sections during the peak periods.

In contrast, the 2031 project scenario (Stage 3 WestConnex) sees traffic reduce by approximately 12% on both roads, partially reversing the increases in traffic expected as a result of Stages 1 and 2 of WestConnex.

Further breakdown of traffic volume changes associated with the various scenarios for Edgeware Road and Bedwin Road are detailed in Table 5.1 and Table 5.2.

Table 5.1 – Edgeware Road and Bedwin Road Stage 1 and 2 expected traffic volume changes (AWT)

Section	2021 Base Traffic			2021 Stage 1 and 2		Change	
		NB	SB	NB	SB	NB	SB
Bedwin Road – Between Edinburgh Road and Unwins Bridge Road	Daily	17910	16800	22480	21530	26%	28%
		NB	SB	NB	SB	NB	SB
Edgeware Road – Between Enmore Road and Lynch Avenue	Daily	9830	10410	10640	11600	8%	11%

Table 5.2 – Edgeware Road and Bedwin Road Stage 3 expected traffic volumes changes (AWT)

Section	2031 Stage 1 and 2			2031 Stage 3		Change	
		NB	SB	NB	SB	NB	SB
Bedwin Road – Between Edinburgh Road and Unwins Bridge Road	Daily	24680	23780	21080	20730	-15%	-13%
		NB	SB	NB	SB	NB	SB
Edgeware Road – Between Enmore Road and Lynch Avenue	Daily	11290	12300	10050	10880	-11%	-12%

In regard to road safety, along Edgeware Road, there has been a cluster of pedestrian and cyclist crashes at the intersection of Alice Street, near the retail area. In addition, there were crashes noted to occur in the vicinity of the Enmore TAFE. Table 5.3 provides some details regarding the reported crashes on Bedwin Road and Edgeware Road.

Table 5.3 – Edgeware Road and Bedwin Road crash data 2010 to 2016

Section	Number Crashes	Pedestrian and Cyclist Crashes
Bedwin Road	20	1 pedestrian 1 cyclist
Edgeware Road	74	6 pedestrian 2 cyclist

The potential increase of traffic along Edgeware Road is a potential safety concern, particularly in the vicinity of the Enmore TAFE and the other schools in the vicinity. It is recommended that safety interventions be considered at the Edgeware Road/Alice Street Intersection, more critical as traffic volumes increase.

5.2.2 Unwins Bridge Road

It is anticipated that the New M5 Tunnel (Stage 2 WestConnex) will result in a decrease in traffic volumes along this road as it provides a faster alternative route for vehicles. However, with the introduction of the M4-M5 Link (Stage 3 WestConnex), increased traffic volumes are projected on Unwins Bridge Road as it becomes major access route to the St Peters Interchange. Figure 5.5 illustrates the expected traffic volumes on Unwins Bridge Road under the scenarios tested.

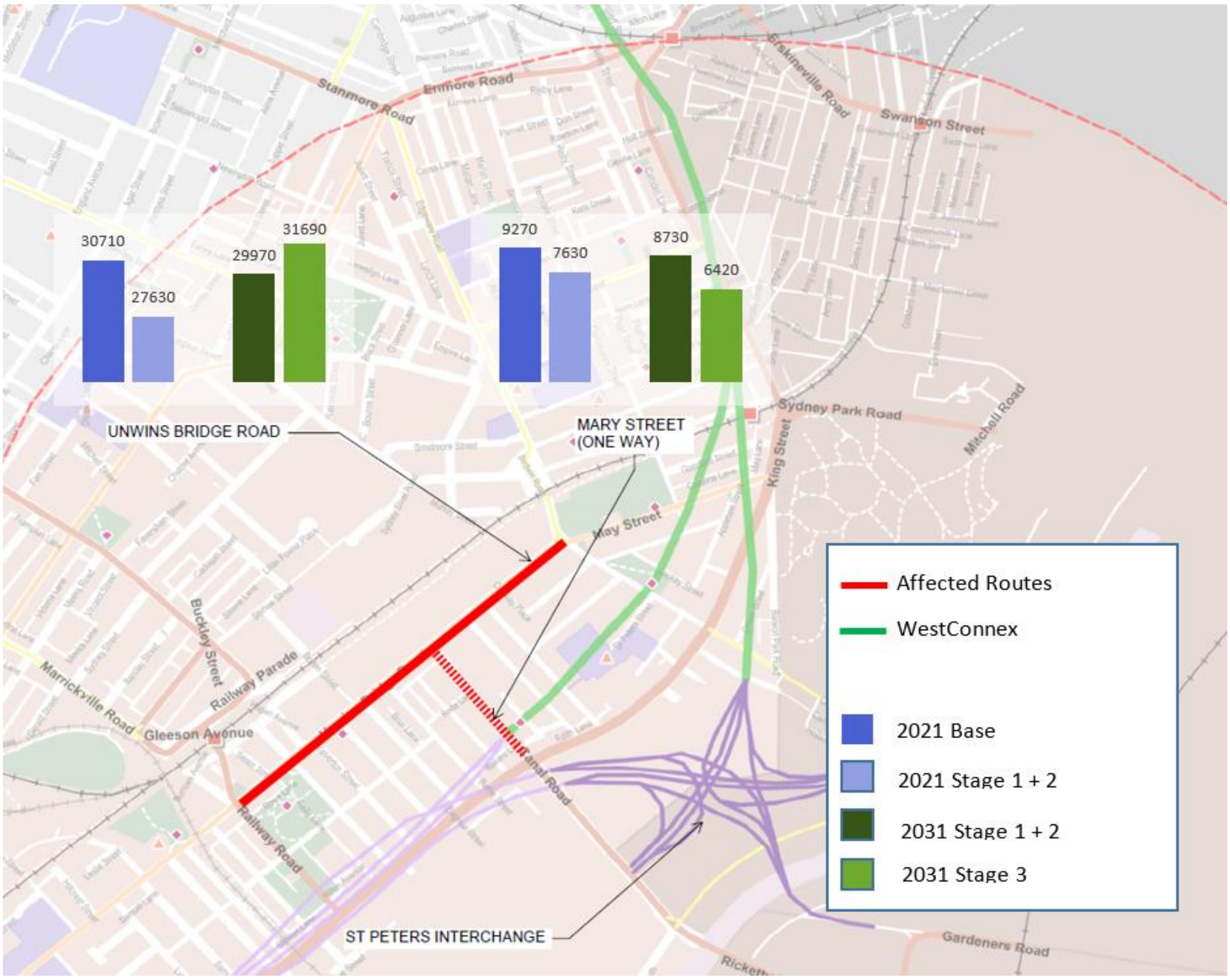


Figure 5.5 – Expected traffic volumes on Unwins Bridge Road

The traffic modelling information is showing that under the 2021 project scenario, there is potential mixed traffic changes along the route. On Unwins Bridge Road, south of Mary Street, there is potentially a 7% increase in traffic, but this flips to a 9% decrease approaching Campbell Street. The 2031 project scenario indicates a potential reversing of these changes, with LoS during the peak hours remaining largely consistent across the tested periods.

Additionally, Mary Street, a one-way northbound road, potentially has an 18% decrease and 26% decrease in the 2021 and 2031 project scenarios respectively. In terms of performance, the modelling is indicating that in the 2031 project scenario, the route could be operating at a LoS A.

Further breakdown of traffic volume changes associated with the various scenarios for Unwins Bridge Road and Mary Street are detailed in Table 5.4 and Table 5.5.

Table 5.4 – Unwins Bridge Road and Mary Street Stage 1 and 2 expected traffic volume changes (AWT)

Section	2021 Base Traffic			2021 Stage 1 and 2		Change	
		NB	SB	NB	SB	NB	SB
Unwins Bridge Road – Between Campbell Street and Brown Street	Daily	17950	12760	15340	12290	-15%	-4%
		NB	SB	NB	SB	NB	SB
Unwins Bridge Road – Between Mary Street and Grove Street	Daily	12130	19080	14320	19060	18%	0%
		NB	SB	NB	SB	NB	SB
Unwins Bridge Road – Between George Street and Railway Road	Daily	16460	15890	17340	16880	5%	6%
		NB		NB		NB	
Mary Street – Between Unwins Bridge Road and Princes Highway	Daily	9270		7630		-18%	

Table 5.5 – Unwins Bridge and Mary Street Stage 3 expected traffic volume changes (AWT)

Section	2031 Stage 1 and 2			2031 Stage 3		Change	
		NB	SB	NB	SB	NB	SB
Unwins Bridge Road – Between Campbell Street and Brown Street	Daily	16700	13270	17040	14650	2%	10%
		NB	SB	NB	SB	NB	SB
Unwins Bridge Road – Between Mary Street and Grove Street	Daily	15530	21370	15970	20110	3%	-6%
		NB	SB	NB	SB	NB	SB
Unwins Bridge Road – Between George Street and Railway Road	Daily	19350	18920	17850	17470	-8%	-8%
		NB		NB		NB	
Mary Street – Between Unwins Bridge Road and Princes Highway	Daily	8730		6420		-26%	

In regard to road safety, crash data for the six year period between 2010 and 2016. There have been a number of crashes along Unwins Bridge Road, with some involving vulnerable road users (pedestrians and cyclists). Table 5.6 provides some details regarding the reported crashes on Unwins Bridge Road and Mary Street.

Table 5.6 – Unwins Bridge Road and Mary Street crash data 2010 to 2016

Section	Number Crashes	Pedestrian and Cyclist Crashes
Unwins Bridge Road – Between Campbell Street and Railway	62	2 pedestrian 0 cyclist
Mary Street – Between Unwins Bridge Road and Princes Highway	7	0 pedestrian 0 cyclist

On Unwins Bridge Road, a number of the pedestrian and cyclist crashes occurred in the vicinity of Sydenham Green Park. As traffic volumes increase, this increases the exposure to vulnerable road users, potentially increasing the number of crashes occurring. It is recommended that improved pedestrian and cyclist facilities at this location could have safety benefits.

5.3 Haberfield Routes

Streets in the vicinity of the Wattle Street Interchange are anticipated to experience increases in traffic volumes as a result of the M4 East (Stage 1 WestConnex). This is due to it being the location where the subterranean motorway ends, discharging traffic onto the surface road network. With the completion of the M4-M5 Link (Stage 3 WestConnex), this increase is likely to be reversed and an overall reduction in traffic experienced. However, some routes may still experience increases as they serve as access points to the Wattle Street Interchange.

Figure 5.6 illustrates the routes identified in Haberfield.

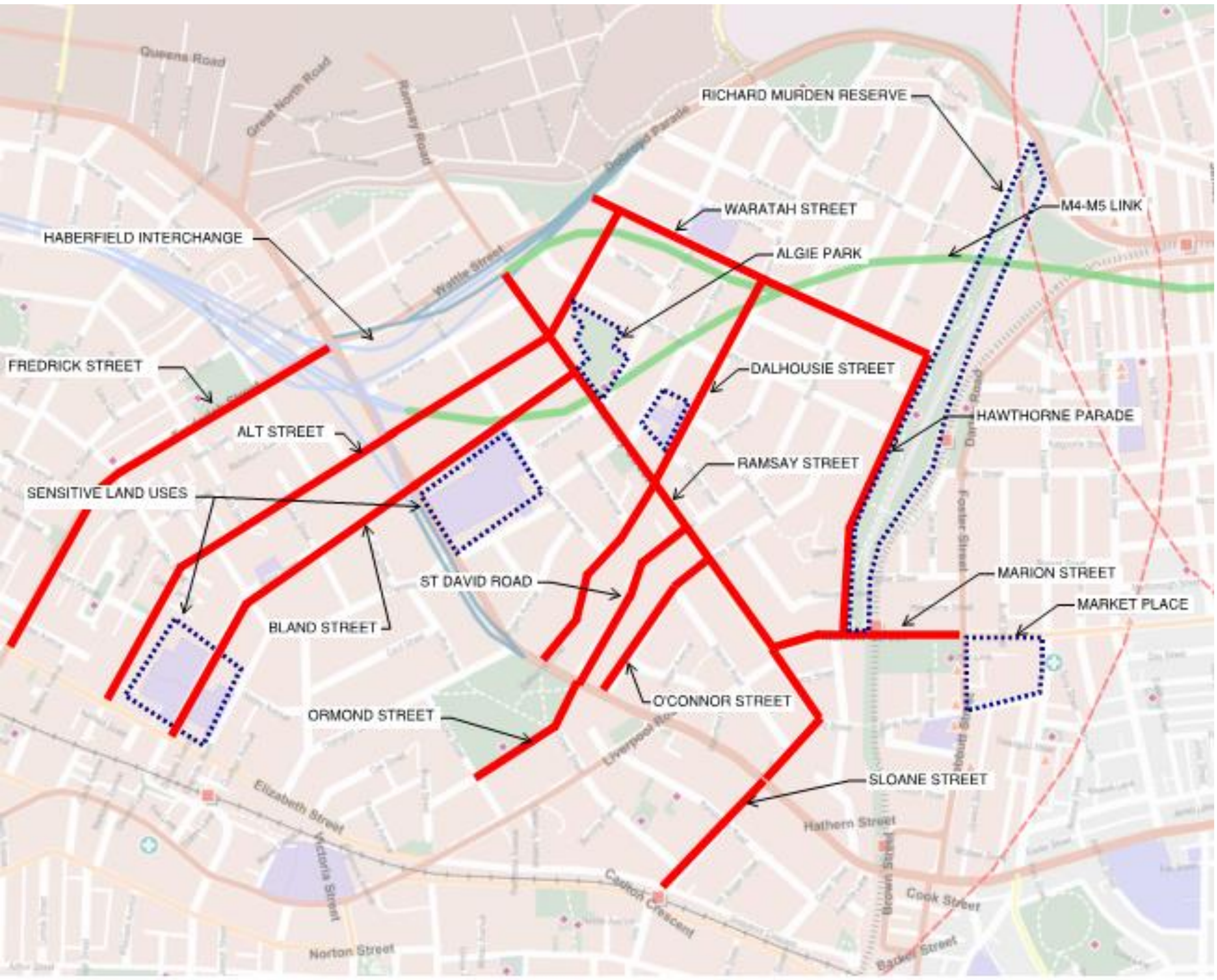


Figure 5.6 – Potentially impacted routes at Haberfield

Within this area, the routes identified as being potentially sensitive to changes in traffic volumes associated with WestConnex (as seen in Figure 5.6) include:

- Ramsay Street, route connecting with Marion Street and Sloane Street.
- Waratah Street, route connecting with Alt Street, Dalhousie Street or Hawthorne Parade and joining the Ramsay Street route.
- Various Ashfield to Haberfield routes, parallel connecting roads, including Alt Street, Bland Street, St David Street, Ormond Street and O’Connor Street.
- Frederick Street, route connecting into Parramatta Road near the Wattle Street Interchange.

It should be noted that due to the grid nature of the road network in the Haberfield/Ashfield area, this creates the opportunity for a number of routes to be utilised and there is very little control over the hierarchy. This creates challenges when determining which routes may be problematic as issues may dynamically alter between parallel running routes due to constantly changing traffic conditions.

Sensitive areas identified within this zone include:

- St Joan of Arc Catholic Primary School.
- Haberfiled Public School.
- Camdenville Public School.
- Uniting Marion Leichhardt Church.
- Dobroyd Point Public School.
- De La Salle College Ashfield.
- Bethlehem College.
- St Vincent’s Catholic School and Church.
- St John’s Anglican Church.
- St David’s Uniting Church.

5.3.1 Ramsay Street

Upon completion of the M4 East (Stage 1 WestConnex) will increase traffic volumes on Ramsay and Marion Streets. This is due to vehicles continuing their journeys after the end of the M4 motorway, with expected rat-running to avoid congestion on Parramatta Road.

With the completion of the M4-M5 Link (Stage 3 WestConnex) traffic volumes are expected to decrease to a level lower than that seen in the 2021 base scenario. This is because the M4-M5 Link will provide additional east- west capacity and removing traffic from the surface road network, this would be expected to reduce existing rat-running.

Figure 5.7 illustrates the expected traffic volumes on Ramsay Street, Sloane Street and Marion Street under the scenarios tested.

Figure 5.7 – Expected traffic volumes on Ramsay Street, Sloane Street and Marion Street

Within the 2021 project scenario, Ramsay Street is anticipated to experience an increase of traffic volumes from 7% to 19% (varying along the route). Similarly Marion Street could see similar levels of increase, project to experience a 7% increase.

With the implementation of Stage 3 WestConnex, the 2031 project scenario could experience a noticeable decrease in traffic volumes on both Ramsay and Marion Street, ranging from -20% to -32%. In regard to LoS during the peak periods, Marion Street has been shown to operate at a LoS E or F, which is projected to remain consistent with the implementation of the 2031 project scenario.

In contrast, Sloane Street is not expected to experience much change in traffic volumes associated with the 2021 and 2031 project scenarios, with an increase of 3% overall.

Further breakdown of traffic volume changes associated with the various scenarios for Ramsay Street, Sloane Street and Marion Street are detailed in Table 5.7 and Table 5.8.

Table 5.7 – Ramsay Street, Marion Street and Slone Street stage 1 and 2 traffic volumes (AWT)

Section	2021 Base Traffic			2021 Stage 1 and 2		Change	
Ramsay Street – Between City West Link and Dalhousie Street		NB	SB	NB	SB	NB	SB
	Daily	5480	6440	6500	6870	19%	7%
Ramsay Street – Between O'Connor Street and Marion Street		NB	SB	NB	SB	NB	SB
	Daily	6900	7230	7950	8110	15%	12%
Marion Street – Between Ramsay Street and Foster Street		EB	WB	EB	WB	EB	WB
	Daily	11990	11690	12930	12500	8%	7%
Sloane Street – Between Ramsay Street and Parramatta Road		NB	SB	NB	SB	NB	SB
	Daily	5160	4550	5310	4250	3%	-7%

Table 5.8 – Ramsay Street, Marion Street and Slone Street stage 3 traffic volumes (AWT)

Section	2031 Stage 1 and 2			2031 Stage 3		Change	
Ramsay Street – Between City West Link and Dalhousie Street		NB	SB	NB	SB	NB	SB
	Daily	7520	7710	5130	5850	-32%	-24%
Ramsay Street – Between O'Connor Street and Marion Street		NB	SB	NB	SB	NB	SB
	Daily	9110	9220	6280	6360	-31%	-31%
Marion Street – Between Ramsay Street and Foster Street		EB	WB	EB	WB	EB	WB
	Daily	14210	13850	11300	10960	-20%	-21%
Sloane Street – Between Ramsay Street and Parramatta Road		NB	SB	NB	SB	NB	SB
	Daily	5990	4440	5220	4820	-13%	9%

In regard to road safety, crash data for the six year period between 2010 and 2016 were analysed. Table 5.9 provides details regarding the reported crashes on Ramsay Street, Marion Street and Sloane Street.

Table 5.9 – Ramsay Street, Marion Street and Sloane Street crash data 2010 and 2016

Section	Number Crashes	Pedestrian and Cyclist Crashes
Ramsay Street – Between City West Link and Marion Street	62	7 pedestrian 0 cyclist
Marion Street – Between Ramsay Street and Foster Street	20	2 pedestrian 3 cyclist
Sloane Street – Between Ramsay Street and Parramatta Road	13 (mostly on intersection with Parramatta Road)	1 pedestrian (on intersection with Parramatta Road) 0 cyclist

Both Ramsay Street and Marion Street have witnessed a higher number of vulnerable road user (pedestrian and cyclist) crashes than the surrounding streets. These are generally located in the vicinity of retail areas and the Marion light rail station, as indicated from the reported crash data. In addition, cycle crashes are also concentrated around the Marion light rail station.

5.3.2 Waratah Street

It is anticipated that following completion of the M4 East (Stage 1 WestConnex) traffic volumes will increase along Waratah Street and Hawthorne Parade. This is expected due to vehicles avoiding increased traffic volumes on Ramsay Street and Parramatta Road.

As with Ramsay Street, with the completion of the M4-M5 Link, traffic flows would be expected to decrease to levels lower than experienced in the 2021 base scenario. This is anticipated as the M4-M5 Link provides increased capacity for east-west traffic movements, removing vehicles from the surface road network.

Figure 5.8 illustrates the expected traffic volumes on Waratah Street, Dalhousie Street and Hawthorne Parade under the scenarios tested.

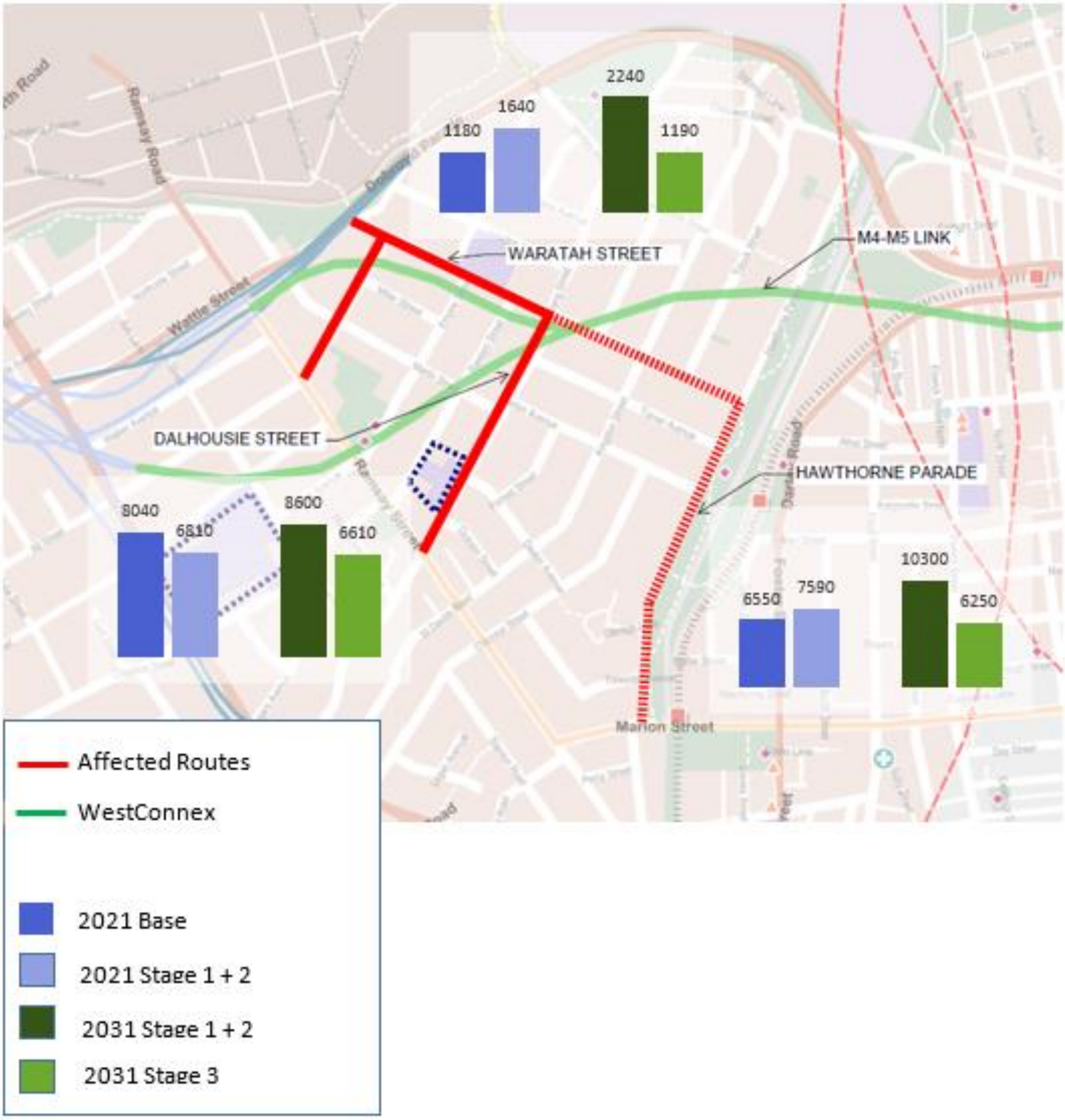


Figure 5.8 – Expected traffic volumes on Waratah Street, Dalhousie Street and Hawthorne Parade

Similar to that seen on Ramsay Street, Waratah Street under the 2021 project scenario could potentially experience traffic volume increases of 11% in the eastbound direction and 53% in the westbound direction. This corresponds to an increase of 15% on Hawthorne Parade. In contrast, it is anticipated that there could be a decrease of up to 15% on Alt Street and Dalhousie Street.

Within the 2031 project scenario, Waratah Street, Dalhousie Street and Hawthorne experience between 22% and 54% decreases in traffic volumes in some segments. This largely reverses the increases experienced in the 2021 project scenario. Exceptions to this are Alt Street, which is expected to see a 28% increase travelling towards Waratah Street. From the information generated within the traffic modelling, it appears that the existing identified Waratah/Hawthorne rat-run route could alter to an Alt/Waratah rat-run.

Further breakdown of traffic volume changes associated with the various scenarios for Waratah Street, Alt Street, Dalhousie Street and Hawthorne Parade are detailed in Table 5.10 and Table 5.11.

Table 5.10 – Waratah Street, Alt Street, Dalhousie Street and Hawthorne Parade stage 1 and 2 traffic volume (AWT)

Section	2021 Base Traffic			2021 Stage 1 and 2		Change	
Waratah Street – Between Alt Street and Dalhousie Street		EB	WB	EB	WB	EB	WB
	Daily	380	800	420	1220	11%	53%
Alt Street – Between Waratah Street and Ramsay Street		NB	SB	NB	SB	NB	SB
	Daily	2540	2710	2360	2020	-7%	-25%
Dalhousie Street – Between Waratah Street and Barton Avenue		NB	SB	NB	SB	NB	SB
	Daily	3810	4230	3210	3600	-16%	-15%
Hawthorne Parade – Between Barton Avenue and Marion Street		NB	SB	NB	SB	NB	SB
	Daily	2790	3760	3270	4320	17%	15%

Table 5.11 – Waratah Street, Alt Street, Dalhousie Street and Hawthorne Parade stage 3 traffic volumes (AWT)

Section	2031 Stage 1 and 2			2031 Stage 3		Change	
Waratah Street – Between Alt Street and Dalhousie Street		EB	WB	EB	WB	EB	WB
	Daily	550	1690	410	780	-25%	-54%
Alt Street – Between Waratah Street and Ramsay Street		NB	SB	NB	SB	NB	SB
	Daily	2390	2480	3050	2510	28%	1%
Dalhousie Street – Between Waratah Street and Barton Avenue		NB	SB	NB	SB	NB	SB
	Daily	3980	4620	3090	3520	-22%	-24%
Hawthorne Parade – Between Barton Avenue and Marion Street		NB	SB	NB	SB	NB	SB
	Daily	4420	5880	2550	3700	-42%	-37%

In regard to road safety, crash data for the six year period between 2010 and 2016 was analysed. Table 5.12 provides details regarding the reported crashes on Waratah Street, Alt Street, Dalhousie Street and Hawthorne Parade.

Table 5.12 – Waratah Street, Alt Street, Dalhousie Street and Hawthorne Parade crash data 2010 to 2016

Section	Number Crashes	Pedestrian and Cyclist Crashes
Waratah Street – Between Alt Street and Dalhousie Street	2	1 pedestrian 1 cyclist
Alt Street – Between Waratah Street and Ramsay Street	1	0 pedestrian 0 cyclist
Dalhousie Street – Between Waratah Street and Ramsay Street	6	0 pedestrian 0 cyclist
Hawthorne Parade – Between Waratah Street and Marion Street	2	0 pedestrian 0 cyclist

Of note is that a pedestrian and cyclist crash occurred at the Dalhousie Street/Waratah Street Roundabout during the observation period. Traffic increases at this intersection, as well as in the vicinity Dobroyd Point Public School on Waratah Street may experience road safety issues.

5.3.3 Ashfield to Haberfield Routes

The modelling has indicated that within the 2021 base and project scenarios, there are only moderate changes to traffic volumes as a result of the completion of the M4 East (Stage 1 WestConnex) project. In contrast, with the completion of the M4-M5 Link (Stage 3 WestConnex), these roads become major access routes to the new motorway, showing an associated increase in traffic in the 2031 project scenario.

Figure 5.9 illustrates the expected traffic volumes on Alt Street, Bland Street and Dalhousie Street under the scenarios tested.

Figure 5.9 – Expected traffic volumes on Alt Street, Bland Street and Dalhousie Street

The Ashfield to Haberfield routes are a series of parallel streets connecting Haberfield and Ashfield, traversing Parramatta Road. It should be noted that the Bland Street and Dalhousie Street intersections with Parramatta Roads are the only ones with full functionality of movements. The other intersections operated with restricted left in-left-out configurations.

Changes to traffic volumes along these routes vary across the various stages of WestConnex. The 2021 project scenario (Stage 1 WestConnex) see Bland Street, South of Parramatta Road, increasing by 103% in the southbound direction. The northbound direction in contrast only shows a moderate increase of 2%. O'Connor Street is expected to have a decrease in traffic volumes of approximately 77%, whilst others are only expected to have minimal decreases in traffic volumes.

For the 2031 project scenario (Stage 3 WestConnex), Alt Street, St David's Road and O'Connor Street are shown to have significant traffic volume increases. Dalhousie Street and Ormond Street are expected to experience a decreases of approximately 35% and 12% respectively.

Further breakdown of traffic volume changes associated with the various scenarios for Alt Street, Bland Street, Dalhousie Street, Ormond Street, St David's Road and O'Connor Street are detailed in Table 5.13 and Table 5.14.

Table 5.13 – Ashfield to Haberfield routes stage 1 and 2 traffic volumes (AWT)

Section		2021 Base Traffic		2021 Stage 1 and 2		Change	
		NB	SB	NB	SB	NB	SB
Alt Street – Between Henry Street and Parramatta Road	Daily	3810	3980	3600	3930	-6%	-1%
		NB	SB	NB	SB	NB	SB
Alt Street – Between Parramatta Road Denman Avenue	Daily	2520	1930	2310	1700	-8%	-12%
		NB	SB	NB	SB	NB	SB
Bland Street – Between Julia Street and Parramatta Road	Daily	4480	2890	4560	5870	2%	103%
		NB	SB	NB	SB	NB	SB
Bland Street – Between Parramatta Road Denman Avenue	Daily	2220	3450	2230	2520	0%	-27%
		NB	SB	NB	SB	NB	SB
Dalhousie Street – Between Parramatta Road and Ramsay Street	Daily	3810	3300	3370	3610	-12%	9%
		NB	SB	NB	SB	NB	SB
Ormond Street – Between Parramatta Road and Gower Street	Daily	5150	320	5540	320	8%	0%
		NB	SB	NB	SB	NB	SB
St David's Road – Between Parramatta Road and Ramsay Street	Daily	400	430	320	400	-20%	-7%
		NB	SB	NB	SB	NB	SB
O'Connor Street – Between Parramatta Road and Ramsay Street	Daily	1420	1310	160	470	-89%	-64%

Table 5.14 – Ashfield to Haberfield routes stage 3 traffic volumes (AWT)

Section	2031 Stage 1 and 2			2031 Stage 3		Change	
Alt Street – Between Henry Street and Parramatta Road		NB	SB	NB	SB	NB	SB
	Daily	4480	4970	5240	5330	17%	7%
Alt Street – Between Parramatta Road Denman Avenue		NB	SB	NB	SB	NB	SB
	Daily	2860	2190	3750	2980	31%	36%
Bland Street – Between Julia Street and Parramatta Road		NB	SB	NB	SB	NB	SB
	Daily	5720	7460	6110	5550	7%	-26%
Bland Street – Between Parramatta Road Denman Avenue		NB	SB	NB	SB	NB	SB
	Daily	2920	3250	2350	4410	-20%	36%
Dalhousie Street – Between Parramatta Road and Ramsay Street		NB	SB	NB	SB	NB	SB
	Daily	4380	4480	2940	2870	-33%	-36%
Ormond Street – Between Parramatta Road and Gower Street		NB	SB	NB	SB	NB	SB
	Daily	6040	350	5170	320	-14%	-9%
St David's Road – Between Parramatta Road and Ramsay Street		NB	SB	NB	SB	NB	SB
	Daily	270	430	440	400	63%	-7%
O'Connor Street – Between Parramatta Road and Ramsay Street		NB	SB	NB	SB	NB	SB
	Daily	240	610	810	800	238%	31%

To determine the relative safety of the routes, crash data for the six year period between 2010 and 2016 was analysed. Table 5.15 details the reported crashes for Alt Street, Bland Street, Dalhousie Street, Ormond Street, St David's Road ad O'Connor Street during the observation period.

Table 5.15 – Ashfield to Haberfield routes crash data 2010 to 2016

Section	Number Crashes	Pedestrian and Cyclist Crashes
Alt Street – Between Henry Street and Ramsay Street	3	0 pedestrian 0 cyclist
Bland Street – Between Julia Street and Ramsay Road	19	0 pedestrian (plus 1 on Parramatta Road nearby) 0 cyclist
Dalhousie Street - Between Parramatta Road and Ramsay Street	12	1 pedestrian 0 cyclist
Ormond Street	0	0 pedestrian 0 cyclist
St David's Road	5 (all on Parramatta Road)	1 pedestrian 0 cyclist
O'Connor Street	1	0 pedestrian 0 cyclist

A cluster of crashes (19) was observed on a section of Bland Street between Julia Street and Ramsay Street. This section is relatively short at 800 metres in length and also includes Haberfield Public School. It also feeds directly into Ashfield station, with the majority (11) of the crashes occurring at the Bland Street/Elizabeth Street Intersection. With Stage 3 of WestConnex, this section of road is expected to have an increase in traffic, potentially increasing the exposure to crash risks, resulting in more reported crashes.

5.3.4 Frederick Street

Frederick Street currently services as a major access route onto City West Link. With the completion of the M4 East Project (Stage 1 WestConnex) which is expected to place increased traffic volumes on City West Link, vehicles are anticipated to find alternative routes to avoid increasing projected congestion. This maybe a reason for the reduction in traffic on Frederick Street in the 2021 project scenario.

With the completion of the M4-M5 Link (Stage 3 WestConnex), Frederick Street provides a key access point to the Wattle Street Interchange, which see an associated increase in projected traffic volumes.

Figure 5.10 illustrates the expected traffic volumes on Frederick Street under the scenarios tested.

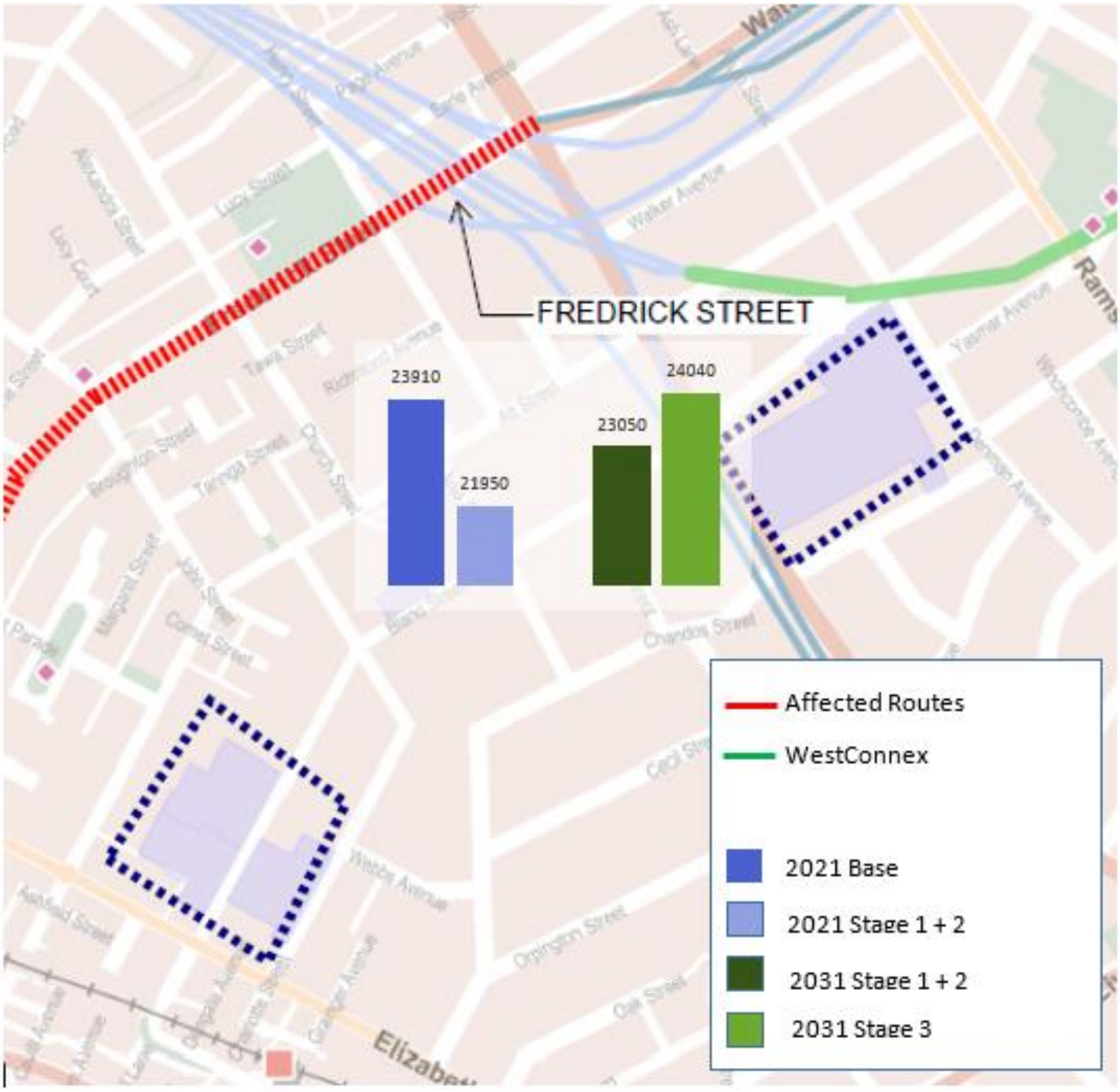


Figure 5.10 – Expected traffic volumes on Frederick Street

A further breakdown of traffic volumes on Frederick Street associated with the various scenarios is provided in Table 5.16 and Table 5.17**.**

Table 5.16 – Frederick Street stage 1 and 2 traffic volumes

Section	2021 Base Traffic			2021 Stage 1 and 2		Change	
		NB	SB	NB	SB	NB	SB
Frederick Street – Between Parramatta Road and Henry Street	Daily	11770	12140	10740	11210	-9%	-8%
		NB	SB	NB	SB	NB	SB
Frederick Street – Between John Street and Elizabeth Street	Daily	9100	8900	9740	9470	7%	6%

Table 5.17 – Frederick Street stage 3 traffic volumes

Section	2031 Stage 1 and 2			2031 Stage 3		Change	
		NB	SB	NB	SB	NB	SB
Frederick Street – Between Parramatta Road and Henry Street	Daily	11240	11810	11780	12260	5%	4%
		NB	SB	NB	SB	NB	SB
Frederick Street – Between John Street and Elizabeth Street	Daily	10040	9730	10410	9950	4%	2%

To assess the relative safety performance of this route, crash data for the six year period between 2010 and 2016 was analysed. Table 5.18 provides a breakdown of the reported crashes along Frederick Street for the observation period.

Table 5.18 – Frederick Street crash data 2010 to 2016

Section	Number Crashes	Pedestrian and Cyclist Crashes
Frederick Street – Between Parramatta Road and Elizabeth Street	106	7 pedestrian 1 cyclist

Of particular note is the presence of three pedestrian related crashes that occurred at the Frederick Street/John Street Intersection, with an additional two occurring adjacent to the nearby Hammond Park. With traffic volumes expected to increase along this route, this could increase the exposure to crash risk for vulnerable road users. It would be recommended that consideration be provided to enhanced pedestrian and cyclist infrastructure along this segment.

5.4 Leichhardt/Annandale Routes

The Leichhard/Annandale area would be anticipated to experience the majority of its changes as a result of the completion of the Rozelle Interchange, to be delivered as part of Stage 3 of WestConnex. Under these conditions, City West link and the adjoining road network are expected to be key access links to this interchange.

Figure 5.11 illustrates the identified routes for the Leichhardt/Annandale area.

Figure 5.11 – Potentially impacted routes at Leichhardt/Annandale

It is anticipated that the majority of the roads affected by the various stages of WestConnex lie south of the Interchange. These are routes were motorists are expected to travel on to connect to the Rozelle Interchange or City West Link, these include:

- Johnston Street, connecting with The Crescent towards the Rozelle Interchange and Northumberland Avenue towards Stanmore. It connects to Moore Street mid-way along the route. In addition, Annandale Street runs parallel to Johnston Street.
- Leichhardt to Lilyfield, this includes parallel routes Darley Road, Flood Street, Norton Street, Balmain Road and Catherine Street.

Sensitive areas identified within the area include:

- Annandale North Public School.
- Toxteth Kindergarten.
- Annandale Public School.
- St Brendan’s Catholic Primary School.
- Hunter Baillie Memorial Presbyterian Church.
- Leichhardt Public School.
- Sydney Secondary College Leichhardt Campus.
- St Fiacre’s Catholic Primary School.
- All Souls Anglican Church Leichhardt.
- Kegworth Public School.
- Annandale Shops (Booth Street).
- Leichhardt Shops (Norton Street).
- Pioneers Memorial Park.

5.4.1 Johnston Street

Both Annandale Street and Johnston Street will serve as major routes access points to the Rozelle Interchange and the Western Harbour Tunnel, which is expected to increase traffic volumes once implemented.

Figure 5.12 illustrates the expected traffic volumes on Johnston Street under the scenarios tested.

Figure 5.12 – Expected traffic volumes on Johnston Street

As anticipated, Johnston Street and other routes within the vicinity are expected to experience little change associated with Stage 1 and 2 of WestConnex in 2021. In 2031, with the completion of Stage 3, changes in volumes are expected, with increases on Johnston Street and Annandale Street, with a decrease in Booth Street.

A further breakdown of traffic volumes on Johnston Street, Northumberland Avenue, Booth Street and Annandale Street associated with the various scenarios is provided in Table 5.19 and Table 5.20.

Table 5.19 - Johnston Street stage 1 and 2 traffic volumes (AWT)

Section	2021 Base Traffic			2021 Stage 1 and 2		Change	
Johnston Street – Between Collins Street and Albion Street		NB	SB	NB	SB	NB	SB
	Daily	9270	7250	9160	7290	-1%	1%
Northumberland Avenue – between Parramatta Road and Corunna Road		NB	SB	NB	SB	NB	SB
	Daily	8270	5650	8630	5860	4%	4%
Booth Street – Between Nelson Street and Wigram Road		EB	WB	EB	WB	EB	WB
	Daily	8720	9230	8820	9220	1%	0%
Annandale Street - Between Booth Street and Rose Street		NB	SB	NB	SB	NB	SB
	Daily	1870	1470	1980	1460	6%	-1%

Table 5.20 – Johnston Street stage 3 traffic volumes (AWT)

Section	2031 Stage 1 and 2			2031 Stage 3		Change	
Johnston Street – Between Collins Street and Albion Street		NB	SB	NB	SB	NB	SB
	Daily	10980	9010	10500	9340	-4%	4%
Northumberland Avenue – between Parramatta Road and Corunna Road		NB	SB	NB	SB	NB	SB
	Daily	11270	8130	9770	7080	-13%	-13%
Booth Street – Between Nelson Street and Wigram Road		NB	SB	NB	SB	NB	SB
	Daily	9980	10610	9160	9500	-8%	-10%
Annandale Street - Between Booth Street and Rose Street		NB	SB	NB	SB	NB	SB
	Daily	2840	1970	3030	2410	7%	22%

To evaluate the relative safety of this area, crash data for the six year period between 2010 and 2016. Table 5.21 provides a breakdown of the crashes observed over this period.

Table 5.21 – Johnston Street crash data 2010 to 2016

Section	Number Crashes	Pedestrian and Cyclist Crashes
The Crescent – Between Johnston Street and City West Link	26	1 pedestrian 2 cyclist
Johnston Street	53	4 pedestrian 1 cyclist
Northumberland Avenue – between Parramatta Road and Corunna Road	4	0 pedestrian 2 cyclist
Booth Street	37	1 pedestrian 4 cyclist
Annandale Street	5	0 pedestrian 0 cyclist

It is observed that at the Booth Street/Johnston Street Intersection, near the retail precinct, has a cluster of reported pedestrian and cyclist crashes. As traffic increases, this exposure to crash risk could increases. It is therefore recommended that improved pedestrian and cycling facilities.

5.4.2 Leichhardt to Lilyfield Routes

On Norton Street, with the introduction of Stage 1 and 2 of WestConnex, traffic volumes are expected to increase slightly and continue to grow. In the 2031 project scenario (Stage 3 WestConnex) there is expected to be a decrease in traffic volumes, reverting back to level similar to the 2021 base scenario.

In contrast, Balmain Road is expected to see a decrease in traffic volumes as a result of all stages of WestConnex, that being the 2021 and 2031 project scenarios. Lastly, Catherine Street that provides a relatively direct passage between Parramatta Road and City West Link is expected to have relatively stable traffic volumes within the scenarios tested.

Figure 5.13 illustrates the expected traffic volumes on Balmain Street, Norton Street and Catherine Street under the scenarios tested.

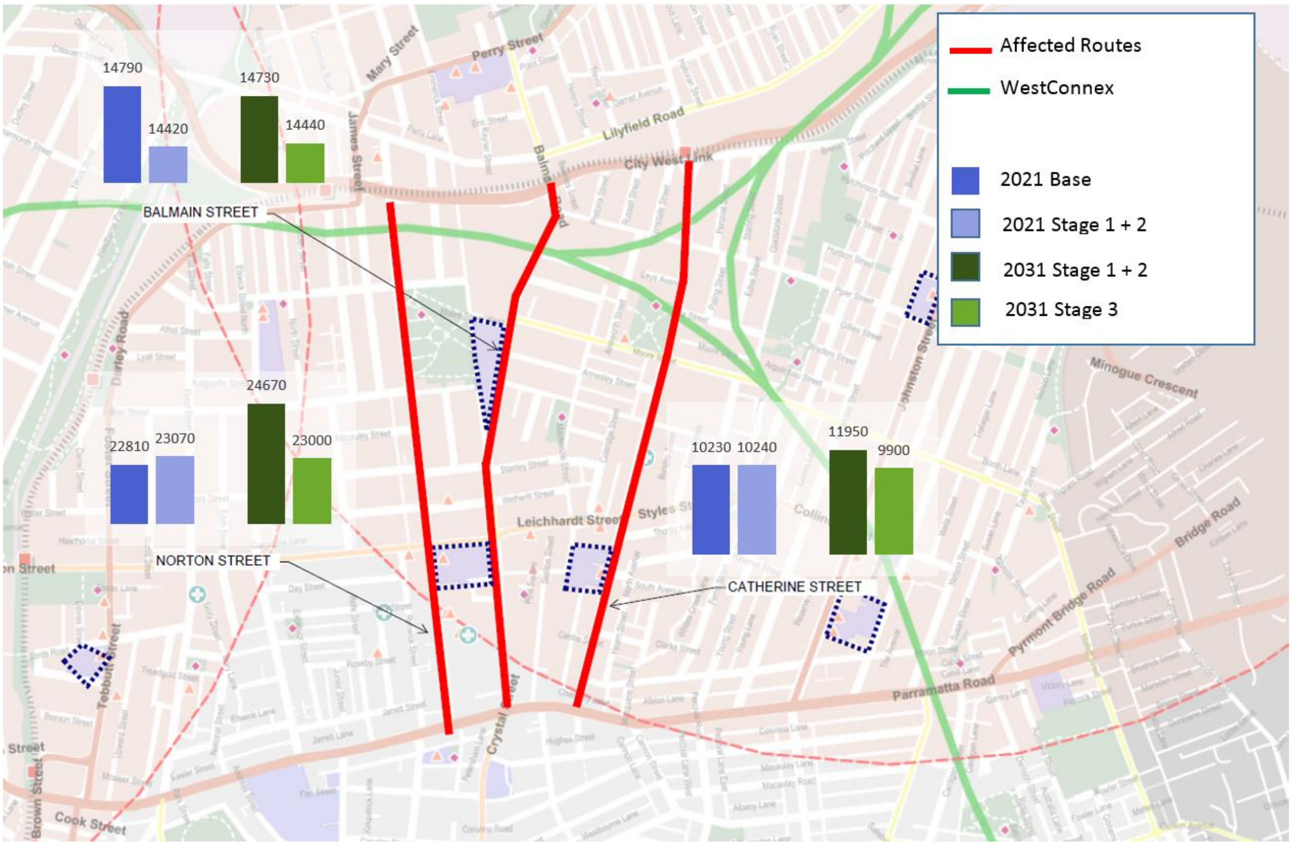


Figure 5.13 – Expected traffic volumes on Balmain Road, Norton Street and Catherine Street

The Leichhardt to Lilyfield routes are three parallel north south routes that connect Parramatta Road to City West Link. Under the 2021 project scenario, all three routes see moderate to negligible increases in traffic volumes. In contrast, in the 2031 project scenario, of the routes evaluated, there was observed to be on average a 7% decrease in traffic on these roads.

A further breakdown of traffic volumes on Balmain Road, Norton Street and Catherine Street associated with the various scenarios is provided in Table 5.22 and Table 5.23.

Table 5.22 – Leichhardt to Lilyfield Routes stage 1 and 2 traffic volumes (AWT)

Section	2021 Base Traffic			2021 Stage 1 and 2		Difference	
		NB	SB	NB	SB	NB	SB
Norton Street – Between City West Link and Williams Street	Daily	7920	7840	7930	7970	0%	2%
Norton Street – Between Williams Street and Marion Street	Daily	5910	5970	5990	6000	1%	1%
Norton Street – Between Marion Street and Parramatta Road	Daily	10940	11870	11110	11960	2%	1%
Balmain Road – Between Parramatta Road and Marion Street	Daily	8080		8060		0%	
Balmain Road – Between Marion Street and Alfred Street	Daily	9280	5510	9070	5350	-2%	-3%
Catherine Street – Between Piper Street and Moore Street	Daily	3730	7090	3620	7000	-3%	-1%
Catherine Street – Between Styles Street and Parramatta Road	Daily	2770	7460	2850	7390	3%	-1%

Table 5.23 – Leichhardt to Lilyfield Route sage 3 traffic volumes (AWT)

Section	2031 Stage 1 and 2			2031 Stage 3		Difference	
Norton Street – Between City West Link and Williams Street		NB	SB	NB	SB	NB	SB
	Daily	9060	9040	8360	9450	-8%	5%
Norton Street – Between Williams Street and Marion Street		NB	SB	NB	SB	NB	SB
	Daily	6460	6850	6150	6510	-5%	-5%
Norton Street – Between Marion Street and Parramatta Road		NB	SB	NB	SB	NB	SB
	Daily	12130	12540	10960	12040	-10%	-4%
Balmain Road – Between Parramatta Road and Marion Street		NB		NB		NB	
	Daily	8600		7610		-12%	
Balmain Road – Between Marion Street and Alfred Street		NB	SB	NB	SB	NB	SB
	Daily	9500	5230	8940	5500	-6%	5%
Catherine Street – Between Piper Street and Moore Street		NB	SB	NB	SB	NB	SB
	Daily	4190	8230	4050	7660	-3%	-7%
Catherine Street – Between Styles Street and Parramatta Road		NB	SB	NB	SB	NB	SB
	Daily	3570	8380	2940	6960	-18%	-17%

To assess the relative safety of the various routes considered in this area, crash data for the six year period between 2010 and 2016 was analysed. Table 5.24 provides a breakdown of the crashes observed over this period on Norton Street, Balmain Road and Catherine Street.

Table 5.24 – Leichhardt to Lilyfield routes crash data 2010 to 2016

Section	Number Crashes	Pedestrian and Cyclist Crashes
Norton Street	40	5 pedestrian (plus one fatal nearby on Marion Street) 0 cyclist
Balmain Road	54	1 pedestrian 1 cyclist
Catherine Street	17	1 pedestrian 2 cyclist

Norton Street appears to have a high number of pedestrian crashes in the vicinity of the Norton Plaza, including a fatality at the intersection with Marion Street. It is recommended that any intervention look to enhance pedestrian and cyclist facilities in this area.

5.4.3 Darley Road Routes

Within the introduction of Stage 1 and 2 of WestConnex, Darley Road is projected to experience a modest reduction in traffic volumes. This changes very little with the completion of Stage 3 of WestConnex. The attractiveness of this route is potentially influenced by the performance and amount of traffic operating along the corridor.

Figure 5.14 illustrates the expected traffic volumes on Balmain Street, Norton Street under the scenarios tested.

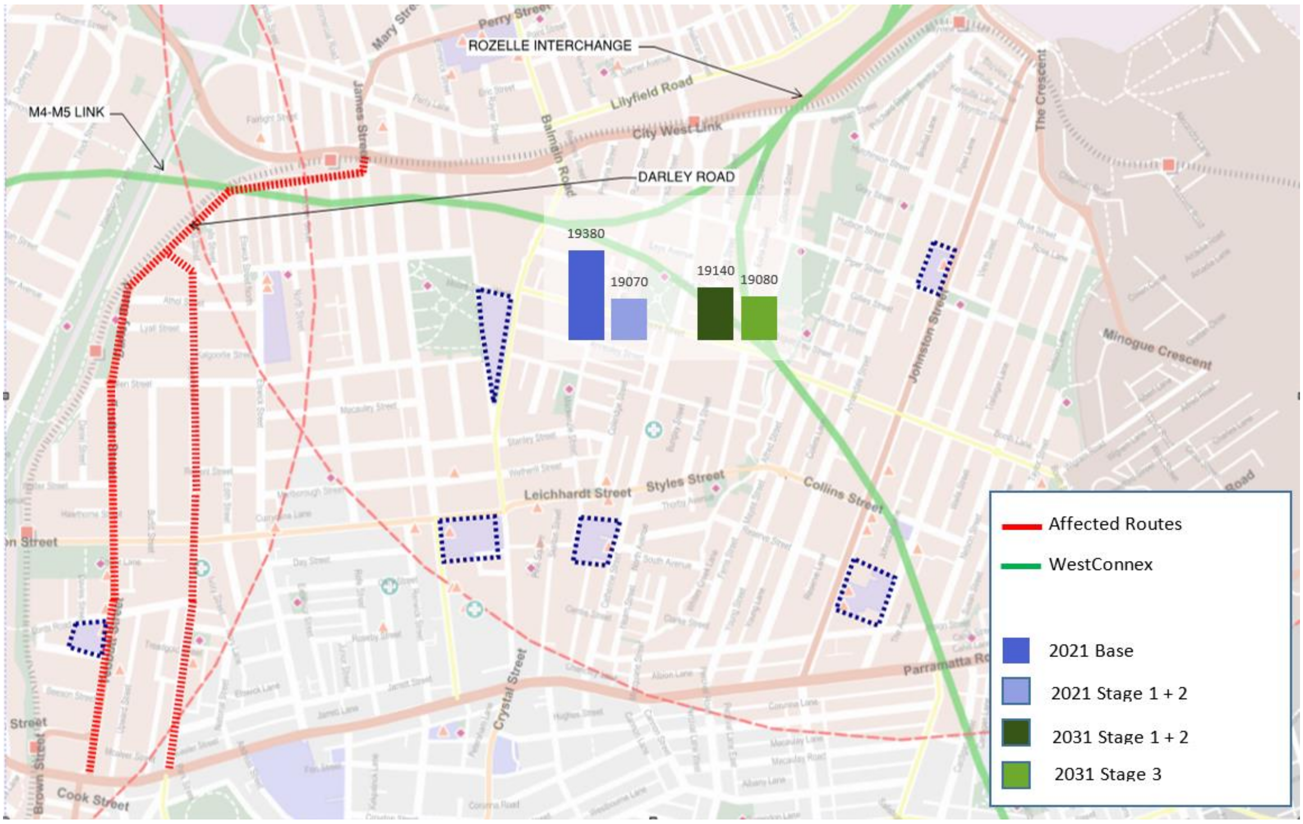


Figure 5.14 – Expected traffic volumes on Darley Road

The traffic modelling has indicated that the 2021 project scenario show minimal change in traffic volumes, with the exception being a 13% decrease on Flood Street near Parramatta Road. With the 2031 project scenario, there is seen to be decrease in most routes within the extent, with an average 11% decrease projected.

A further breakdown of traffic volumes on Darley Road, Foster Street, Tebbutt Street and Flood Street associated with the various scenarios is provided in Table 5.25 and Table 5.26.

Table 5.25 – Darley Street, Foster Street, Tebbutt Street and Flood Street stage 1 and 2 traffic volumes (AWT)

Section	2021 Base Traffic			2021 Stage 1 and 2		Difference	
Darley Road – Between James Street and North Street		EB	WB	EB	WB	EB	WB
	Daily	9400	9980	9360	9710	0%	-3%
Foster Street – Between Allen Street and Marion Street		NB	SB	NB	SB	NB	SB
	Daily	9860	9780	9980	9670	1%	-1%
Tebbutt Street – Between Lords Road and Hathern Street		NB	SB	NB	SB	NB	SB
	Daily	10100	12520	10490	12540	4%	0%
Flood Street – Between William Street and Allen Street		NB	SB	NB	SB	NB	SB
	Daily	420	240	430	220	2%	-8%
Flood Street – Between Lords Road and Parramatta Road		NB	SB	NB	SB	NB	SB
	Daily	5150	3590	4680	3020	-9%	-16%

Table 5.26 – Darley Street, Foster Street, Tebbutt Street and Flood Street stage 3 traffic volumes (AWT)

Section	2031 Stage 1 and 2			2031 Stage 3		Difference	
Darley Road – Between James Street and North Street		EB	WB	EB	WB	EB	WB
	Daily	9470	9670	9170	9910	-3%	2%
Foster Street – Between Allen Street and Marion Street		NB	SB	NB	SB	NB	SB
	Daily	10970	10600	9500	9410	-13%	-11%
Tebbutt Street – Between Lords Road and Hathern Street		NB	SB	NB	SB	NB	SB
	Daily	11530	12300	9900	11050	-14%	-10%
Flood Street – Between William Street and Allen Street		NB	SB	NB	SB	NB	SB
	Daily	660	480	470	280	-29%	-42%
Flood Street – Between Lords Road and Parramatta Road		NB	SB	NB	SB	NB	SB
	Daily	5480	3100	5110	3860	-7%	25%

To evaluate road safety, crash data for the six year period between 2010 and 2016 was analysed. Table 5.27 provides a breakdown of the reported crashes along Darley Road, Foster Street, Tebbutt Street and Flood Street over the observation period.

Table 5.27 – Darley Road, Foster Street, Tebbutt Street and Flood Street crash data

Section	Number Crashes	Pedestrian and Cyclist Crashes
Darley Road	37	0 pedestrian 2 cyclist
Foster Street	23	1 pedestrian 1 cyclist
Tebbutt Street	8	0 pedestrian 0 cyclist
Flood Street	18	6 pedestrian 0 cyclist

On Darley Road and Foster Street, it is reported that a number of crashes are occurring in the vicinity of the various intersections scattered along the route. Another key point to note that there are observed to be a number of pedestrian and cyclist crashes occurring in the vicinity of the Marketplace Leichhardt and the Marion Light Rail Station. Also, at the Marion Street/Flood Street Intersection, four pedestrian crashes were reported. With changing traffic conditions, this could influence the exposure to crash risks and hence increase the number reported. It is therefore recommended that consideration be provided to pedestrian and cyclist facilities in these areas. Table 5.28 provides a summary of traffic flow change from 2021 base to 2021 stage 1+2 and from 2031 stage 1+2 to 2031 stage 3.

Table 5.28 – Summary of Traffic Flow Increase/Decrease

Road	Stage 1 + 2	Stage 3
Edgeware Road – Between Enmore Road and Lynch Avenue	Increase	Decrease
Bedwin Road – Between Edinburgh Road and Unwins Bridge Road	Increase	Decrease
Unwins Bridge Road -Between Campbell Street and Brown Street	Decrease	Increase
Unwins Bridge Road – Between Mary Street and Grove Street	Increase	Decrease
Unwins Bridge Road – Between George Street and Railway Road	Increase	Decrease
Mary Street – Between Unwins Bridge Road and Princes Highway	Decrease	Decrease
Ramsay Street – Between City West Link and Dalhousie Street	Increase	Decrease
Ramsay Street – Between O'Connor Street and Marion Street	Increase	Decrease
Marion Street – Between Ramsay Street and Foster Street	Increase	Decrease
Sloane Street – Between Ramsay Street and Parramatta Road	Decrease	Decrease
Waratah Street – Between Alt Street and Dalhousie Street	Increase	Decrease
Alt Street – Between Waratah Street and Ramsay Street	Decrease	Increase
Dalhousie Street – Between Waratah Street and Barton Avenue	Decrease	Decrease
Hawthorne Parade – Between Barton Avenue and Marion Street	Increase	Decrease
Alt Street – Between Henry Street and Parramatta Road	Decrease	Increase
Alt Street – Between Parramatta Road Denman Avenue	Decrease	Increase
Bland Street – Between Julia Street and Parramatta Road	Increase	Decrease
Bland Street – Between Parramatta Road Denman Avenue	Decrease	Increase
Dalhousie Street – Between Parramatta Road and Ramsay Street	Decrease	Decrease
Ormond Street – Between Parramatta Road and Gower Street	Increase	Decrease
St David's Road – Between Parramatta Road and Ramsay Street	Decrease	Increase
O'Connor Street – Between Parramatta Road and Ramsay Street	Decrease	Increase
Frederick Street – Between Parramatta Road and Henry Street	Decrease	Increase
Frederick Street – Between John Street and Elizabeth Street	Increase	Increase
Johnston Street – Between Collins Street and Albion Street	-	-
Northumberland Avenue – between Parramatta Road and Corunna Road	Increase	Decrease
Booth Street – Between Nelson Street and Wigram Road	Increase	Decrease
Annandale Street - Between Booth Street and Rose Street	Increase	Increase
Norton Street – Between City West Link and Williams Street	Increase	Decrease
Norton Street – Between Williams Street and Marion Street	-	-
Norton Street – Between Marion Street and Parramatta Road	Increase	Decrease
Balmain Road – Between Parramatta Road and Marion Street	-	Decrease
Balmain Road – Between Marion Street and Alfred Street	Decrease	Decrease
Catherine Street – Between Piper Street and Moore Street	Decrease	Decrease
Catherine Street – Between Styles Street and Parramatta Road	Increase	Decrease
Darley Road – Between James Street and North Street	Decrease	Decrease
Foster Street – Between Allen Street and Marion Street	-	Decrease
Tebbutt Street – Between Lords Road and Hathern Street	Increase	Decrease
Flood Street – Between William Street and Allen Street	Decrease	Decrease
Flood Street – Between Lords Road and Parramatta Road	Decrease	Increase

5.5 Precinct Study Area for LAIS

Utilising the data available, incorporating feedback from the community and collaboration with the IWC, various LAIS precincts were defined. The intention of these precincts is to define areas for interventions to develop strategic cost estimates. The LAIS precincts have been established based on expected effects and natural and artificial boundaries (i.e. rivers, railway lines, main roads etc). Figure 5.15 illustrates the LAIS precincts taken forward for this study. As indicated previously, this is not intended to identify areas were interventions will be implemented in the future, but solely used to define potential strategic cost estimates to continue further funding discussions.

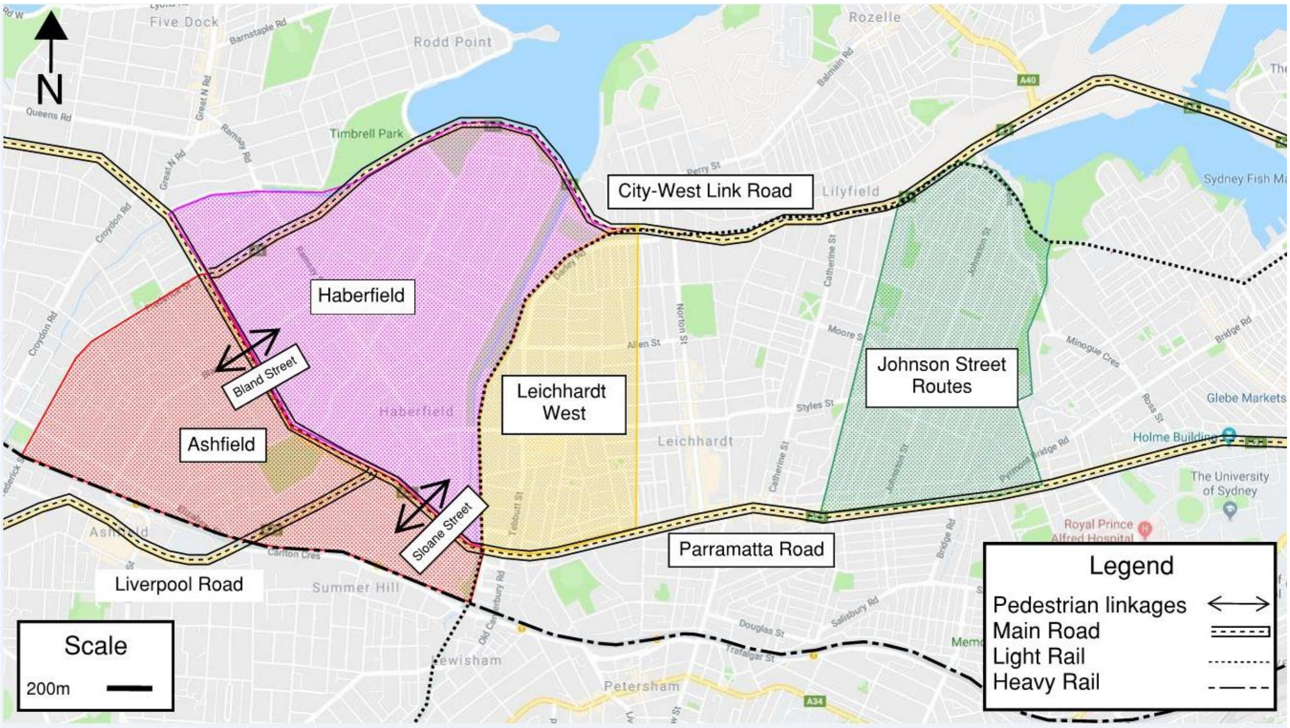


Figure 5.15 – Identified prescient LAIS in Haberfield and Leichhardt areas

For the Haberfield/Leichhardt areas, the defined precinct study areas (as shown in Figure 5.15) include:

- Haberfield – Confined to Iron Cove Creek to the west, City West Link to the north, Light Rail to the east and Parramatta Road to the south;
- Ashfield – Confined to Frederick Street to the west, Parramatta Road to the north, Light Rail to the east and Heavy Rail to the South;
- Leichhardt West – Confined to City West Link to the north, Light Rail to the east and Parramatta Road to South; and
- Johnston Street Routes – these are the routes including and operating parallel to Johnston Street, this is confined to City West Link in the North, the LGA boundary to the east and Parramatta Road to the South.

For St Peters, the LAIS development will be concentrated to a route basis, with particular emphasis on those identified within the community consultation.

6 Potential Improvement Scheme Options

Potential improvement scheme options were developed as a way of off-setting the potential impact of traffic changes within the IWC road network. The treatments also consider community concerns, urban design considerations, local environment amenity and appropriateness to the context of the precincts. A range of treatment categories have been taken forward, each with different effects in how they address the project objectives.

To recap, these objectives, as discussed in Section 1.3 are:

- Understand and benchmark the transport system that currently exists within the IWC area.
- Understand the extent of WestConnex and identify potential issues associated with its implementation.
- Identify a strategy to mitigate effects to be incorporated into the delivery of WestConnex.

The first two objectives listed above have been investigated in the previous sections, the focus of the remaining sections of this report will be on final objective and the development of an improvement strategy.

Treatments identified as having potential to address the intended project objectives were developed in collaboration with IWC and been grouped as:

- Treatment Type 1 – Integrated Traffic Calming, with Pedestrian and Cyclist Facilities. This option looks to utilise a mixture of horizontal and vertical displacement devices, coupled with urban design, landscaping and other traffic improvements. The intention of these type of treatments is to reduce the attractiveness of routes as a thoroughfare, as well as reducing traffic speeds. This is achieved through visual cues, as well as physical deterrents.
- Treatment Type 2 – Intersection Modifications. This option looks to provide pedestrian, cyclist and improved safety facilities at intersections. This can be achieved through new intersection forms (i.e. roundabouts) or enhanced facilities at existing intersections. The intention of this option is to off-set potential safety effects of increased traffic speeds or volumes, whilst encouraging more active transport.
- Treatment Type 3 – Traffic Diversions. This option looks to create physical boundaries to create a road network that hinders the opportunities for rat-running. To do this, a more consistent road network is created through the use of road diversions, which can be in the form of fully or partial closures. These restrict the functionality of access for certain movements, which provides a higher level of control and reduces the directness of routes.

Within each of these treatment categories, there are numerous treatment types that could be implemented to achieve the desired intended outcomes. Described in the remainder of this section are typical details of some treatment types that could be implemented. This is not intended to be an exhaustive list, but more a representation of types to inform strategic cost estimates and provide an appreciation of what some of the features of these treatment options.

Implementing these treatments offers the opportunity to enhance public amenity in the area by using landscaping and water sensitive urban design as part of the treatment options. Furthermore, in some cases, the opportunity to provide additional parking spaces, integrated into the treatment design, can be achieved. It is envisioned at the scheme development stage, more specific details regarding the treatments and specific details will be provided.

6.1 Typical Treatment Types

Detailed within this section is information regarding typical treatment types incorporated into the various options progressed for the development of strategic cost estimates. The intention of the details presented is to give an indication of what they could look like and provide enough information to determine a cost. These are not intended to be designs for implementation.

6.1.1 Treatment Type 1 – Integrated Traffic Calming with Pedestrian and Cycling Facilities Typical Details

Typical details utilised for Treatment Type 1 include:

- Flat-top Road Hump.
- Wombat Crossing.
- Kerb Extension and Pedestrian Crossings.
- Single Lane Angled Slow Point.

6.1.1.1 Flat Top Road Hump

The first type 1 treatment is a flat-top road hump. This is an example of a vertical device. Figure 6.1 Illustrates a typical plan view and cross-section of the configuration of one of these treatments.

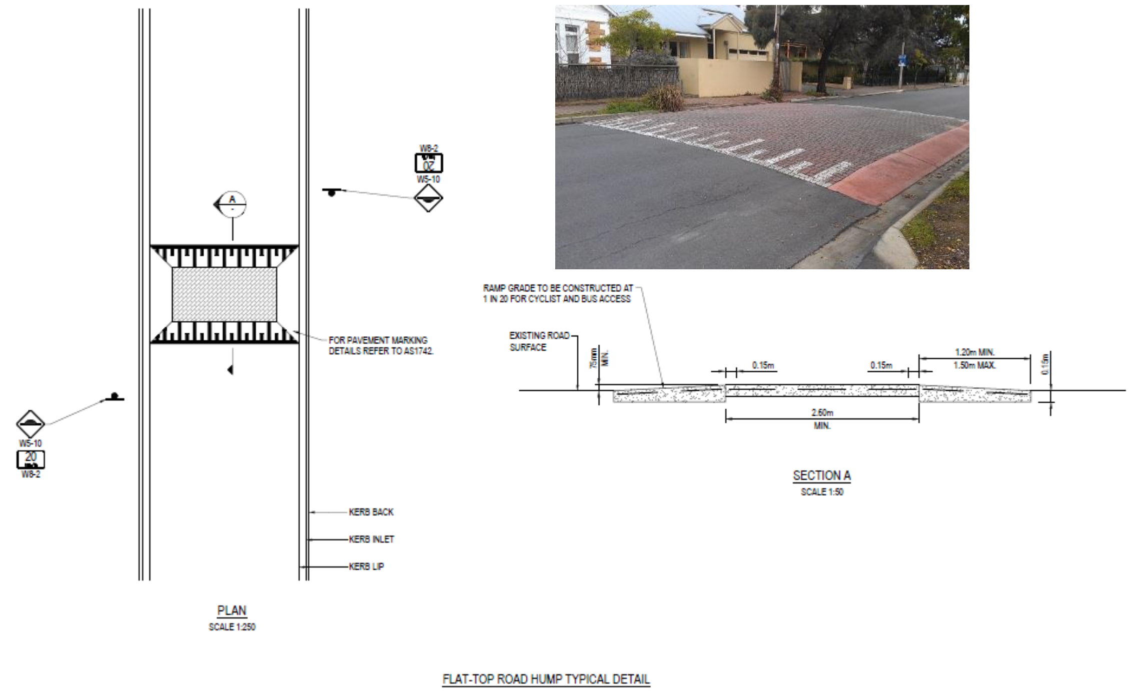


Figure 6.1 – Flat top road hump

The intended outcome of this type is to create physical obstacle to vehicles, which requires them to slow to minimise the amount of vertical displacement and driver discomfort. This in turn reduces the traffic speeds at this point and if applied frequently along a route. The intention being that this reduced speed will have beneficial safety implications in regard to reduced consequences related to vulnerable road user conflicts. It is also intended to make the road less attractive to drivers as they are required to travel slower than desired and hence reduce the likelihood of the route being used as a thoroughfare.

Details associated with the width, length and height of this treatment vary depending on the road width and the amount of speed reduction sought. For the purposes of cost estimation, we have assumed a nominal road width of 11 metres, representing a 7 metre trafficable lane (i.e. 3.5 metre lanes in each direction) and 4 metres on-street parking provision (i.e.2 metres on each side). This width will vary depending on the individual streets applied to. To account for this variability, quantity sensitivities have been applied to the cost estimation, detailed further in Section 7. Other dimensions included in the standard detail include the length of the treatment, represented at 8 metres and the height at 0.75m on a 1:20 approach and departure grade.

6.1.1.2 Wombat Crossing

Similar to the Flat-top Road Hump, a Wombat Crossing is another example of a vertical device. The key difference being that the Wombat Crossing incorporates enhanced pedestrian crossing facilities through the provision of a zebra crossing.

Figure 6.2 illustrates a typical plan view and cross section of the configuration of one of these treatments.

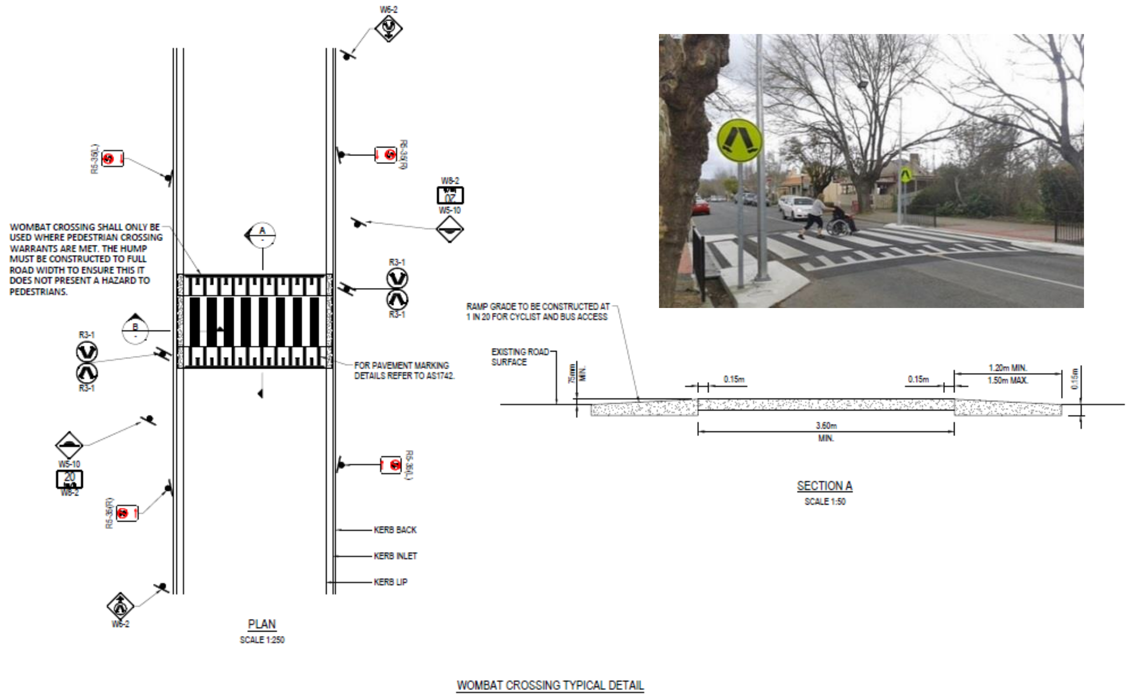


Figure 6.2 – Wombat crossing

As with the flat-top road hump, the intention of this treatment is to provide a physical obstacle to vehicles. The key difference however with this treatment is the presence of a pedestrian zebra crossing. The intention of this is to provide pedestrian enhanced facilities and priority of vehicles, improving pedestrian safety and accessibility. It also contributes to reducing the attractiveness of the route as vehicles are required to slow more to give way to pedestrians.

The dimensions of the wombat crossing are identical to those provided for the flat top hump, as presented previously.

It should be noted that there are potentially some detrimental impacts associated with both the flat-top road hump and the wombat crossing. These include, but are not limited to:

- Increases in traffic noise in close proximity to residential dwellings. Vertical devices may increase the amount of vehicle acceleration and deceleration along a route, including breaking, which may increase traffic noise.
- Potentially contribute to vehicle conflicts associated with loss of control around devices if inappropriate driver behaviour or speeds occur at these features.
- Potential increase in pedestrian and vehicle conflicts. With the inclusion of the zebra crossing, this may give the impression to pedestrians of increased priority on the road. If drivers are unaware of this, the more conflicts between pedestrians and vehicles may occur.

6.1.1.3 Kerb Extensions

Kerb extensions are horizontal devices that reduce road width. Figure 6.3 illustrates a typical plan for kerb extensions associated with both two and four lane roads.

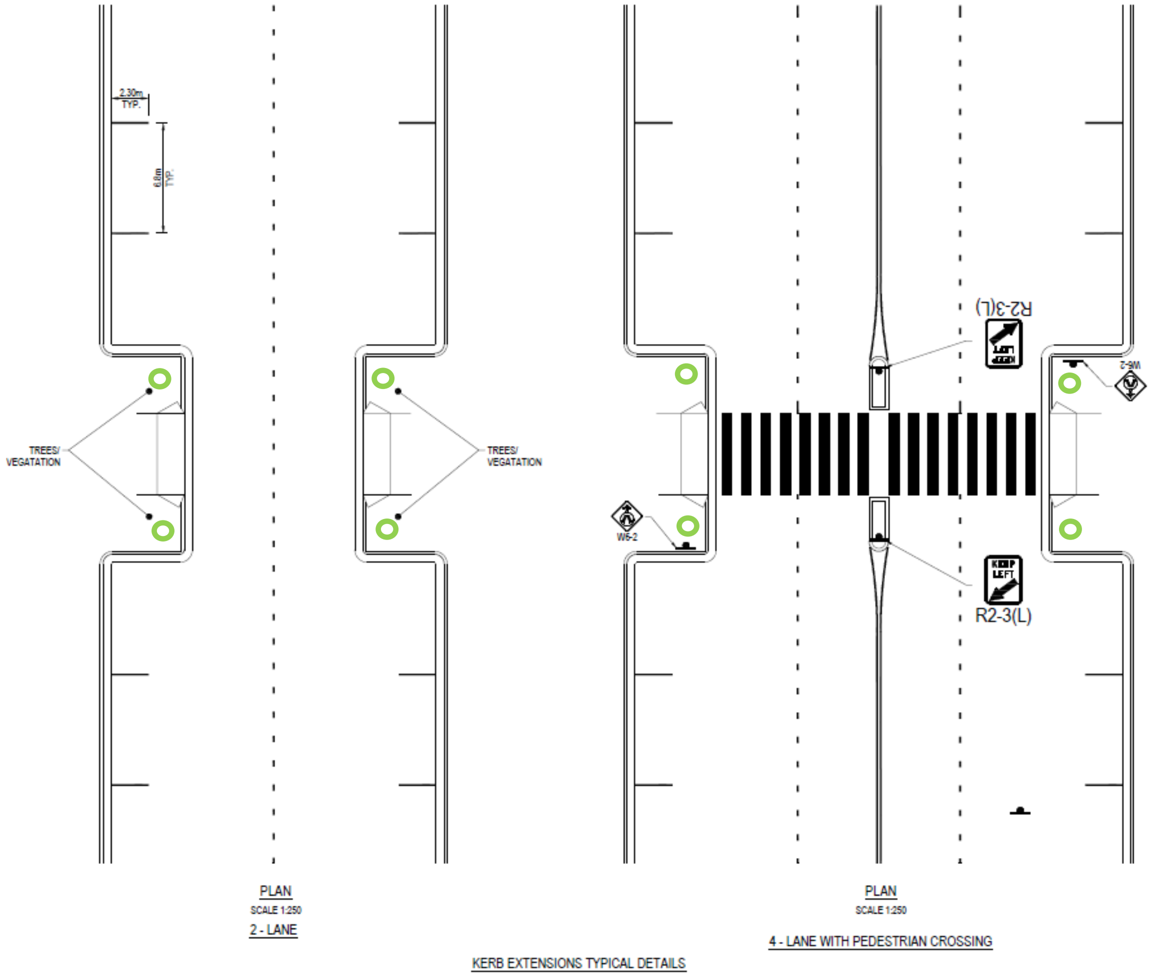


Figure 6.3 – Kerb extensions

The intention of kerb extensions is to narrow the road width to reduce space for vehicles, giving the impressions of a constrained environment which is intended to make vehicles travel slower. This slower travel speed in turn increases travel times along the route, reducing its attractiveness as a through-route. This is intended to reduce the risk associated with potential rat-running.

In the typical detail shown, there are two configurations shown; one for a two lane and one for a four lane road. The reasoning being that there road network classification in the IWC LGA is variable and includes a mixture of two and four lane roads. A feature of both treatments is reduced crossing distances for pedestrians, which is intended to improve accessibility and safety. Although the four lane configuration shows a zebra crossing, this treatment can be implemented without it, with the median pedestrian refugee providing a facility for users.

Details regarding the quantities associated cost estimate of these two treatment types are discussed further in Section 7.

6.1.1.4 Single Lane Angled Slow Point

Single lane angled slow points are an example of a horizontal device. Figure 6.4 illustrates a typical plan view of this treatment.

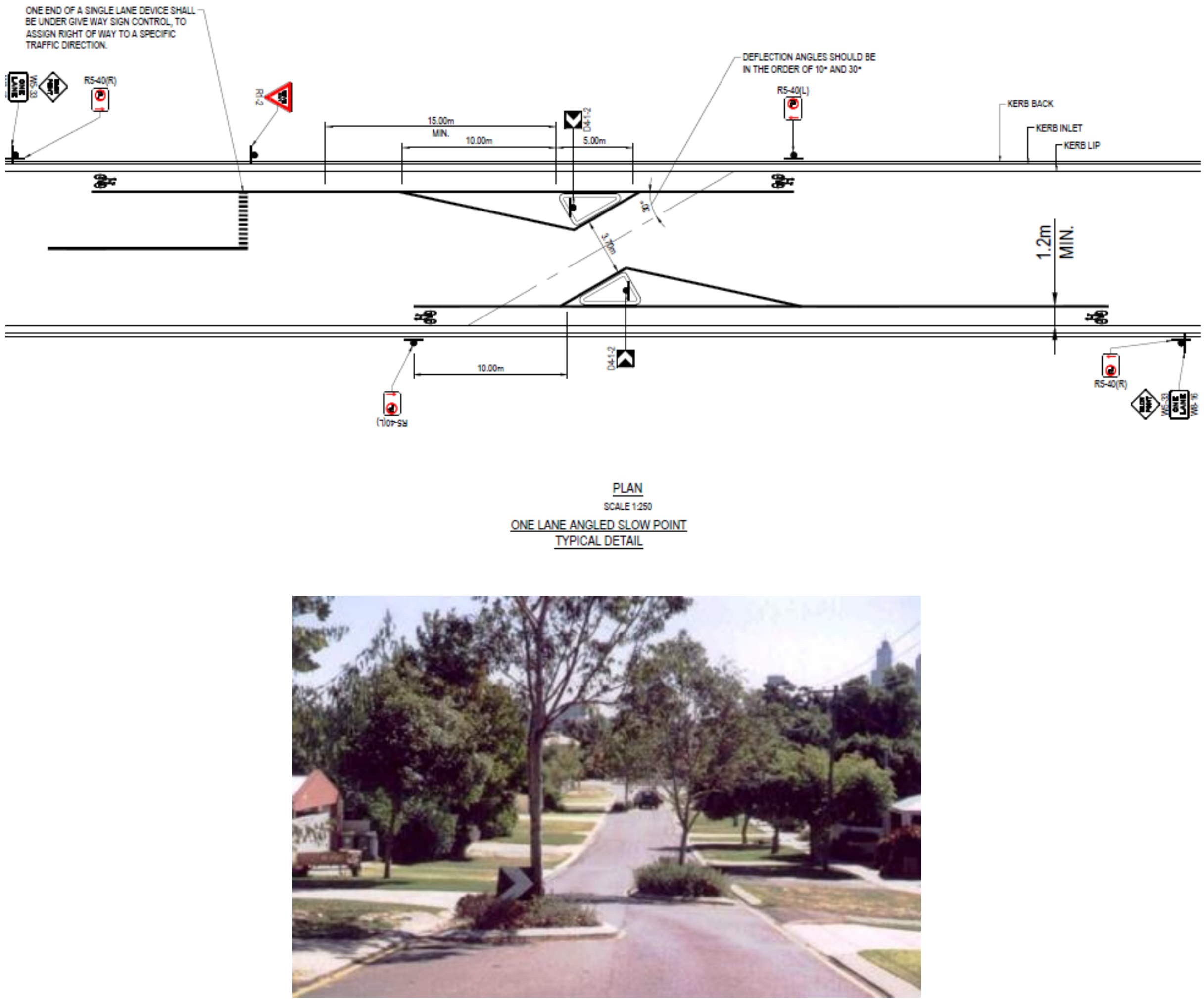


Figure 6.4 – Typical detail of a one lane angled slow point

This treatment works by narrowing the road width so that there is only room for one vehicle to travel through the treatment at a given time. It two vehicles approach the treatment concurrently, then one vehicle is required to give-way to the other, and appropriate signage indicates to drivers to be prepared to give way. The intention of this type of treatment is to provide a physical slow point and change of direction travel to force vehicles to slow. If applied frequently along a route, as well as integrated with other treatment types it encourages reduced travel speeds and hence longer travel times. This has the benefit of reducing the attractiveness of the route and hence reduces the risk of rat-running occurring. Reduced travel speeds are also beneficial in improving overall reduced road safety.

Within the standard detailed provided, it shows the provision of an on-road cycle path. This is included to represent that with this type of treatment, the reallocation of road space to incorporate enhanced active mode facilities is possible. In addition, this type of treatment integrated with landscaping and urban design can enhance the overall amenity if a street. Further details regarding the assumed dimensions of this treatment type are documented further as part of the cost estimation in Section 7.

Some potential negative outcomes of this treatment could include:

- Loss of on-street parking, the provision of the kerb extension and the narrowing of the road width will result in the loss of on-street parking in the vicinity of residential dwellings.
- Potential conflicts between vehicles. As the treatment requires vehicle to give way to each other, this may result in conflicts between vehicles if non-compliance occurs.

6.1.2 Treatment Type 2 – Intersection Modifications

Typical details utilised for Treatment Type 2 include:

- Upgraded priority controlled intersections.
- Modified priority for T-intersections.
- Roundabout intersections.
- Modified signalised intersections.

6.1.2.1 Upgraded Priority Controlled Intersection

The first intersection modification treatment utilised as part of this study involves upgrading existing priority controlled intersections to enhance safety. This involves the provision of improved channelization, as well as pedestrian and cycling facilities. Figure 6.5 illustrates a typical detail associated with an upgraded priority controlled intersection.

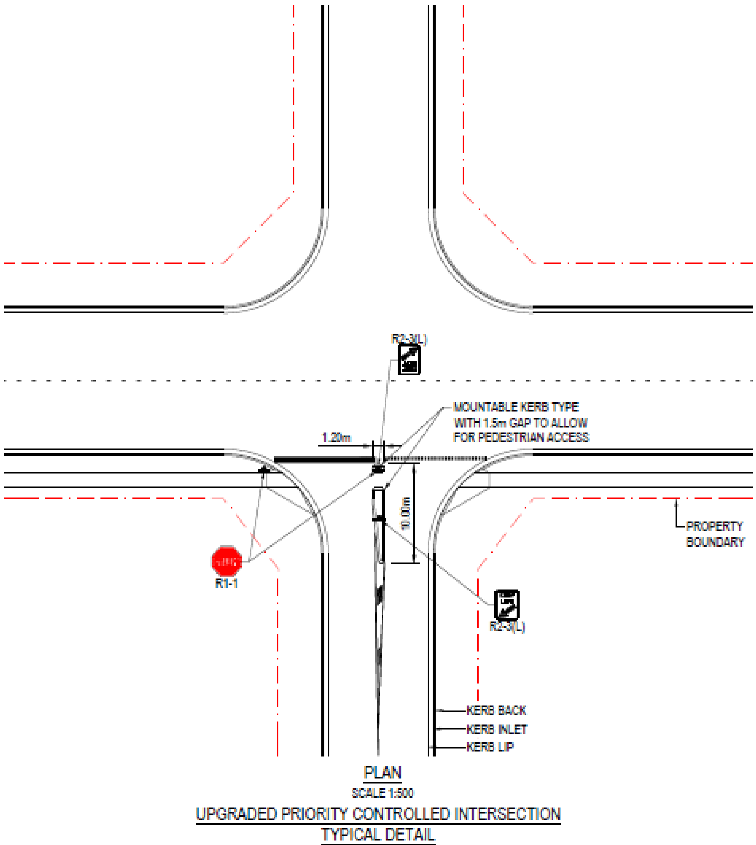


Figure 6.5 – Upgraded priority controlled intersection

The intention of this option is to improve safety at existing priority controlled intersections. This is attempted through the use of increased separation for both vehicles and pedestrians. This option is unlikely to have any effect on the risks associated with rat-running along various routes.

This options would be a considered a low cost implementation option, further details are provided in Section 7.

6.1.2.2 Modified Priority for T-Intersections

The focus of this treatment options is to change the priority of certain movements at intersections. The intention being to align the intersection's function to dominant movements and improve safety. It can also be used as a way of reducing the risk of rat-running by reducing the priority of sensitive routes at key locations. This reduced priority is likely would be expected to increase intersection delay and hence making the route less attractive. Figure 6.6 shows a typical detail of a modified priority intersection.

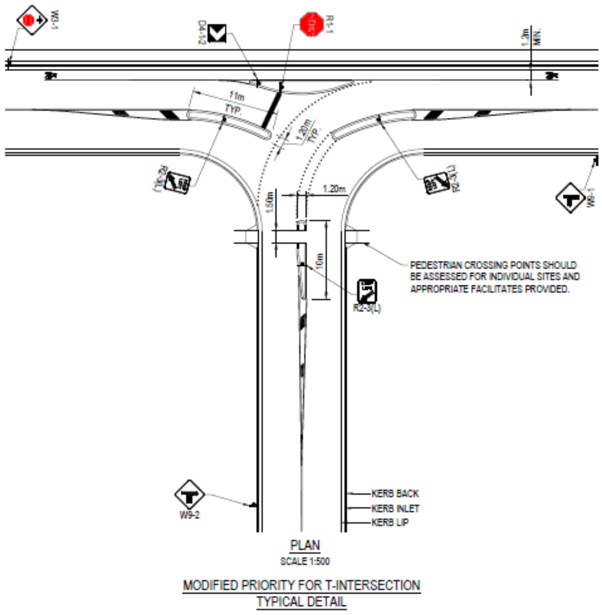


Figure 6.6 – Modified priority intersection

As with the previous treatment type, it is expected that this intersection treatment is likely to be relatively low cost, however further information is provided in Section 7.

6.1.2.3 Roundabout Intersection

The intention of a roundabout solution is twofold. Firstly, the geometry of roundabout, coupled with the stopline causes vehicles to alter their direction of travel and reduce speed, hence increasing the travel time on a route. This reduced speed and deflection also has safety effects for vehicles at the intersection. Figure 6.7 provides a typical plan of a roundabout intersection configuration.

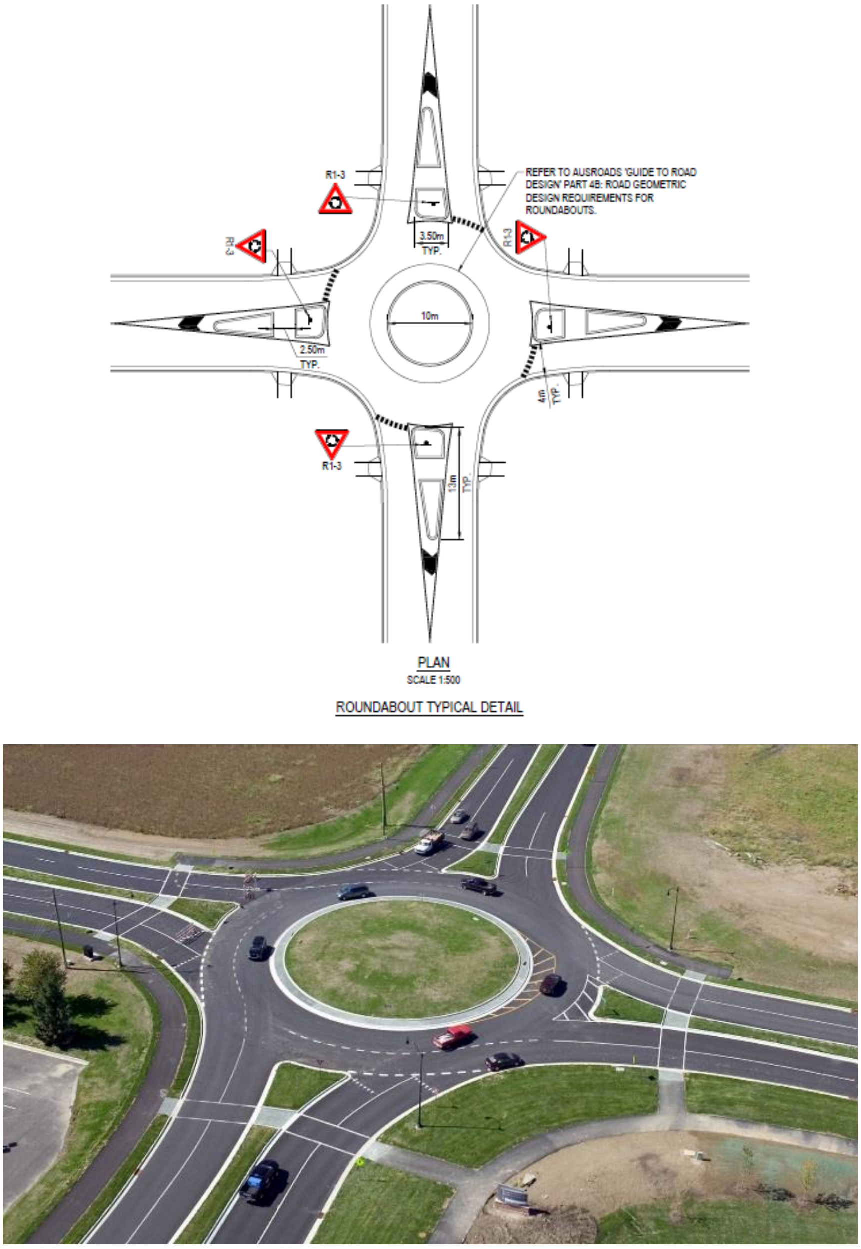


Figure 6.7 –Roundabout intersection

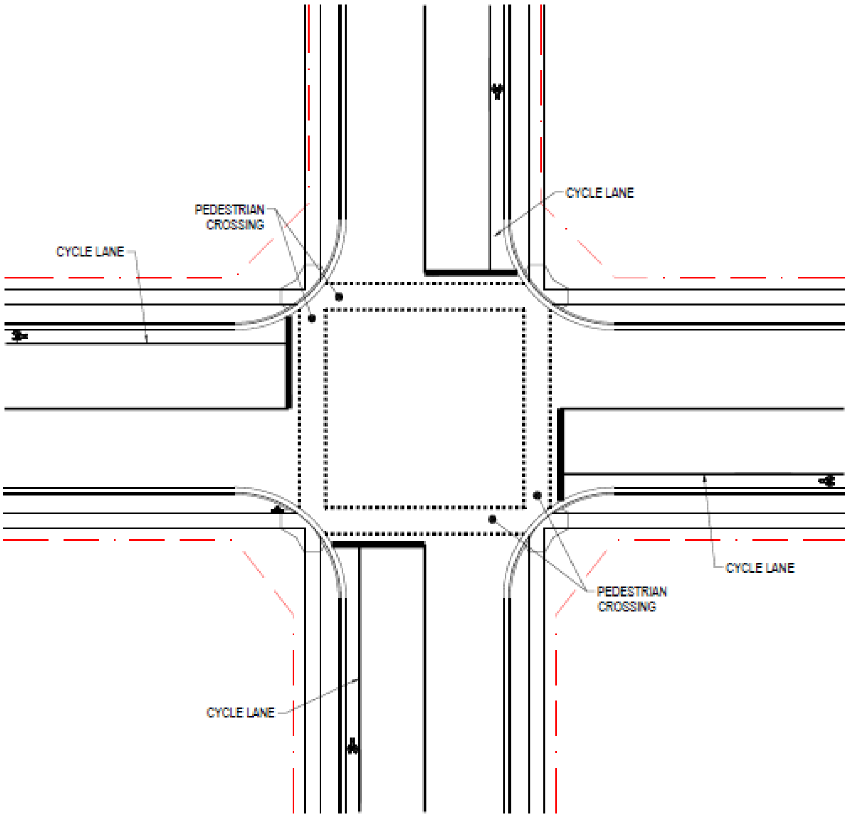
The use of a roundabout intersection configuration may have some unintended consequences, namely:

- The functionality of roundabouts may make the movements out of some roads easier to perform and hence increase the attractiveness of that route, resulting in potentially increased traffic volumes or potential rat-running.
- Roundabouts are known to have potential safety implications for pedestrian and cyclists. This is due to increased conflict points and interactions.

It is expected that this type of treatment would be the most expensive and difficult to implement. This is due to the share scale of the treatment and the amount of physical infrastructure required. Further details regarding the expected cost of this treatment are provided in Section 7.

6.1.2.4 Modified Signalised Intersections

With the completion of WestConnex, potential reductions in traffic on State and Regional roads enables the ability to reallocate capacity at signalised intersections to provide enhanced pedestrian and cycling facilities. These inclusions of enhanced pedestrian and cycling facilities is expected to enhance access, amenity and safety. For this treatment signal phasing could be utilised to disourage rat-running. Figure 6.8 illustrates a typical detail for a signalised intersection, showing full pedestrian crossings and on-road cycle lanes.



PLAN
SCALE 1:500

FULLY SIGNALISED INTERSECTION
TYPICAL DETAIL

Figure 6.8 – Fully signalised intersection

The existing intersections currently in place will vary in regard to the amount pedestrian and cycling facilities provided. For the purposes of developing strategic cost estimates, the following assumptions have been made:

- Provision of two additional pedestrian crossings at each of the intersections.
- Full inclusion of on-road cycling lanes at intersections (assumption none currently).
- Localised kerb widening to accommodate cycle lanes.

Further details regarding the strategic cost estimate for this type of treatment are provided in Section 7.

6.1.3 Treatment Type 3 – Traffic Diversions

Typical details utilised for Treatment Type 3 include:

- Diagonal Road Closure.
- Partial Road Closure.
- Full Road Closure.

6.1.3.1 Diagonal Road Closure

The next treatment investigated involves utilising a diagonal road closure in order to provide a partial road closure, which has less effectiveness and also a reduced effect on the community when compared to a full road closure. This type of partial closure can be utilised as a barrier to through-movements along a route and force vehicles onto parallel routes. Figure 6.9 illustrates a typical plan for a diagonal road closure.

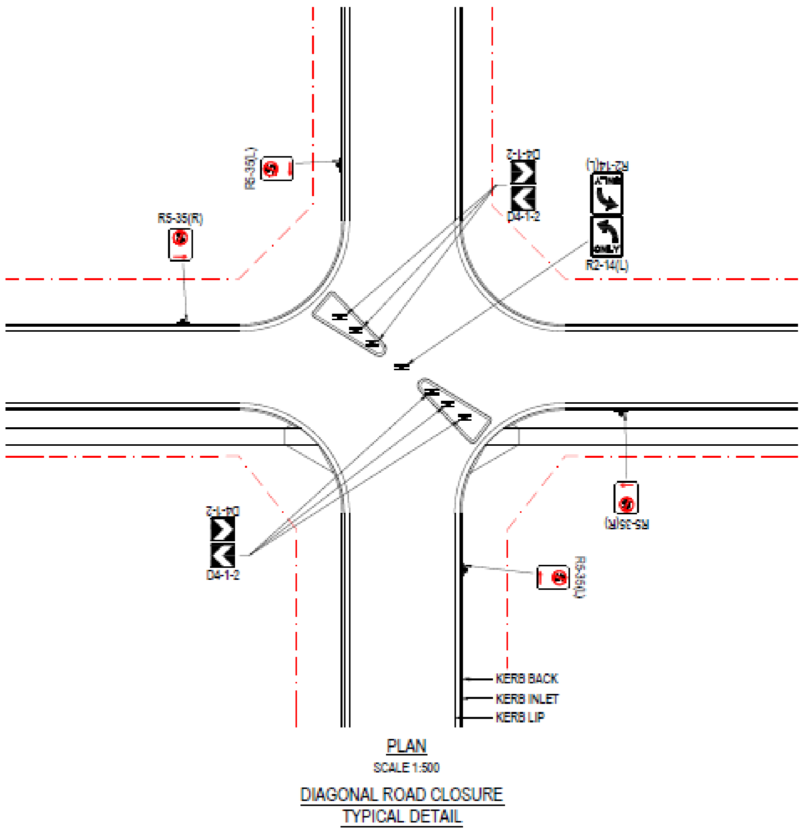


Figure 6.9 – Diagonal road closure

The diagonal road closure illustrated as part of this study and utilised within the cost estimation is based on using static signage to implement the closure. Utilising this level of infrastructure reduces costs, allows for quicker implementation and also maintains accessibility for active modes. This treatment could however be implemented with enhanced physical barriers (i.e. islands/kerbs) to enhance its appearance, which will come at a higher cost and a slower implementation period. This type of treatment could also incorporate landscaping and urban design, enhancing the street’s amenity.

Details regarding this particular treatment in regard to assumptions and associated strategic cost estimates are provided in Section 7.

This type of treatment is likely to affect the accessibility for residents along a particular route. Additionally, as it is a partial closure, it would be expected to have a lower impact in regard to reducing the risk associated with rat-running and maybe required to be implemented in lieu of other treatment options to be effective.

6.1.3.2 Partial Road Closure

Another type of partial road closure investigated is associated with traffic diversions. With this option access is limited to certain movements, which allows for greater control of flow patterns and maintains some, albeit reduced level of accessibility for residents. Figure 6.10 illustrates a typical plan for a partial road closure.

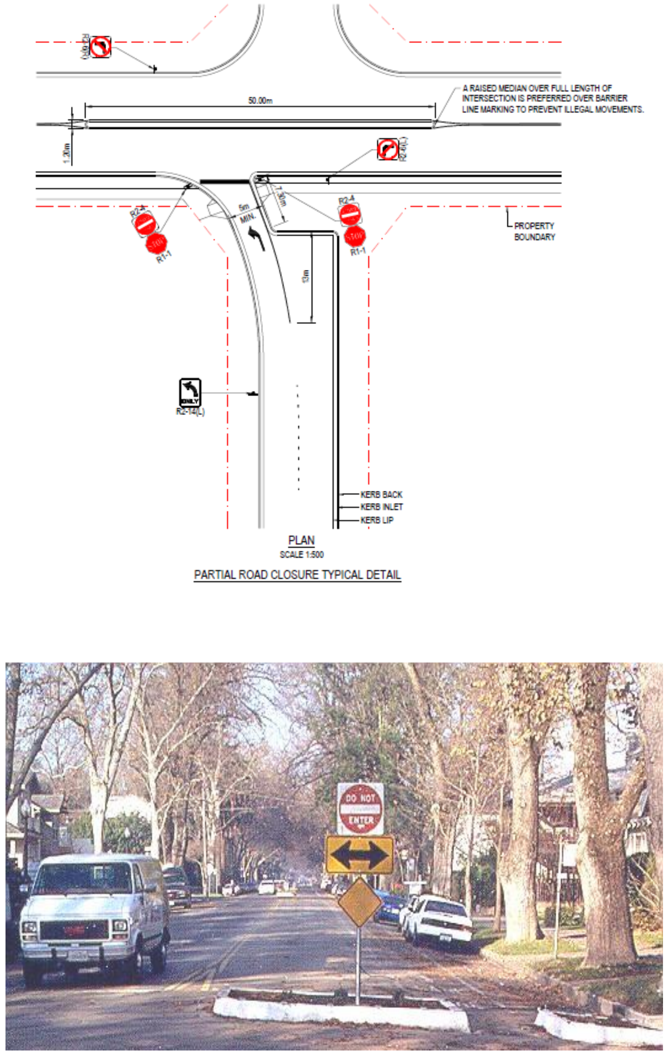


Figure 6.10 – Partial road closure

With the treatment shown, this indicates a left-out intersection arrangement, reducing the overall accessibility of the intersection and route. With this configurations, it still allows the movement out of the route, but not the movement in. This provides an opportunity for residents to maintain some of their accessibility, however they are still likely to be some detrimental impacts on resident travel as a result of this option.

As indicated previously, details regarding this particular treatment in regard to assumptions and associated strategic cost estimates are provided in Section 7.

6.1.3.3 Full Road Closure

The most severe in terms on its effectiveness and effects on the community is a full road closure. This type of treatment creates a physical barrier that limits accessibility and hence removes the ability of some routes to be used as thorough-fares. Figure 6.11 illustrates a typical plan for a full road closure.

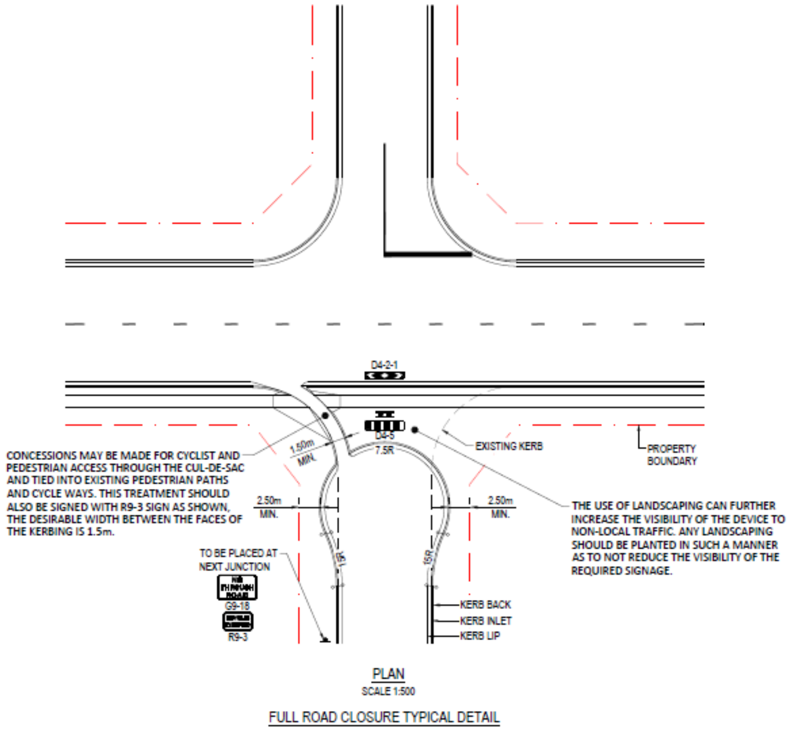


Figure 6.11– Full road closure

The intention of this treatment is to close access on some streets to create a more clearly defined road hierarchy where certain streets cannot be used as thoroughfares. This effectively removes the possibility of the route it has been applied to, to be used as a rat-run. The typical detail indicated shows the provision of a cycle path which maintains active mode accessibility.

Other features that can be incorporated include landscaping and urban design, as well as lesser treatments that may just incorporate signage. Details regarding dimensions assumed, as well as cost estimations are provided in Section 7.

These treatments do reduce the amount of access provided to residents along a route, affecting their travel patterns. In addition, this type of treatment may place increase traffic onto other parts of the network, potentially diminishing the amenity of those streets or placing strain on existing infrastructure (i.e. intersections).

6.2 Precinct Scheme Development

As discussed previously in Section 5.6, treatment strategies for the LAIS have been developed on a precinct basis, these precincts being:

- Haberfield – Confined to Iron Cove Creek to the west, City West Link to the north, Light Rail to the east and Parramatta Road to the south;
- Ashfield – Confined to Frederick Street to the west, Parramatta Road to the north, Light Rail to the east and Heavy Rail to the South;
- Leichhardt West – Confined to City West Link to the north, Light Rail to the east and Parramatta Road to South; and
- Johnston Street Routes – these are the routes including and operating parallel to Johnston Street, this is confined to City West Link in the North, the LGA boundary to the east and Parramatta Road to the South.

In addition to this, treatment strategies were developed for selected routes around St Peters.

The selection of treatment types, as well as their locations were developed based on areas that are likely to be sensitive to changes in travel behaviours as a result of WestConnex, as detailed earlier in the report. In addition to this, community feedback and intended amenity improvements have been considered. The treatments are focused around core areas (most affected/likely for rat running and peripheral routes where dispersal is likely). Local roads unlikely to become rat runs due to geometry or lack of connections are not included as locations for treatments. Treatment types have been selected in a way that is relevant to their location and the existing provisions in place (e.g. if there is currently a roundabout, then this is maintained). Additionally, in areas where traffic calming treatments are implemented gateway treatments will be put in place to make drivers aware of the changes in conditions.

Further details regarding the treatment logic for the various precincts to inform the strategic cost estimate are provided below. Drawings identifying the various locations and types of treatments assumed for the strategic cost estimate are provided in **Appendix D.**

6.2.1 Ashfield Precinct LAIS Strategy

The Ashfield Precinct is bound by three major State Roads, these being: Parramatta Road, Hume Highway and Frederick Street. Congestion currently occurs on these routes, which may continue post implementation of WestConnex. Therefore, vehicles may attempt to avoid congestion by taking rat-running opportunities within the Ashfield Precinct. A highly effective but also disruptive to residents way,to avoid this sort of behaviour occurring is to provide Treatment Type 3 (Traffic Diversions) on local roads that connect these State Roads. Within the Ashfield Precinct, Treatment Type 3 infrastructure has been assumed at:

- Ormond Street to restrict traffic from Parramatta Road.
- Chandos Street to restrict traffic from Parramatta Road.
- Henry Street to restrict traffic from Frederick Street

- John Street to restrict traffic from Frederick Road.

The use of these treatment types also helps to create a more well defined and consistent road hierarchy, which allows local streets to maintain their amenity and not been used as a thoroughfare. However, when implementing traffic diversions, consideration needs to be given regarding access for local residents as well as maintaining access for buses. Additionally, these treatments can divert traffic onto alternative roads, potentially creating an issue elsewhere. Within the strategy put forward, access within the precinct has been maintained on Bland Street and Elizabeth Street.

Along Bland Street there are a number of schools and churches, whilst Elizabeth Street is in close proximity to the Ashfield Station and the Ashfield retail areas. These land-uses typically result in high pedestrian activity, this coupled with potential higher traffic volumes or speeds could result increased conflicts. Therefore to attempt to mitigate this, Treatment Type 1 infrastructure (Traffic Calming) has been recommended along these routes with an assumed frequency of 100m. In addition to this, to enhance pedestrian and cycling provisions, a number of Treatment Type 2 (Intersection Modifications) have been provided.

When treatments are applied to Elizabeth Street and Bland Street, consideration of adjacent streets is required due to the potential for traffic to be shifted onto these streets. Potential re-direction streets within Ashfield include Alt Street, Charlotte Street, Chandos Street and Orpington Street. On these streets, as well as others for the same rationale, a number of traffic diversions have been assumed.

6.2.2 Haberfield Precinct LAIS Strategy

The Haberfield Precinct lies between two major east-west roads, these being Parramatta Road and City West Link, both of which carry traffic coming the M4 East's Wattle Street portal. Motorists looking to avoid congestion on these roads may travel along Ramsay Street and Marion Street, regional roads that cut through the Haberfield Precinct. There routes also serve as a major access point to the precinct, as well as the Haberfield retail area. Traffic diversions could be placed along local streets that connect with these roads to avoid potential rat-running opportunities onto local streets. For the Haberfield Precinct, traffic diversions have been assumed at:

- Chandos Street to restrict traffic from Parramatta Road.
- O'Connor Street to restrict traffic from Parramatta Road.
- Sloane Street to restrict traffic from Parramatta Road.
- O'Connor Street to restrict traffic from Ramsay Street.
- Intersection of Learmonth Street and Dudley Street to restrict traffic from Mortley Avenue.

As with the Ashfield Precinct, the use of these treatment types also helps to create a more well-defined and consistent road hierarchy, which allows local streets to maintain their amenity and not be used as a thoroughfare. However, when implementing traffic diversions, consideration needs to be given regarding access for local residents. Additionally, these treatments can divert traffic onto alternative roads, potentially creating an issue elsewhere. Access to the Precinct is maintained primarily through Waratah Street, Mortley Avenue, Dalhousie Street, Hawthorne Parade and Bland Street, connecting through Ramsay and Marion Street.

Existing traffic calming measures already exist along sections of Waratah Street (outside Dobroyd Point Public School) and Dalhousie Street (between Waratah Street and Ramsay Street). The strategy has identified that there is benefit in providing new traffic calming and intersection modifications in the vicinity of Haberfield Public School and the Haberfield Retail Area, as an assumed frequency of 100 metres.

With the implementation of these treatments, consideration is required on parallel routes to ensure traffic is not diverted onto these routes, creating issues. As the local streets in this area form a grid pattern, it is difficult to know exactly which roads would be affected. One way to create a clear road network is the use of more traffic diversions, which creates a clearer hierarchy and limits the risks associated with trip migration. If it is not possible to implement these, then traffic calming and intersection modifications will reduce the attractiveness of these alternative routes and maintain desired amenity.

This strategy is applied on local roads around Martin Street and Kingston Street, with traffic diversions placed along these streets to break up the grid pattern and remove the viability of these routes entirely. Traffic calming and intersection modifications are then placed on any remaining routes to discourage their use by through traffic whilst still allowing access to local residents.

6.2.3 Leichhardt West Precinct LAIS Strategy

The Leichhardt West Precinct is situated within a number of north-south routes formed around Tebbutt Street, Foster Street and Darley Road, and the east-west routes Marion Street and Parramatta Road.

Motorists looking to avoid congestion on the north south links may look for rat-running opportunities via Flood Street or Elswick Street. Traffic diversions can be placed along these routes to remove the viability of these routes entirely, such as restricting access to north Flood Street from Allen Street and restricting access to the numerous local road access to Darley Road.

If this is not possible without severely impacting access for residents and other users of this precinct, then Traffic calming and Intersection Modifications could be effective at minimising this risk of rat-running along this route.

Within the Leichhardt West Precinct, traffic diversions have been assumed at:

- On Upward Street to restrict traffic from Parramatta Road.
- On George Street to restrict traffic from Parramatta Road.
- On William Street to restrict traffic from Darley Road.
- On Falls Street to restrict traffic from Darley Road.
- On the four unnamed lanes between Falls Street and James Street to restrict traffic from Darley Road.
- Intersection of Regent Street and Edith Street to break up the grid pattern and restrict through traffic.
- On Flood Street to restrict traffic from the intersection of Allen Street and Flood Street.

The configuration of local roads makes east-west rat running through the Leichhardt West precinct to avoid Marion Street and Parramatta Road a relatively minor concern. Of note is the potential rat running through Marlborough Street, Carlisle Street and Macaulay Street. Installation of traffic calming infrastructure along the route will help minimise potential rat-running.

If traffic diversions (Treatment Type 2) are implemented, it is possible that traffic will get diverted on to north south routes, including: Burfitt Street, Edith Street and North Street. On these routes traffic calming infrastructure measures at 100 metre intervals have been assumed.

6.2.4 Johnston Street Precinct LAIS Strategy

The Johnston Street precinct is situated south of the planned Rozelle interchange portals, with Parramatta Road running on its southern border. Johnston Street and The Crescent will form major access routes for vehicles looking to use the Rozelle interchange.

Johnston Street runs through a retail precinct and is adjacent to a number of schools and churches. As this road is a State Road, the treatments identified for the strategy have been limited to improved pedestrian and cycling facilities, as indicated with traffic calming and intersection modifications.

Vehicles looking to avoid congestion on Johnston Street or The Crescent may look for rat-running opportunities via the many numerous parallel roads such as Annandale Street or Nelson Street. Traffic calming be placed along these routes or with their connections to Parramatta Road remove the viability of these routes entirely. If this is not possible without severely impacting access for residents and other users of this precinct, traffic calming could be implement to reduce the risk associated with rat-running.

Within the Johnston Street Precinct, traffic diversions infrastructure has been assumed at:

- Young Street to restrict traffic from Parramatta Road
- Annandale Street to restrict traffic from Parramatta Road
- Trafalgar Street to restrict traffic from Parramatta Road
- Nelson Street to restrict traffic from Parramatta Road
- Breillat Street to restrict traffic from Pritchard Street
- Intersection of Annandale Street and Piper Street to break up the grid pattern and restrict through traffic
- Intersection of Annandale Street and Weynton Street to break up the grid pattern and restrict through traffic

6.2.5 St Peters Routes LAIS Strategy

The primary routes identified within St Peters include Unwins Bridge Road, Bedwin Road, and Edgeware Road. Edgeware Road is particular subject to significant community concerns regarding traffic and pedestrian safety. A mixture of traffic calming and intersection modifications will help to minimise traffic speeds and improve safety, particularly with the use of pedestrian and cycling infrastructure, coupled with horizontal devices. Other routes within the vicinity have similar identified issues as St Peters and hence similar recommended solutions.

7 Strategic Cost Estimate

To assist in discussions with Roads and Maritime and provide IWC with an indication of an indicative cost to deliver the treatment types identified, as well as selection of treatments across the precincts discussed, a strategic cost estimate was undertaken.

This strategic cost estimate has been undertaken at a high level and intended to give a ball park value and potential range of costs. It is not intended to inform a forward works programme or provide an absolute assurance on expected project costs.

Detailed below is the methodology, assumptions and outcomes associated with the strategic cost estimate.

7.1 Methodology

The strategic cost estimation has been conducted on a measure and value basis, that being quantities of materials and labour associated with an industry recognised unit rate. As the design of treatments is at the strategic level, with few specific details and relevance to on-site conditions, there are likely to be large variabilities in the ultimate expected cost. To address this variability, the following was undertaken:

- Ranges of quantities were utilised, these being a base, lower (75%) and higher (150%) of measured quantity.
- Allowance for design and project management of 25% of measured costs.
- Inclusion of 20% contingency on measured costs.

These cost estimates were developed for each of the treatment options discussed previously in Section 6.1. Unit rates for various components of the treatments were determined utilising the following sources:

- Rawlinsons' Australia Construction Handbook (ACH) 2017;
- Marrickville Unit Rates 2016/17, updated by 30% as advised in 31 July 2017 email from IWC ;
- Supplier websites, where possible.

No update factors or allowance for annual adjustments to the consumer price index (CPI) have been applied to these unit rates. Additionally, there has been no allowance for operating expenditure, annual or periodic maintenance, and is solely isolated to capital expenditure.

Once the treatment costs were estimated, these were multiplied by the number identified for each precinct. As the types of treatments used will vary and be dependent on the scheme design, the precinct costs are presented as lower order and higher order costs. Lower order being the cheaper treatment types and higher order being the more expensive treatments, with the assumption they applied cross all the identified locations.

7.2 Treatment Cost Estimates

Included within this section are details regarding the individual treatment cost estimates for the various treatment options identified.

For all treatment (unless stated otherwise), the following assumptions have been made:

- Road carriageway width of 11 metres with a pavement profile consisting of 150mm thick asphalt.
- 150mm high 32 MPa concrete kerbs.
- Footpath thickness of 80mm, constructed of unreinforced 32 MPa concrete.

- Road Occupancy Licence (ROL) from Roads and Maritime required.

It is to be noted that the costs mentioned below do not account for landscaping, drainage or work related to utilities.

7.2.1 Flat-Top Road Hump

For the development of the Flat-Top Road Hump, the following dimensions and specification have been adopted:

- Dimensions of 75mm high (0.75m) with a 1.5 metre long incline on all approached, flattop is 3.6m long.
- Equivalent existing pavement to be demolished and disposed.
- Constructed of 40 MPa, SL82 steel mesh reinforced concrete, with a thickness of 150mm of flattop and 200mm on incline.
- Road markings of 100mm white paint.
- Four standard road signs.
- Assumed to take a typical work day to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.1.

Table 7.1 – Flat-Top Road Hump Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	19,400	24,300	36,200

7.2.2 Wombat Crossing

For the development of the Wombat Crossing, the following dimensions and specification have been adopted:

- Dimensions of 75mm high (0.75m) with a 1.5 metre long incline on approaches, flattop is 3.6m long.
- Equivalent existing pavement to be demolished and disposed.
- Constructed of 40 MPa, SL82 steel mesh reinforced concrete, with a thickness of 150mm of flattop and 200mm on incline.
- Road markings of 100mm white paint.
- Twelve standard road signs.
- Assumed to take two typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.2.

Table 7.2 – Wombat Crossing Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	22,500	29,800	42,900

7.2.3 Lane Narrowing (2-lane Road)

For the development of the lane narrowing (kerb extension), the following dimensions and specifications have been adopted:

- Based on narrowing the road carriageway width from 11 metres to seven metres, over a road length of 10 metres.
- Equivalent existing pavement to be demolished and disposed.
- Removal of kerbing, assumed to be equivalent to 150mm concrete slab.
- Two pedestrian kerb drop downs and concrete slab provided.
- Pedestrian fencing and landscaping.
- Assumed to take two typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.3

Table 7.3 – Lane Narrowing (2-Lane) Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	38,800	47,800	63,900

7.2.4 Lane Narrowing (4-lane Road)

For the development of the lane narrowing (kerb extension), the following dimensions and specifications have been adopted:

- Based on narrowing the road carriageway width from 18 metres to 14 metres, over a road length of 10 metres.
- Equivalent existing pavement to be demolished and disposed.
- Removal of kerbing, assumed to be equivalent to 150mm concrete slab.
- Two pedestrian kerb drop downs and concrete slab provided.
- 100mm wide white pavement markings.
- Six standard signs.
- Pedestrian fencing and landscaping.
- Assumed to take three typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.4.

Table 7.4 – Lane Narrowing (4-Lane) Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	54,300	67,200	94,100

7.2.5 Slow Point

For the development of the slow point, the following dimensions and specification have been adopted:

- Design based on a one lane slow point, with a carriageway width of 3.7m, at an angle of 30 degrees off centre.
- Kerbed Blister Island with landscaped infill on both sides.
- 1.2 metres cycle lane provision between kerb base and Blister Island.
- Equivalent existing pavement to be demolished and disposed.
- 100mm wide white paint markings and on-road bike symbols.
- Nine standard signs.
- Assumed to take two typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.5.

Table 7.5 – Slow Point Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	16,400	21,900	28,300

7.2.6 Upgraded Priority Controlled Intersection

For the development of the upgraded priority controlled intersection, the following dimensions and specification have been adopted:

- Design based on installation of one Median Island with a pedestrian refuge.
- Equivalent existing pavement to be demolished and disposed.
- Relocation of pedestrian ramps to align with pedestrian refuge.
- 100mm wide white pavement markings.
- Four standard signs.
- Assumed to take one typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.6.

Table 7.6 – Full Road Closure Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	21,400	27,200	40,800

7.2.7 Modified Priority for T-intersection

For the development of the modified priority for t-intersection, the following dimensions and specification have been adopted:

- Design based on changing the priority of the t-intersection to make one arm of the through road yield to movements going across the other two arms
- Three Median Islands with pedestrian refuges, with pedestrian ramps relocated to align with the pedestrian refuges.
- Kerbed Blister Island with concrete infill on the through road opposite the ending road.
- Equivalent existing pavement to be demolished and disposed.
- 1.2 metres cycle lane provision between kerb base and Blister Island.
- 100mm wide white paint markings and on-road bike symbols.
- Five standard signs.
- Assumed to take a typical work day to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.7.

Table 7.7 – Modified Priority for T-intersection Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	51,300	68,000	104,600

7.2.8 Roundabout Intersection

For the development of the roundabout intersection, the following dimensions and specification have been adopted:

- Design based on a 10m wide Roundabout and four Median Islands with pedestrian refuges.
- Equivalent existing pavement to be demolished and disposed.
- Pedestrian ramps 4 relocated to align with the pedestrian refuges.
- 100mm wide white paint markings and on-road bike symbols.
- Four standard signs.
- Assumed to take three typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.8.

Table 7.8 – Roundabout Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	104,900	140,300	211,300

7.2.9 Modified Signalised Intersection

For the development of the modified signalised intersection, the following dimensions and specification have been adopted:

- Design based the installing two new pedestrian crossings and four new cycle lanes, including required lanterns and push buttons.
- 100mm wide white paint markings and on-road bike symbols.
- Assumed to take a typical work day to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.9.

Table 7.9 – Modified Signalised Intersection Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	60,800	86,900	130,400

7.2.10 Diagonal Road Closure

For the development of the diagonal road closure, the following dimensions and specification have been adopted:

- Design based on the closure of the centre of a four-way intersection to create two independently operating through roads.
- Kerbed Blister Island with landscaped infill on two corners of the intersection.
- Equivalent existing pavement to be demolished and disposed.
- 1.2 metres gap between Blister Islands to allow cyclists to pass through.
- Sixteen standard signs.
- Assumed to take two typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.10.

Table 7.10 – Diagonal Road Closure Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	26,400	34,500	48,200

7.2.11 Partial Road Closure

For the development of the partial road closure, the following dimensions and specification have been adopted:

- Design based on reclaiming a 7m section of the road to footpath or vegetation, with a single carriageway width of 5m provided to allow exiting left turn movements.
- Equivalent existing pavement to be demolished and disposed.
- Removal of kerbing, assumed to be equivalent to 150mm concrete slab.
- Two pedestrian kerb drop downs and concrete slab provided.
- Seven standard signs.
- Assumed to take five typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.11.

Table 7.11 – Partial Road Closure Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	47,000	56,200	76,600

7.2.12 Full Road Closure

For the development of the full road closure, the following dimensions and specification have been adopted:

- Design based on reclaiming a 7m section of the road to footpath or vegetation, with a 1.2 metres cycle lane provision through the closure.
- Equivalent existing pavement to be demolished and disposed.
- Removal of kerbing, assumed to be equivalent to 150mm concrete slab.
- Four standard signs.
- Assumed to take five typical work days to complete, including traffic control.

Based on the specifications listed above, the lower, base and upper range cost for this treatment were determined and are presented in Table 7.12.

Table 7.12 – Full Road Closure Cost Estimate

	Lower Band	Base	Higher Band
Cost ($)	86,600	113,500	164,300

7.3 Precinct Cost Estimates

Utilising the information from Section 7.2, these treatments have been utilised to inform strategic cost estimates for the precincts identified earlier. As discussed previously, in order to calculate the costs for the precinct, the number of treatment types assumed is required. Summarised in Table 7.14 is the assumed number of treatment options for each of the precincts. These are as per the treatment locations identified in the drawings attached in **Appendix E.**

Table 7.14 – Assumed number of treatment options per precinct

	Core Impact Area			Peripheral Area		
	Treatment Option 1	Treatment Option 2	Treatment Option 3	Treatment Option 1	Treatment Option 2	Treatment Option 3
Ashfield Precinct	14	13	3	6	3	1
Haberfield Precinct	12	22	5	13	25	6
Leichhardt West Precinct	5	18	6	11	9	4
Johnston Street Precinct	12	18	6	15	13	3
St Peters Routes	4	8	0	3	4	0

Based on the information in Table 7.14, high range and low range cost estimates for each of the precincts are provided in Table 7.15.

Table 7.15 – Precinct low range and high range cost estimates

	Low Range Cost		High Range Cost	
	Core Impact Area	Peripheral Area	Core Impact Area	Peripheral Area
Ashfield Precinct	$763,000	$247,300	$3,105,400	$937,600
Haberfield Precinct	$1,032,600	$1,170,500	$4,460,700	$5,062,300
Leichhardt West Precinct	$805,200	$623,100	$3,542,500	$2,455,900
Johnston Street Precinct	$958,400	$784,900	$4,012,900	$3,172,600
St Peters Routes	$304,900	$174,300	$1,391,300	$762,900
Total Costs	$6,864,200		$28,904,100	

The information in Table 7.15 indicates a potential strategic cost range for all the precincts of between $6,864,200 and $28,904,100.

8 Recommendations and Conclusions

With any major infrastructure project, the general intention is to provide improvements, WestConnex is no different. Although, the objective of the project is to provide increased vehicular capacity through the Inner West, this may generate unforeseen effects. In response to this, the Inner West Council (IWC) has commissioned this Local Area Improvement Strategy to identify potential effects associated with the various stages of WestConnex and develop a strategy to off-set these effects. To achieve this, the following project objectives have been developed:

- Understand and benchmark the transport system that currently exists within the IWC area.
- Understand the extent of WestConnex and identify potential issues associated with its implementation.
- Identify a strategy to mitigate effects to be incorporated into the delivery of WestConnex.

The ultimate outcome associated with this strategy is to identify treatment options available, where they could be applied within the Inner West to offset potential effects and establish a strategic cost estimate.

To do this, traffic modelling information, coupled with community concerns were utilised to identify areas that are sensitive to changes in traffic volumes or speeds as a result of WestConnex. This identified areas of short term (WestConnex Stage 1 and 2) and long term (WestConnex Stage 3) sensitivities, which was utilised to develop a number of precinct study areas for the development of Local Area Improvement Strategy (LAIS). The precinct identified as part of this study:

- Haberfield – Confined to Iron Cove Creek to the west, City West Link to the north, Light Rail to the east and Parramatta Road to the south;
- Ashfield – Confined to Frederick Street to the west, Parramatta Road to the north, Light Rail to the east and Heavy Rail to the South;
- Leichhardt West – Confined to City West Link to the north, Light Rail to the east and Parramatta Road to South; and
- Johnston Street Routes – these are the routes including and operating parallel to Johnston Street, this is confined to City West Link in the North, the LGA boundary to the east and Parramatta Road to the South.
- St Peters – Routes along Edgeware and Unwins Bridge Road, as well as local adjoining streets.

For each of these precincts, strategy plans were developed based on three treatment option types, these being:

- Treatment Type 1 – Integrated Traffic Calming, with Pedestrian and Cyclist Facilities. This options looks to utilise a mixture of horizontal and vertical devices, coupled with urban design, landscaping and other traffic improvements. The intention of these type of treatments is to reduce the attractiveness of routes as a thoroughfare, as well as reducing traffic speeds. This is achieved through visual cues, as well as physical deterrents.
- Treatment Type 2 – Intersection Modifications. This option looks to provide pedestrian, cyclist and improved safety facilities at intersections. This can be achieved through new intersection forms (i.e. roundabouts) or enhanced facilities at existing intersections. The intention of this option is to off-set potential safety effects of increased traffic speeds or volumes, whilst encouraging more active transport.
- Treatment Type 3 – Traffic Diversions. This option looks to create physical boundaries to create a road network that hinders the opportunities for rat-running. To do this, a more consistent road network is created through the use of road diversions, which can be in the form of fully or partial closures. These restrict the functionality of access for certain movements, which provides a higher level of control.

This information was then used to develop strategic cost estimates utilising industry recognised unit standard costs for components of infrastructure identified. This information applied to the precinct strategies indicated a potential strategic cost range of between $6,864,200and $28,904,100.

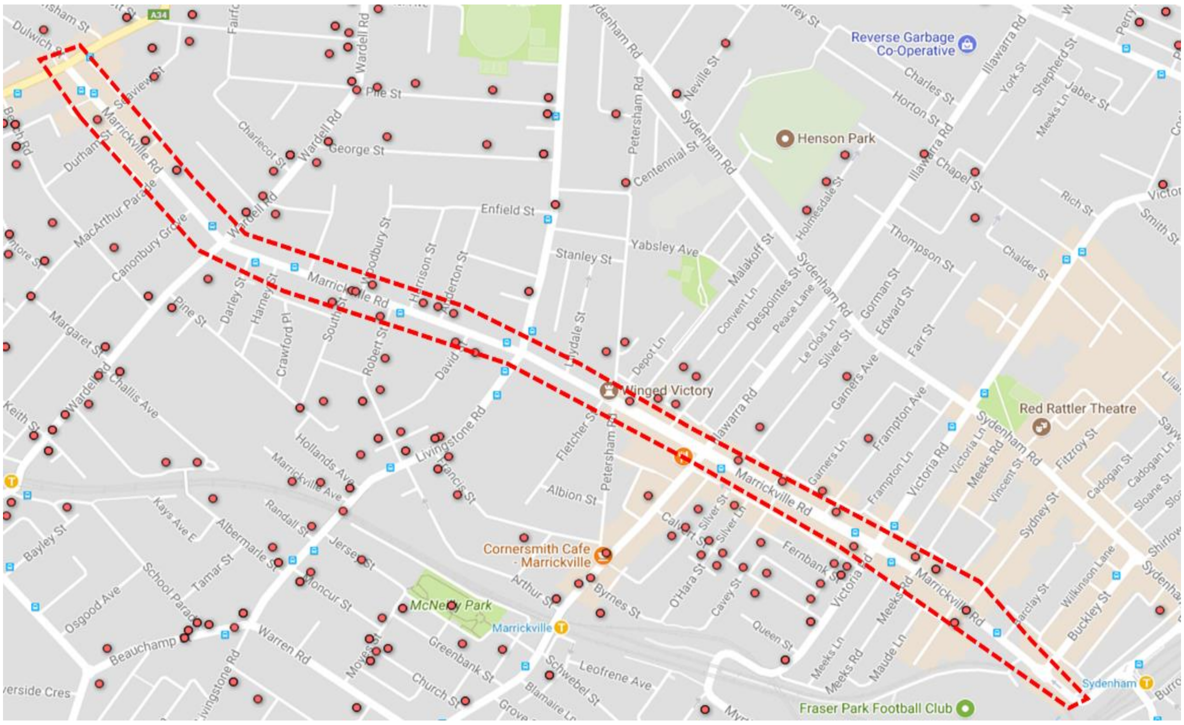
It is intended that this cost information, coupled with information and data presented within this report will assist in IWC in discussions with Roads and Maritime regarding funding for the implementation of LAIS to offset the effects of WestConnex.

Going forth and taking this work further, it is recommended that further investigation and the development of scheme designs for each of the precincts be developed. This could also include some sort of prioritisation which may help to inform implementation plan provisions at a later stage.

Appendix A – Existing LATM Treatments

Marrickville Road

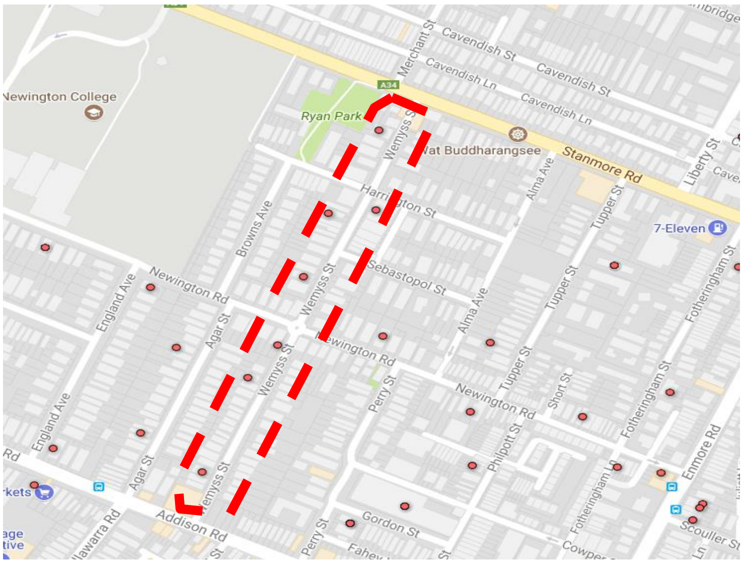
Traffic device	Traffic Device Type ID	Road
One-way street	Diversion D	Marrickville Road
Refuge island	Horizontal DD	Marrickville Road
Traffic signal - intersection	Other Treatments	Marrickville Road
Solid median	Horizontal DD	Marrickville Road
Kerb Extension with Ped Crossing and Median Traffic Islane	Horizontal DD	Marrickville Road
Raised pedestrian platform on side road	Vertical DD	Marrickville Road
Traffic signal - intersection	Other Treatments	Marrickville Road
Raised pedestrian platform on side road	Vertical DD	Marrickville Road
Raised pedestrian platform on side road	Vertical DD	Marrickville Road
Traffic signal - intersection	Other Treatments	Marrickville Road
Raised pedestrian platform on side road	Vertical DD	Marrickville Road
Raised pedestrian platform on side road	Vertical DD	Marrickville Road
Raised platform at traffic signals	Vertical DD/Other Treatements	Marrickville Road
Dragon Teeth	Linemarking	Marrickville Road
Traffic signal - intersection	Other Treatments	Marrickville Road
Dragon Teeth	Linemarking	Marrickville Road
Refuge island	Horizontal DD	Marrickville Road
Dragon Teeth	Linemarking	Marrickville Road
Refuge island	Horizontal DD	Marrickville Road
Traffic signals - intersection	Other Treatments	Marrickville Road
Refuge island	Horizontal DD	Marrickville Road
Kerb extension with Ped Fencing	Horizontal DD	Marrickville Road
Wombat crossing	Vertical DD	Marrickville Road
Kerb extension and Zig-Zag line marking	Horizontal DD/Linemarking	Marrickville Road
Raised pedestrian platform on side road	Vertical DD	Marrickville Road
Wombat Crossing on Side Road	Vertical DD	Marrickville Road
Wombat Crossing on Side Road	Vertical DD	Marrickville Road
Zig-Zag line marking and narrowing of road	Horizontal DD/Linemarking	Marrickville Road
Traffic signals - intersection	Other Treatments	Marrickville Road



Reverse Garbage Co-Operative
Henson Park
Winged Victory
Red Rattler Theatre
Cornersmith Cafe - Marrickville
McNeilly Park
Marrickville
Sydenham
Fraser Park Football Club
Marrickville Rd
Sydenham Rd
Illawarra Rd
Petersham Rd
Victoria Rd
Livingstone Rd
Wardell Rd
Enfield St
Stanley St
Yabsley Ave
George St
Pile St
Albion St
Warren Rd
Leofrene Ave
Fernbank St
Queen St

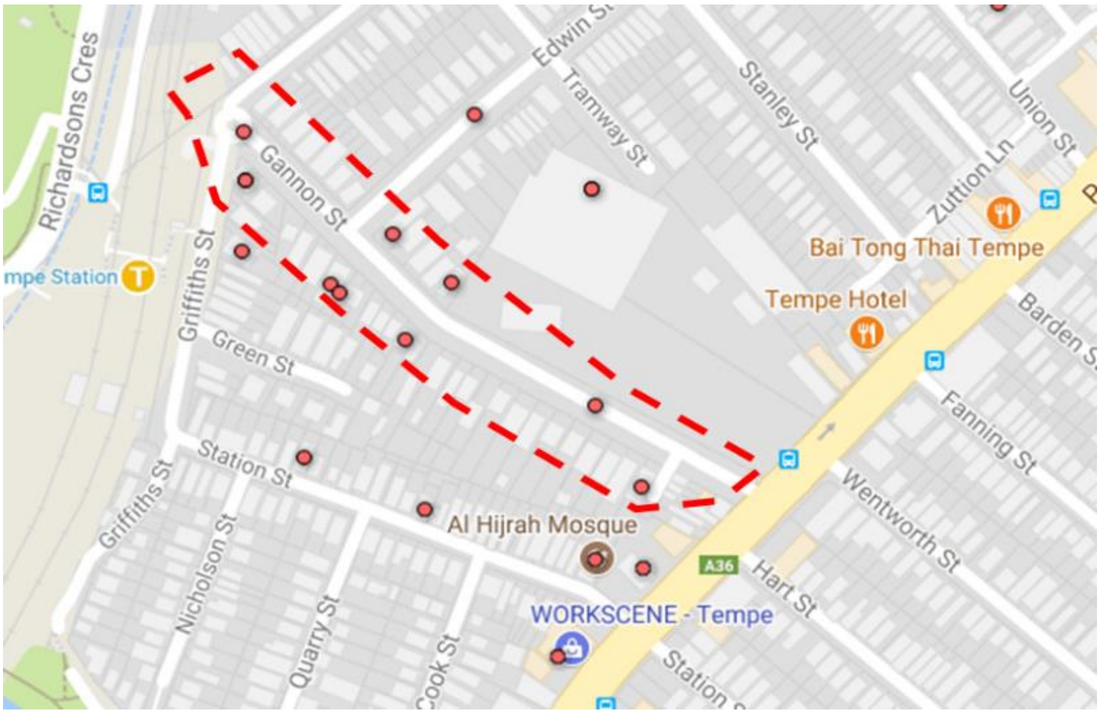
Wemyss Street

Traffic device	Traffic Device Type ID	Road
Raised Platform	Vertical DD	Wemyss Road
Raised Platform	Vertical DD	Wemyss Road
Kerb extensions with Planting	Horizontal DD	Wemyss Road
Raised Platform	Vertical DD	Wemyss Road
Raised Platform	Vertical DD	Wemyss Road



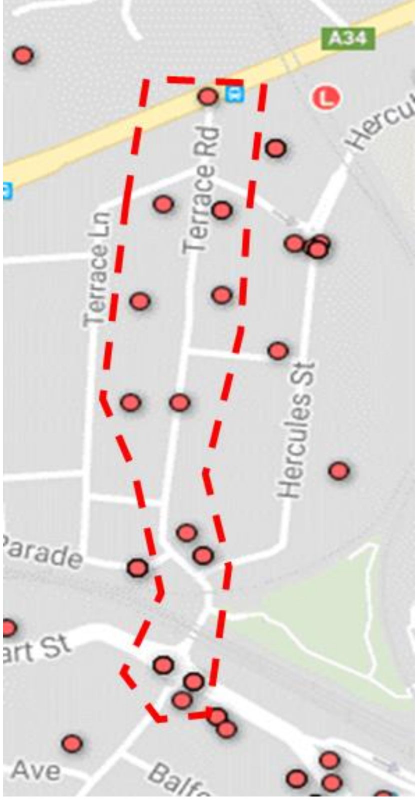
Gannon Street

Traffic device	Traffic Device Type ID	Road
Kerb extension and planting	Horizontal DD	Gannon Street
Raised platform and kerb extensions with planting	Horizontal DD/Vertical DD	Gannon Street
Zig-Zag line markings	Line marking	Gannon Street
Raised platform and kerb extensions with planting	Horizontal DD/Vertical DD	Gannon Street
Wombat crossing	Vertical DD	Gannon Street
Zig-Zag line markings	Line	Gannon Street



Terrace Road

Traffic device	Traffic Device Type ID	Road
Kerb extension and planting/Chicane	Hoizontal DD	Terrace Road
Kerb extension and planting/Chicane	Hoizontal DD	Terrace Road
Horizontal Parking	Other treatment	Terrace Road
Kerb extension and planting/Chicane	Hoizontal DD	Terrace Road
Horizontal Parking	Other treatment	Terrace Road
Kerb extension	Hoizontal DD	Terrace Road
Horizontal Parking	Other treatment	Terrace Road
Roundabout	Hoizontal DD	Terrace Road



Calvert Street

Traffic device	Traffic Device Type ID	Road
Kerb extension and planting	Horizontal DD	Calvert Street
Diagonal parking	Other treatment	Calvert Street
Raised platform and kerb extensions with planting	Horizontal DD/Vertical DD	Calvert Street
Lane narrowing	Horizontal DD	Gladston Road
Raised platform	Vertical DD	Calvert Street
Wombat Crossing	Vertical DD	Calvert Street
Raised platform	Vertical DD	Calvert Street

Northumberland Avenue

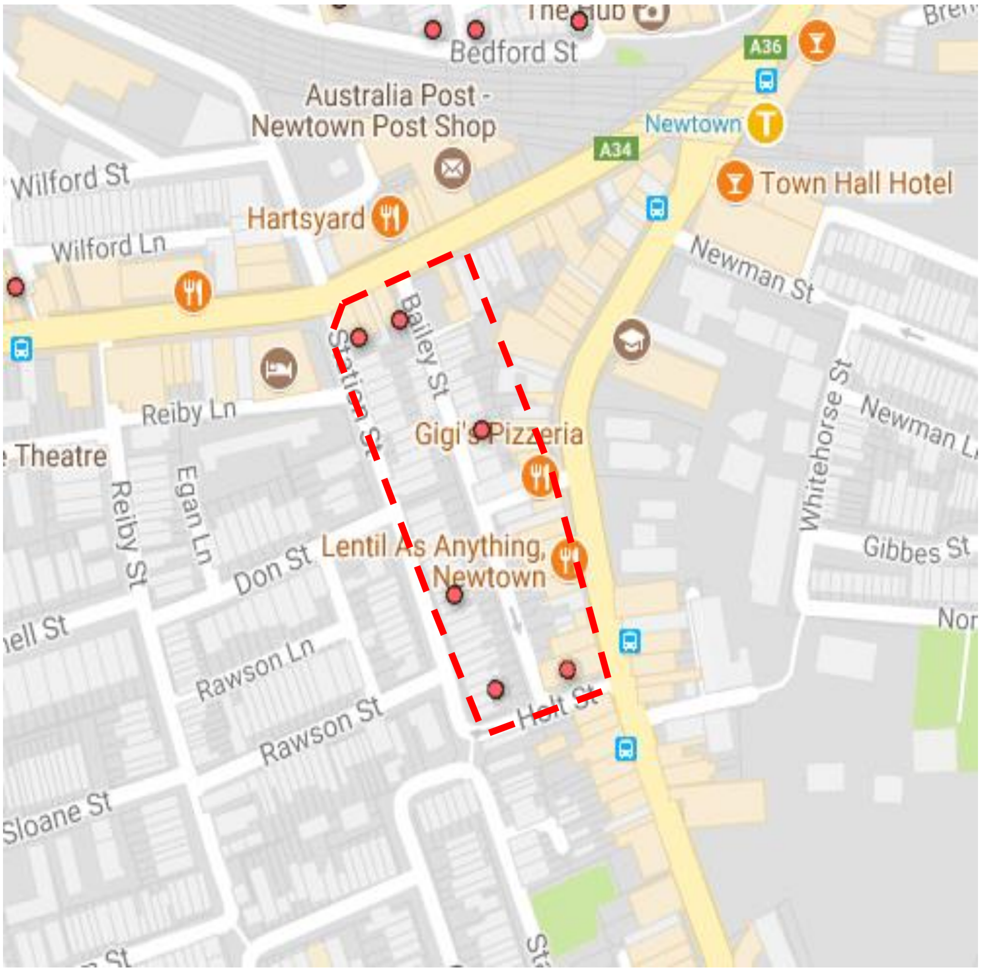
Traffic device	Traffic Device Type ID	Road
Roundabout	Horizontal DD	Northumberland Ave
Raised platform	Vertical DD	Northumberland Ave
Raised platform	Vertical DD	Northumberland Ave
Roundabout	Horizontal DD	Northumberland Ave
Kerb extension	Horizontal DD	Northumberland Ave
Raised platform	Vertical DD	Northumberland Ave

Alice Street

Traffic device	Traffic Device Type ID	Road
Kerb extension with planting	Horizontal DD	King Street
Kerb extension and road narrowing, pedestrian refuge	Horizontal DD	Alice Street
Kerb extension with planting	Horizontal DD	Alice Street
Pedestrian refuge	Horizontal DD	Alice Street
Pedestrian refuge	Horizontal DD	Alice Street
Zig-zag marking	Line marking	Alice Street
Wombat crossing and kerb extension with planting	Vertical DD/Horizontal DD	Alice Street
Zig-zag marking	Line marking	Alice Street
Dragon Teeth	Linemarking	Alice Street

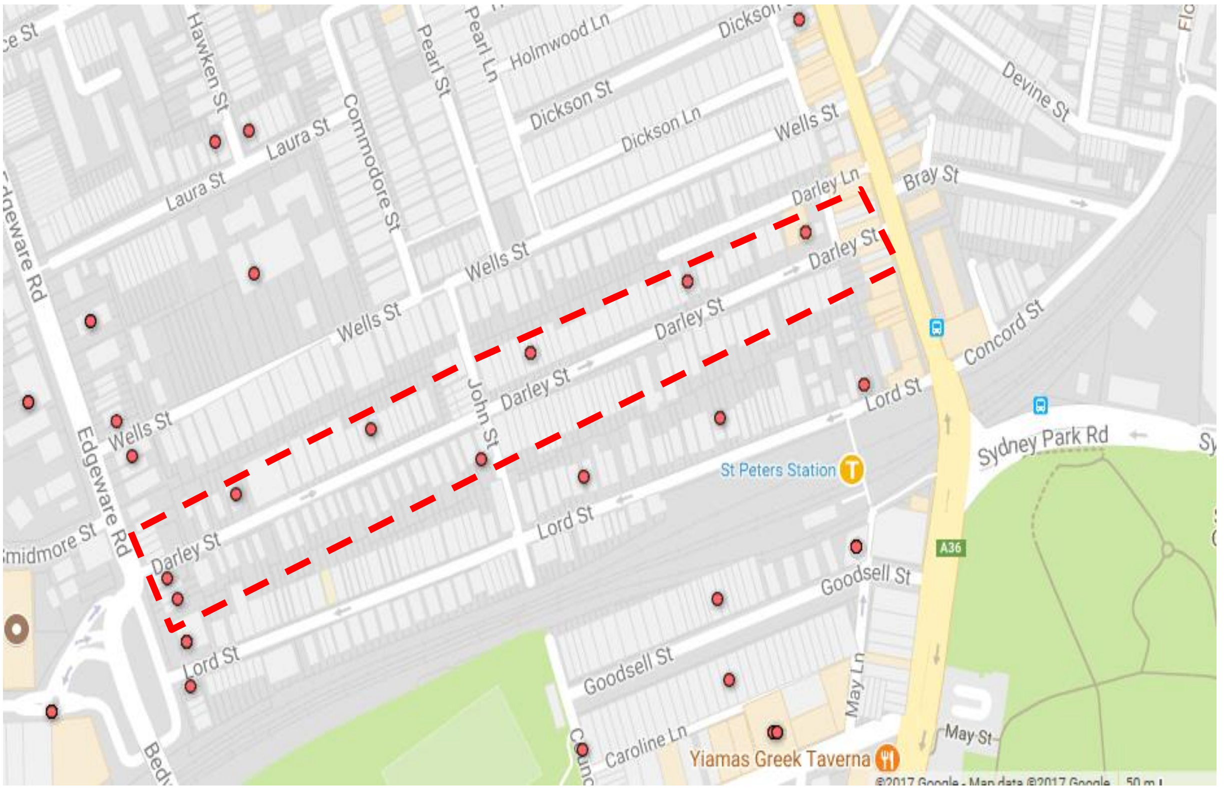
Bailey Street and Station Street

Traffic device	Traffic Device Type ID	Road
Surface treatments	Other treatments	Enmore Road
Raised platform	Vertical DD	Bailey Street
Raised platform	Vertical DD	King Street
One Way	Diversion devices	Bailey Street
Raised platform and kerb extenions with planting	Horizontal DD/Vertical DD	Station Street
One Way	Diversion devices	Station Street
Surface treatments	Other treatments	Enmore Road



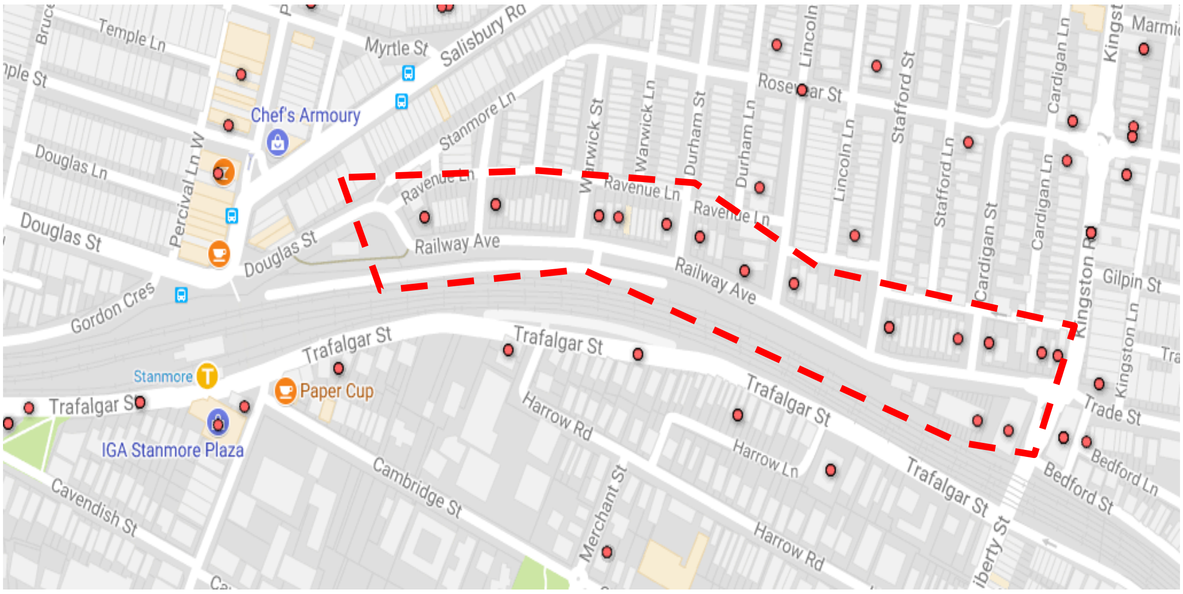
Darley Street

Traffic device	Traffic Device Type ID	Road
Raised platform	Vertical DD	Darley Street
Raised platform	Vertical DD	Darley Street
Raised platform	Vertical DD	Darley Street
Raised platform	Vertical DD	Darley Street
Raised platform	Vertical DD	Darley Street



Railway Avenue

Traffic device	Traffic Device Type ID	Road
Roundabout	Horizontal DD	Railway Avenue
Road Cushion	Vertical DD	Railway Avenue
Kerb extensions with planting, with Road Cushions	Horizontal/Vertical DD	Railway Avenue
Kerb extensions with planting, with Road Cushions	Horizontal/Vertical DD	Railway Avenue
Kerb extensions with planting	Horizontal DD	Railway Avenue
Kerb extensions with planting	Horizontal DD	Railway Avenue
Kerb extensions with planting	Horizontal DD	Railway Avenue
Kerb extensions with planting	Horizontal DD	Railway Avenue
Road Cushion	Vertical DD	Railway Avenue



Appendices B – Standard Detail Costing

	Low	Base	High
T1 Flat-top road hump	19,400	24,300	36,200
T1 Wombat crossing	22,500	29,800	42,900
T1 Lane narrowing (two-lane)	38,800	47,800	63,900
T1 Lane narrowing (four-lane)	54,300	67,200	94,100
T1 Slow point	16,400	21,900	28,300
T2 Median treatments	21,400	27,200	40,800
T2 Modified T-intersection	51,300	68,000	104,600
T2 Roundabout	104,900	140,300	211,300
T2 Signalised intersection	60,800	86,900	130,400
T3 Diagonal road closure	26,400	34,500	48,200
T3 Left out only	47,000	56,200	76,600
T3 Full road closure	86,600	113,500	164,300

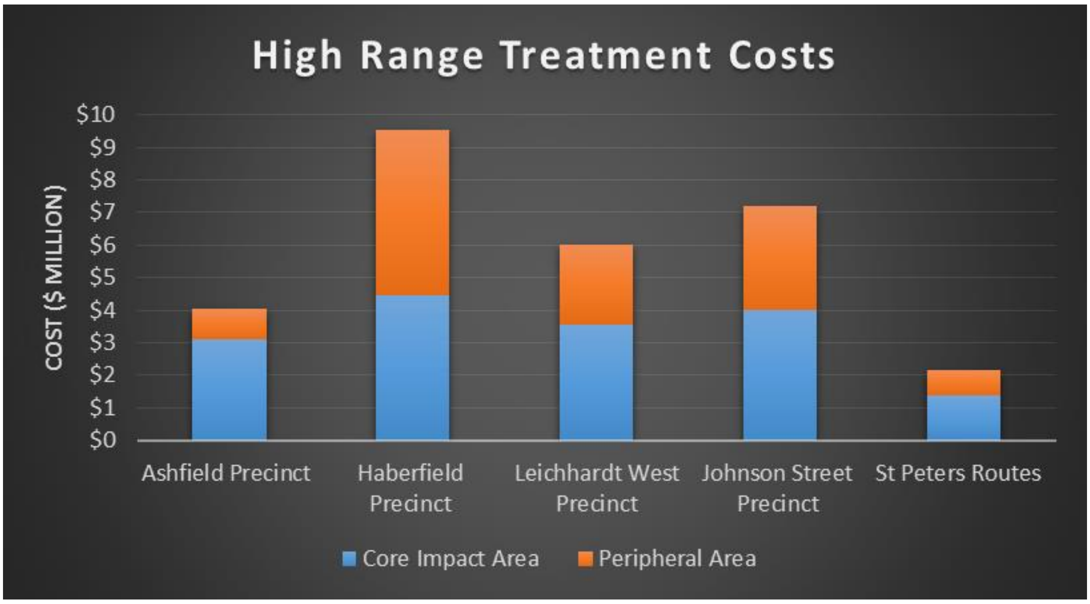
Core impact					
	Ashfield	**Haberfield**	**West Leichhardt**	**Johnston Street**	**St Peters**
T1 intergrated traffic calming	14	12	5	12	4
T2 intersection upgrades	13	22	18	18	8
T3 traffic diversions	3	5	6	6	0

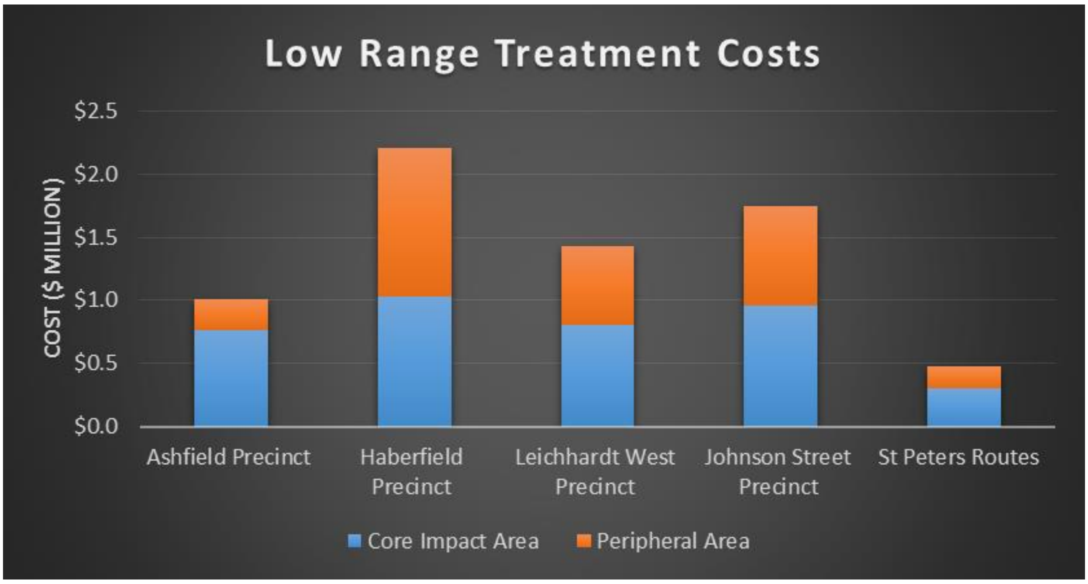
Core impact					
Total min	$763,000	$1,032,600	$805,200	$958,400	$304,900
Total max	$3,105,400	$4,460,700	$3,542,500	$4,012,900	$1,391,300

Non-Core impact					
	Ashfield	**Haberfield**	**West Leichhardt**	**Johnston Street**	**St Peters**
T1 intergrated traffic calming	6	13	11	15	3
T2 intersection upgrades	3	25	9	13	4
T3 traffic diversions	1	6	4	3	0
Total min	$247,300	$1,170,500	$623,100	$784,900	$174,300
Total max	$937,600	$5,062,300	$2,455,900	$3,172,600	$762,900

Total					
	Ashfield	**Haberfield**	**West Leichhardt**	**Johnston Street**	**St Peters**
T1 intergrated traffic calming	20	25	16	27	7
T2 intersection upgrades	16	47	27	31	12
T3 traffic diversions	4	11	10	9	0
Total min	$1,010,400	$2,203,100	$1,428,300	$1,743,400	$479,200
Total max	$4,043,000	$9,523,100	$5,998,400	$7,185,500	$2,154,200

Total					
	Ashfield	**Haberfield**	**West Leichhardt**	**Johnston Street**	**St Peters**
T1 intergrated traffic calming	20	25	16	27	7
T2 intersection upgrades	16	47	27	31	12
T3 traffic diversions	4	11	10	9	0
Total min	$1,010,400	$2,203,100	$1,428,300	$1,743,400	$479,200
Total max	$4,043,000	$9,523,100	$5,998,400	$7,185,500	$2,154,200


High Range Treatment Costs
COST ($ MILLION)
$10
$9
$8
$7
$6
$5
$4
$3
$2
$1
$0
Ashfield Precinct
Haberfield Precinct
Leichhardt West Precinct
Johnson Street Precinct
St Peters Routes
Core Impact Area
Peripheral Area


Low Range Treatment Costs
COST ($ MILLION)
$2.5
$2.0
$1.5
$1.0
$0.5
$0.0
Ashfield Precinct
Haberfield Precinct
Leichhardt West Precinct
Johnson Street Precinct
St Peters Routes
Core Impact Area
Peripheral Area

Appendices C – Community Feedback

Primary concern	Haberfield	Leich-Annan	St Peters	Grand Total
Safety	44	67	40	**151**
Traffic Volume	36	60	37	**133**
Traffic Speeds	28	16	4	48
Access	9	10	14	33
Traffic Performance	10	2	4	16
Environmental		1	4	5
Noise	2	2		4
Parking			4	4
Compliance	1		1	2
Heavy Vehicles			2	2
Amenity			1	1
Grand Total	130	158	111	399

Secondary concern	Haberfield	Leich-Annan	St Peters	Grand Total
Safety	17	23	12	52
Traffic Volume	21	19		40
Traffic Speeds	19	7	2	28
Traffic Performance	4	11	7	22
Access	3		7	10
Traffic Volumes			8	8
Amenity	1		4	5
Parking		3	2	5
Noise	2		1	3
Compliance			1	1
Environmental			1	1
Increased Traffic	1			1

Concern	Primary	Secondary	TOTAL
Safety	151	52	**203**
Traffic Volume	133	40	**173**
Traffic Speeds	48	28	**76**
Access	33	10	**43**
Traffic Performance	16	22	**38**
Parking	4	5	**9**
Noise	4	3	**7**
Environmental	5	1	**6**
Amenity	1	5	**6**
Compliance	2	1	**3**
Heavy Vehicles	2		**2**

Appendix D – Standard Detail Drawings

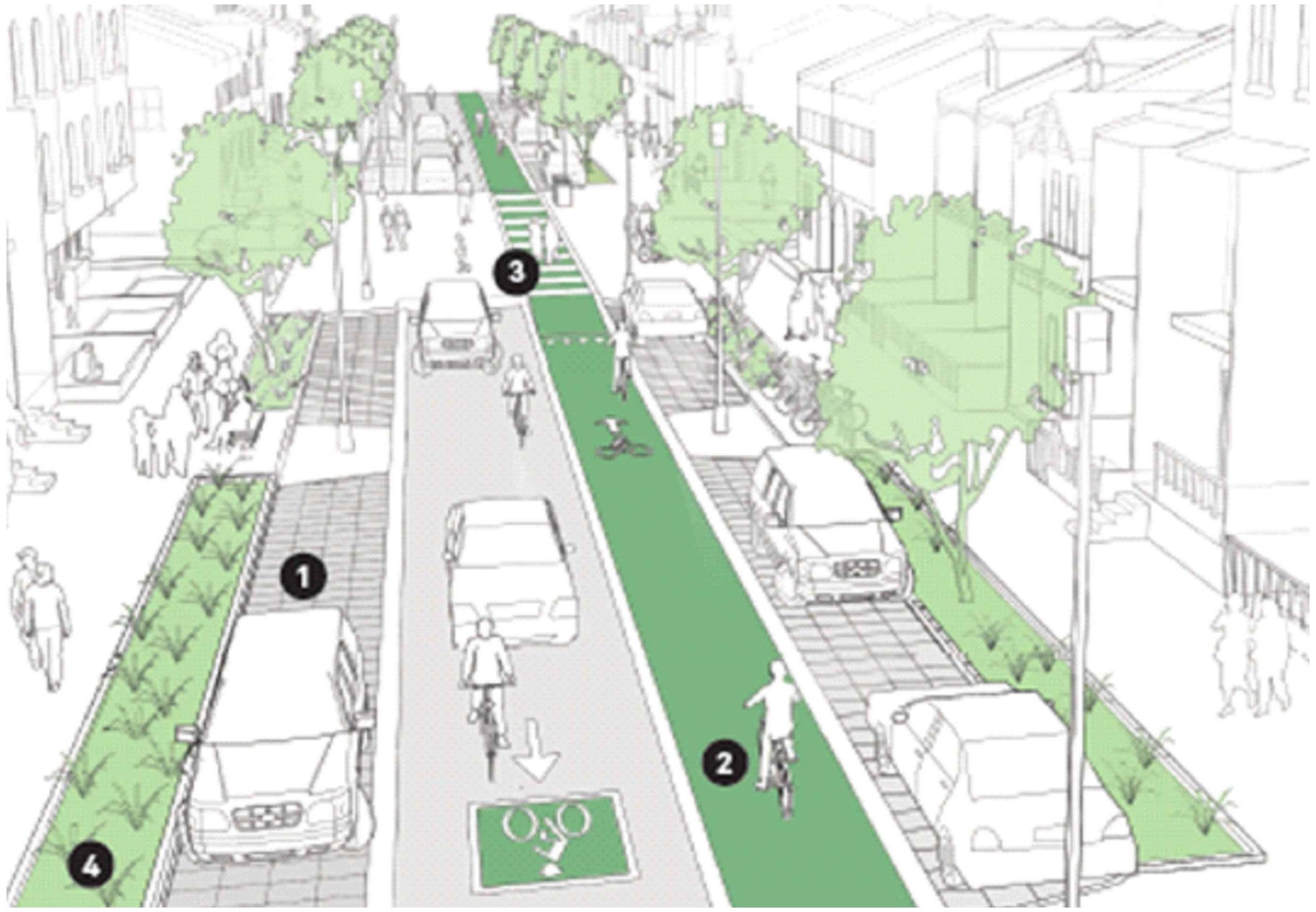
Drawing Plotted: 08 Mar 2018 3:58 PM

INNER WEST COUNCIL

WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY

STRATEGIC DESIGN

DRAWING INDEX	
DRAWING NUMBER	DRAWING TITLE
SK-GE-0001	COVER SHEET AND DRAWING INDEX
SK-GE-0002	LOCALITY PLAN
SK-GE-0003	GENERAL ARRANGEMENT ASHFIELD PRECINCT - SHEET 1 OF 1
SK-GE-0004	GENERAL ARRANGEMENT HABERFIELD PRECINCT - SHEET 1 OF 1
SK-GE-0005	GENERAL ARRANGEMENT LEICHHARDT WEST PRECINCT - SHEET 1 OF 1
SK-GE-0006	GENERAL ARRANGEMENT JOHNSTON STREET PRECINCT - SHEET 1 OF 1
SK-GE-0007	GENERAL ARRANGEMENT ST PETERS PRECINCT - SHEET 1 OF 1
SK-CV-0101	INTERGRATED TRAFFIC CALMING - SHEET 1 OF 4
SK-CV-0102	INTERGRATED TRAFFIC CALMING - SHEET 2 OF 4
SK-CV-0103	INTERGRATED TRAFFIC CALMING - SHEET 3 OF 4
SK-CV-0104	INTERGRATED TRAFFIC CALMING - SHEET 4 OF 4
SK-CV-0105	INTERSECTION MODIFICATIONS - SHEET 1 OF 4
SK-CV-0106	INTERSECTION MODIFICATIONS - SHEET 2 OF 4
SK-CV-0107	INTERSECTION MODIFICATIONS - SHEET 3 OF 4
SK-CV-0108	INTERSECTION MODIFICATIONS - SHEET 4 OF 4
SK-CV-0109	TRAFFIC DIVERSIONS - SHEET 1 OF 3
SK-CV-0110	TRAFFIC DIVERSIONS - SHEET 2 OF 3
SK-CV-0111	TRAFFIC DIVERSIONS - SHEET 3 OF 3



Source: Global Cities Design Initiatives

No.	Revision	By	Chk	Appd	Date
A	DRAFT FOR COMMENTS	JM	NH	AW	03.02.18

Original Scale (A3)			
	Design	N.HU	02.03.18
	Drawn	J.MURRAY	02.03.18
	Dsg Verifier	A.WASHINGTON	02.03.18
	Dwg Check	L.MADZOSKI	02.03.18

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: COVER SHEET AND DRAWING INDEX

Discipline: TRANSPORT

Drawing No.: SK-GE-0001 | Rev.: A

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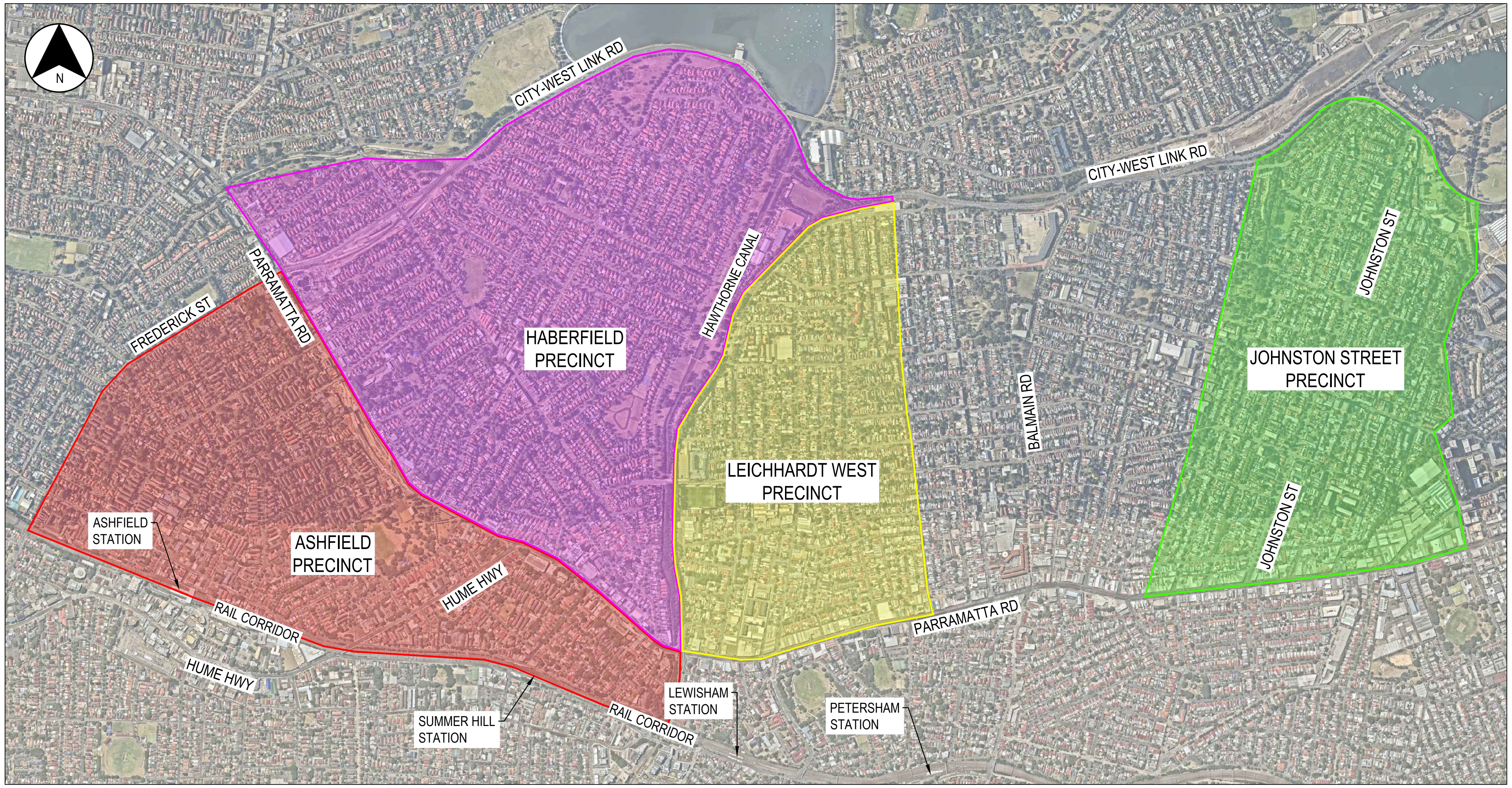
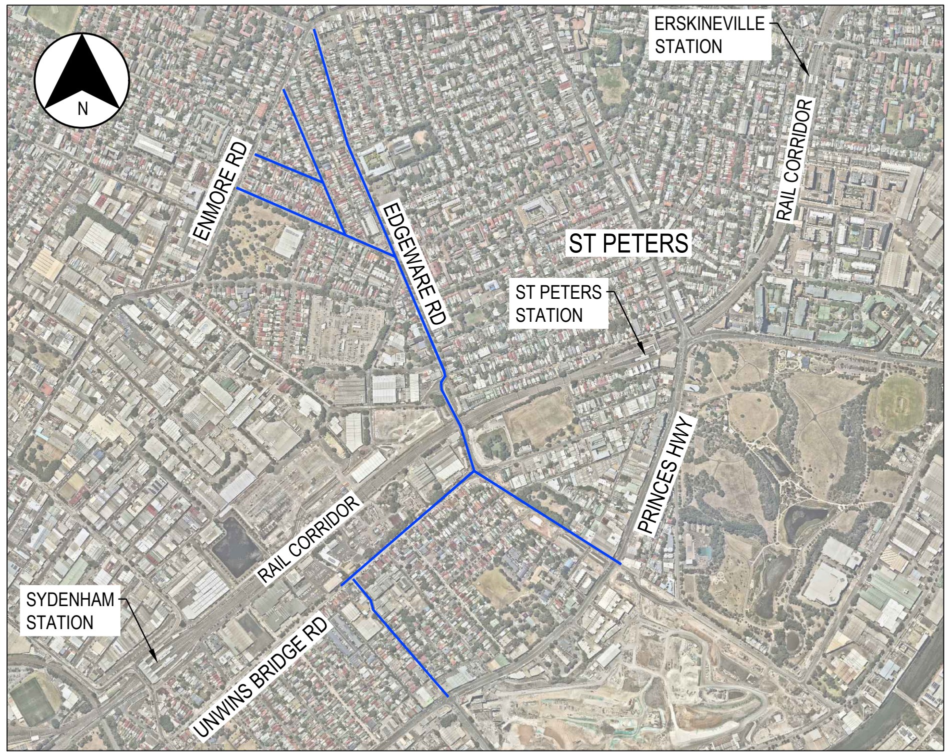


SITE LAYOUT

SCALE : 1:20000

LOCALITY PLAN



SITE LAYOUT

SCALE : 1:20000

SCALE 1:20000 200 0 200 400 AT A3

FOR INFORMATION
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PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	DRAFT FOR COMMENTS	JM	NH	AW	03.02.18

Original Scale (A3)

Design	N.HU	02.03.18
Drawn	J.MURRAY	02.03.18
Dsg Verifier	A.WASHINGTON	02.03.18
Dwg Check	L.MADZOSKI	02.03.18

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: LOCALITY PLAN

Discipline: TRANSPORT

Drawing No.: SK-GE-0002

Rev.: A

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Document No. P:\349\3493636\7. CAD\SK-GE-0002.DWG

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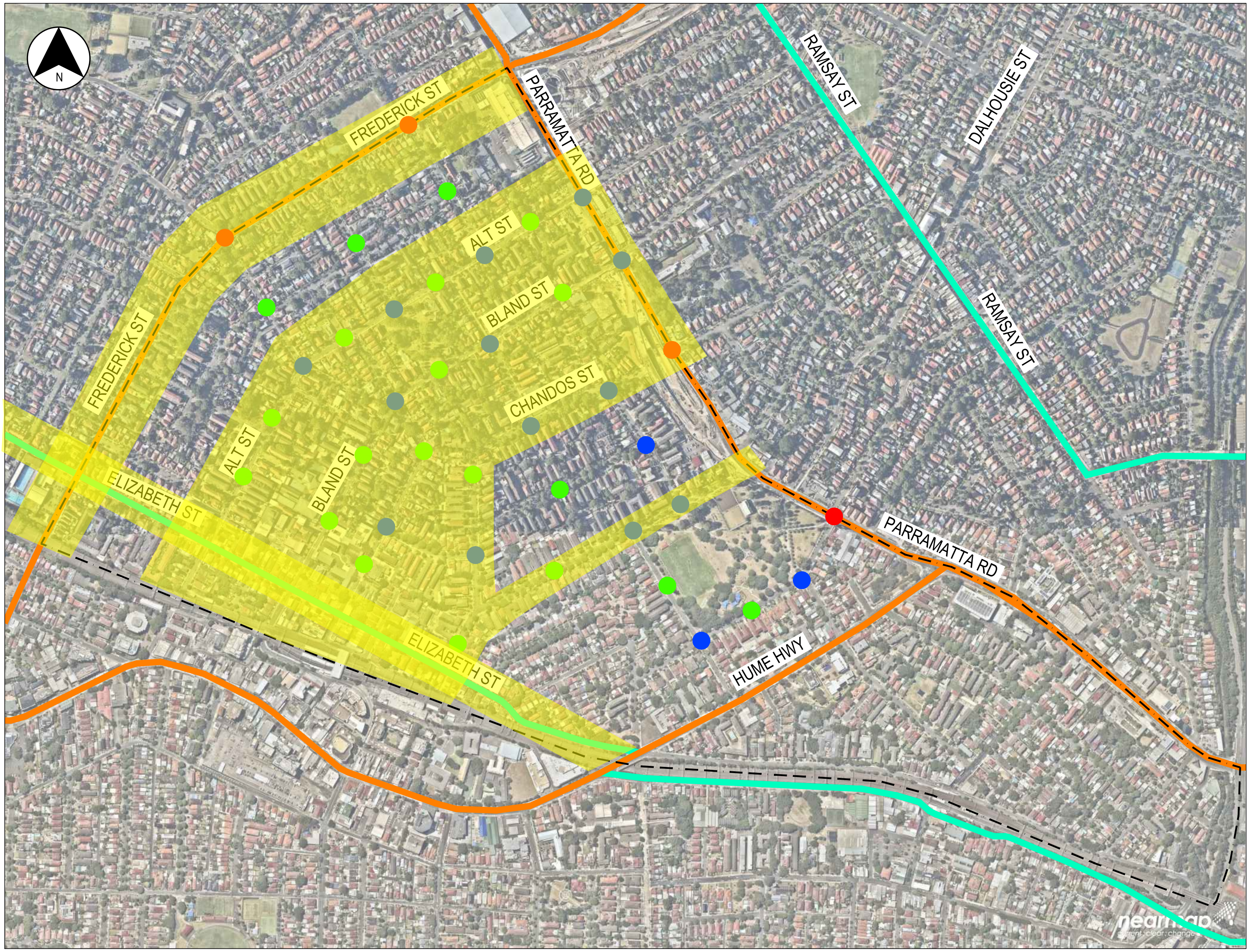
Drawing Plotted: 08 Mar 2018 4:37 PM

ASHFIELD PRECINCT



SITE LAYOUT
SCALE : 1:10000

LEGEND

- PRECINCT BORDER
- STATE ROADS
- REGIONAL ROADS
- TREATMENT 1 - INTEGRATED TRAFFIC CALMING
- TREATMENT 2 - INTERSECTION MODIFICATIONS
- TREATMENT 3 - TRAFFIC DIVERSIONS
- CORE IMPACT ZONE

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No.	Revision	By	Chk	Appd	Date
A	DRAFT FOR COMMENTS	JM	NH	AW	03.02.18

Original Scale (A3)			
	Design	N.HU	02.03.18
	Drawn	J.MURRAY	02.03.18
	Dsg Verifier	A.WASHINGTON	02.03.18
	Dwg Check	L.MADZOSKI	02.03.18

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: GENERAL ARRANGEMENT ASHFIELD PRECINCT SHEET 1 OF 1

Discipline: TRANSPORT

Drawing No.: SK-GE-0003 Rev.: A

Document No. P:\349\3493617_CAD\SK-GE-0003.DWG

SCALE 1:10000 100 0 100 200 AT A3

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NOT FOR CONSTRUCTION

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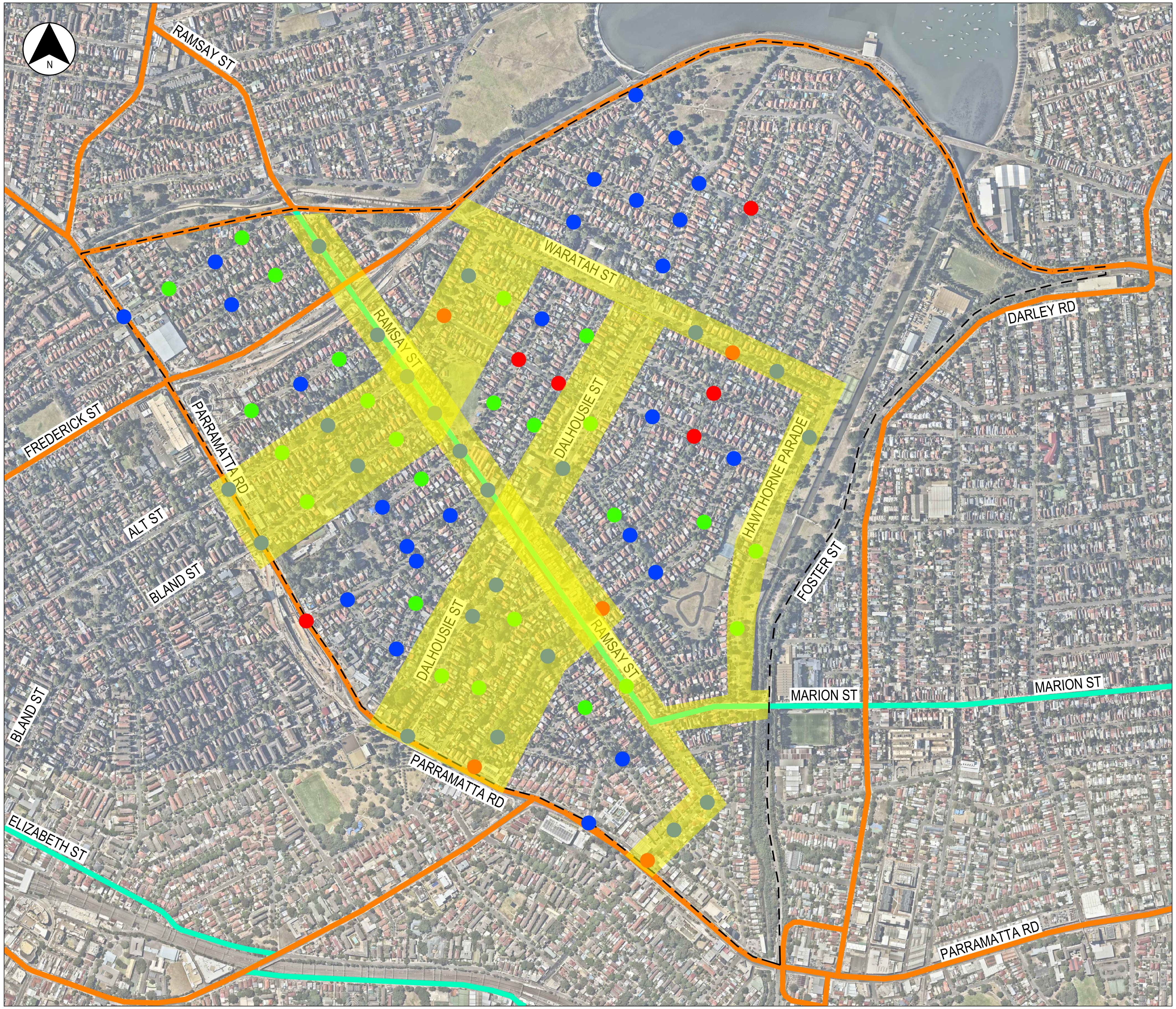
Drawing Plotted: 08 Mar 2018 4:37 PM

HABERFIELD PRECINCT



LEGEND

- PRECINCT BORDER
- STATE ROADS
- REGIONAL ROADS
- TREATMENT 1 - INTEGRATED TRAFFIC CALMING
- TREATMENT 2 - INTERSECTION MODIFICATIONS
- TREATMENT 3 - TRAFFIC DIVERSIONS
- CORE IMPACT ZONE

SITE LAYOUT

SCALE : 1:10000

SCALE 1:10000 100 0 100 200 AT A3

FOR INFORMATION NOT FOR CONSTRUCTION

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No.	Revision	By	Chk	Appd	Date
A	DRAFT FOR COMMENTS	JM	NH	AW	03.02.18

Original Scale (A3)			
	Design	N.HU	02.03.18
	Drawn	J.MURRAY	02.03.18
	Dsg Verifier	A.WASHINGTON	02.03.18
	Dwg Check	L.MADZOSKI	02.03.18

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: GENERAL ARRANGEMENT HABERFIELD PRECINCT SHEET 1 OF 1

Discipline: TRANSPORT

Drawing No.: SK-GE-0004 Rev.: A

Document No. P:\3493493\3607. CAD\SK-GE-0004.DWG

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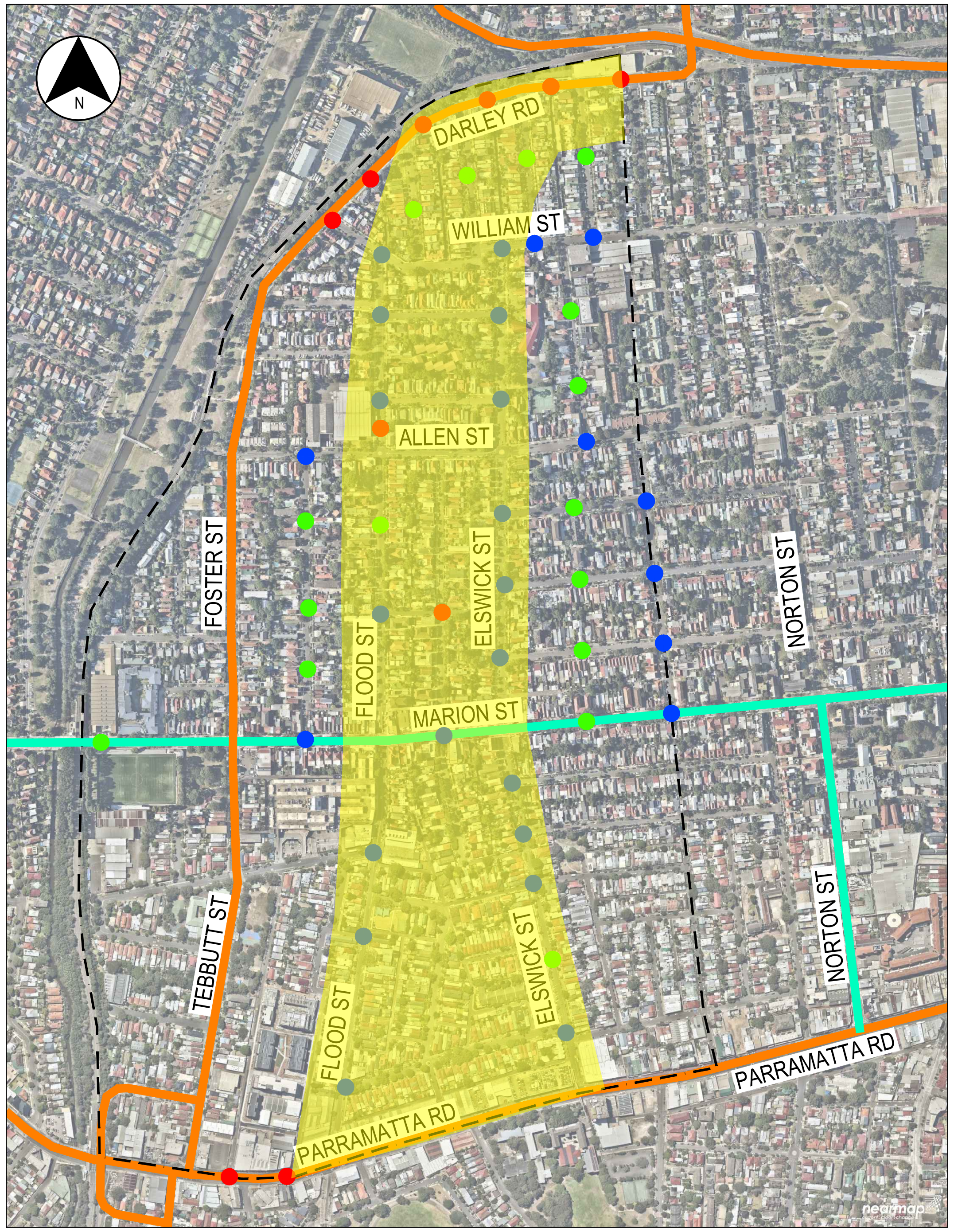
LEICHHARDT WEST PRECINCT



SITE LAYOUT
SCALE : 1:10000

LEGEND

- PRECINCT BORDER
- STATE ROADS
- REGIONAL ROADS
- TREATMENT 1 - INTEGRATED TRAFFIC CALMING
- TREATMENT 2 - INTERSECTION MODIFICATIONS
- TREATMENT 3 - TRAFFIC DIVERSIONS
- CORE IMPACT ZONE

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No.	Revision	By	Chk	Appd	Date
A	DRAFT FOR COMMENTS	JM	NH	AW	03.02.18

Original Scale (A3)

Design	N.HU	02.03.18
Drawn	J.MURRAY	02.03.18
Dsg Verifier	A.WASHINGTON	02.03.18
Dwg Check	L.MADZOSKI	02.03.18

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: GENERAL ARRANGEMENT LEICHHARDT WEST PRECINCT SHEET 1 OF 1

Discipline: TRANSPORT

Drawing No.: SK-GE-0005 Rev.: A

FOR INFORMATION NOT FOR CONSTRUCTION

PRELIMINARY NOT FOR CONSTRUCTION

SCALE 1:10000 100 0 100 200 AT A3

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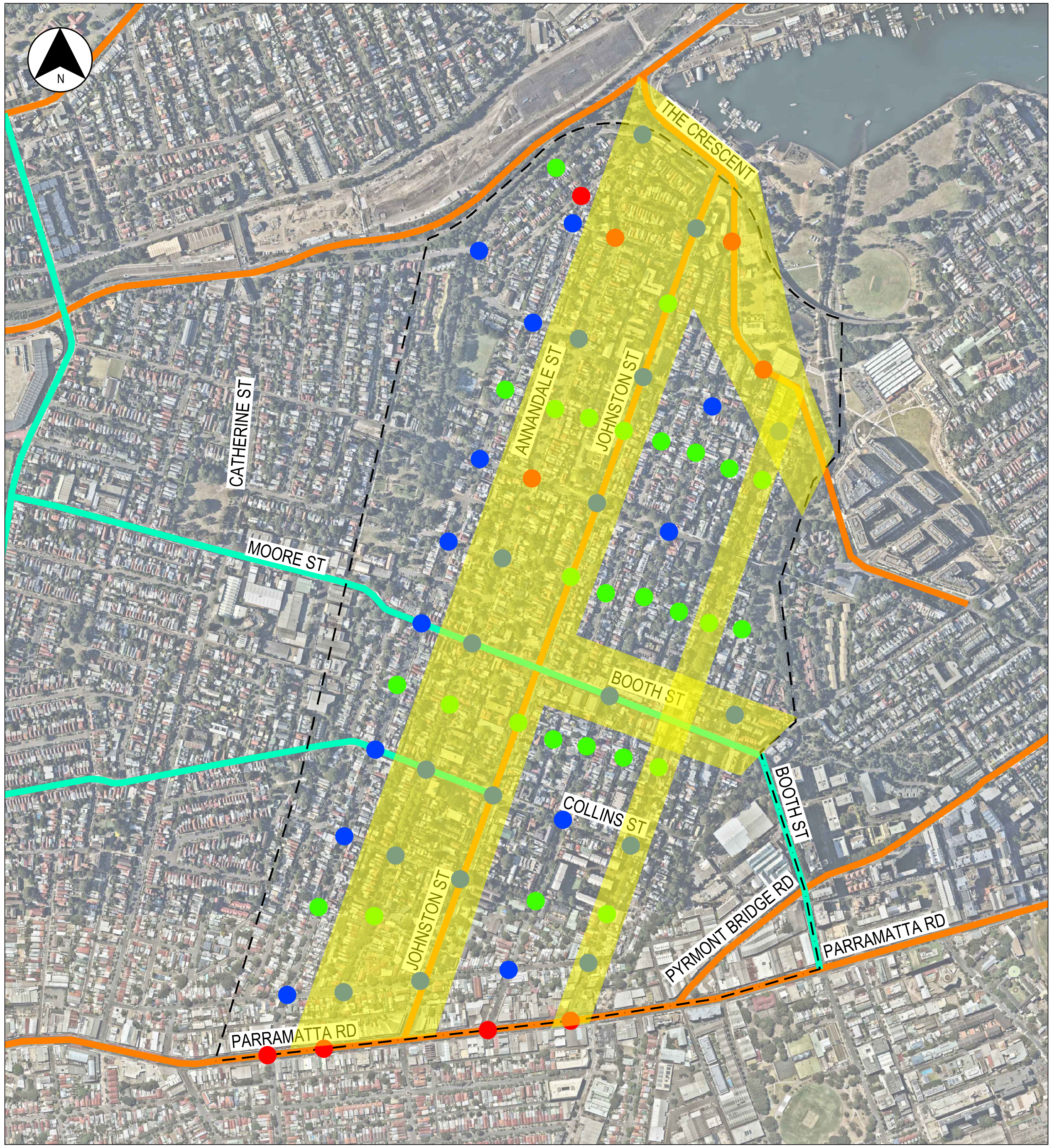
DO NOT SCALE

IF IN DOUBT ASK.

Drawing Plotted: 08 Mar 2018 4:37 PM

JOHNSTON ST PRECINCT



SITE LAYOUT
SCALE : 1:10000

LEGEND

- PRECINCT BORDER
- STATE ROADS
- REGIONAL ROADS
- TREATMENT 1 - INTEGRATED TRAFFIC CALMING
- TREATMENT 2 - INTERSECTION MODIFICATIONS
- TREATMENT 3 - TRAFFIC DIVERSIONS
- CORE IMPACT ZONE

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No.	Revision	By	Chk	Appd	Date
A	DRAFT FOR COMMENTS	JM	NH	AW	03.02.18

Original Scale (A3)

Design	N.HU	02.03.18
Drawn	J.MURRAY	02.03.18
Dsg Verifier	A.WASHINGTON	02.03.18
Dwg Check	L.MADZOSKI	02.03.18

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: GENERAL ARRANGEMENT JOHNSTON STREET PRECINCT SHEET 1 OF 1

Discipline: TRANSPORT

Drawing No.: SK-GE-0006 Rev.: A

FOR INFORMATION NOT FOR CONSTRUCTION

PRELIMINARY NOT FOR CONSTRUCTION

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Document No. P:\3493493\3493617. CAD\SK-GE-0006.DWG

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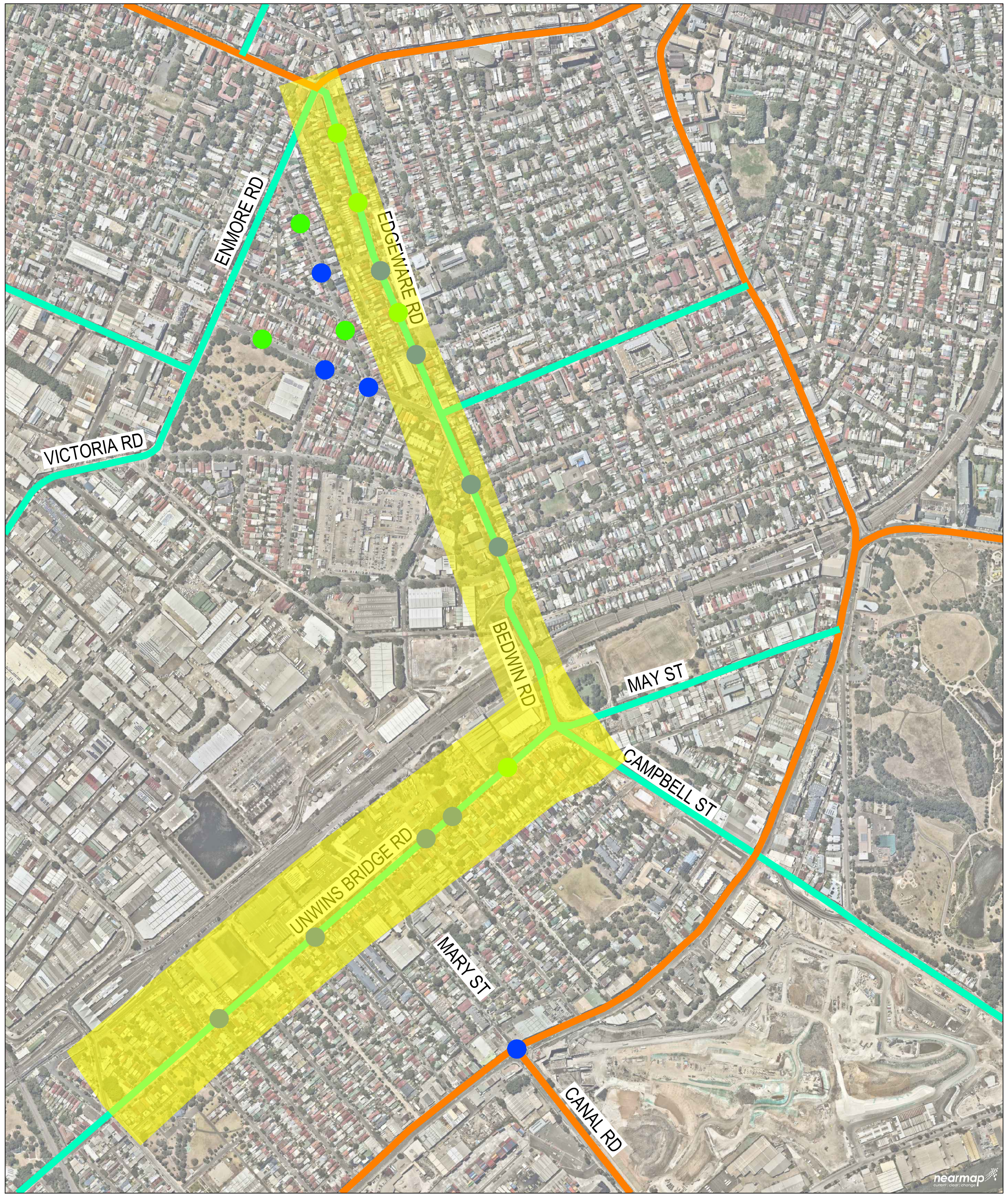
ST PETERS



SITE LAYOUT
SCALE : 1:10000

LEGEND

- STATE ROADS
- REGIONAL ROADS
- TREATMENT 1 - INTEGRATED TRAFFIC CALMING
- TREATMENT 2 - INTERSECTION MODIFICATIONS
- TREATMENT 3 - TRAFFIC DIVERSIONS
- CORE IMPACT ZONE

SCALE 1:10000 100 0 100 200 AT A3

FOR INFORMATION
NOT FOR CONSTRUCTION

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	DRAFT FOR COMMENTS	JM	NH	AW	03.02.18

Original Scale (A3)

Design	N.HU	02.03.18
Drawn	J.MURRAY	02.03.18
Dsg Verifier	A.WASHINGTON	02.03.18
Dwg Check	L.MADZOSKI	02.03.18

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: GENERAL ARRANGEMENT ST PETERS SHEET 1 OF 1

Discipline: TRANSPORT

Drawing No.: SK-GE-0007 Rev.: A

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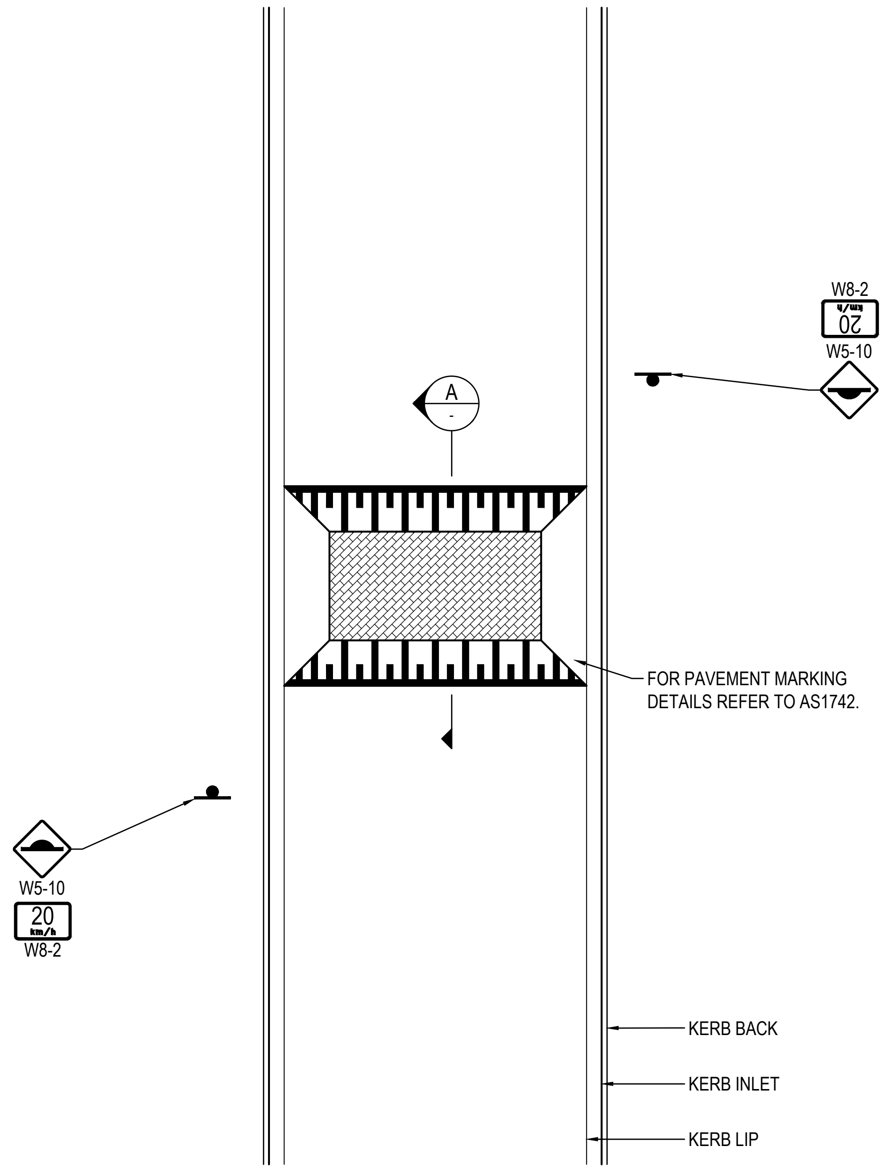
Document No. P:\3493493\3617. CAD\SK-GE-0007.DWG

NOTES

1. THE GEOMETRY OF THE INTERSECTION IS BASED ON 11m WIDE ROADS. GEOMETRIC DESIGN SHOULD BE CONFIRMED BY USE OF TURNING PATHS APPROPRIATE TO SPECIFIC INTERSECTION CONDITIONS.
2. LANE WIDTHS SHOWN ARE DESIRABLE. APPROACH LANE WIDTH SHOULD BE 3.0m (MIN.) OR 3.7m OR MORE TO PROVIDE FOR SAFE CYCLE PASSAGE, ACCOMMODATE BUS ROUTES OR COMMERCIAL TRAFFIC.
3. SEPARATE CYCLE ACCESS THROUGH INTERSECTION IS PREFERRED WHERE EXISTING INTERSECTION CONDITIONS ALLOW FOR IT.
4. CONSIDERATION MUST BE GIVEN TO IMPACT ON PROPERTY ACCESS AND EXISTING PARKING USAGE FOR THE STREET AND TO THE OVERALL IMPACT ON THE ROADWAY.
5. CONSIDERATION MUST BE GIVEN TO IMPACT ON EXISTING DRAINAGE FLOWS.
6. STREET LIGHTING SHOULD BE DESIGNED AND INSTALLED IN ACCORDANCE WITH AS1158.
7. PROPOSED KERBS TO BE TYPE SA. KERBING FOR MEDIAN ISLANDS TO BE SEMI-MOUNTABLE. REFER TO RMS STANDARD DRAWING R0300-01 FOR DETAILS.
8. FOR REQUIRED PAVEMENT AND LINE MARKINGS REFER TO RMS DELINEATION MANUAL.
9. CONSIDERATION MUST BE GIVEN TO IMPACT OF EXISTING PEDESTRIAN ACCESS THROUGH INTERSECTION. FOR KERB RAMP POSITIONING AND DETAILS REFER TO RMS STANDARD DRAWING R0300-11.
10. REQUIRED SIGNAGE FOR INTERSECTION MUST BE CONFIRMED DURING DETAILED DESIGN.



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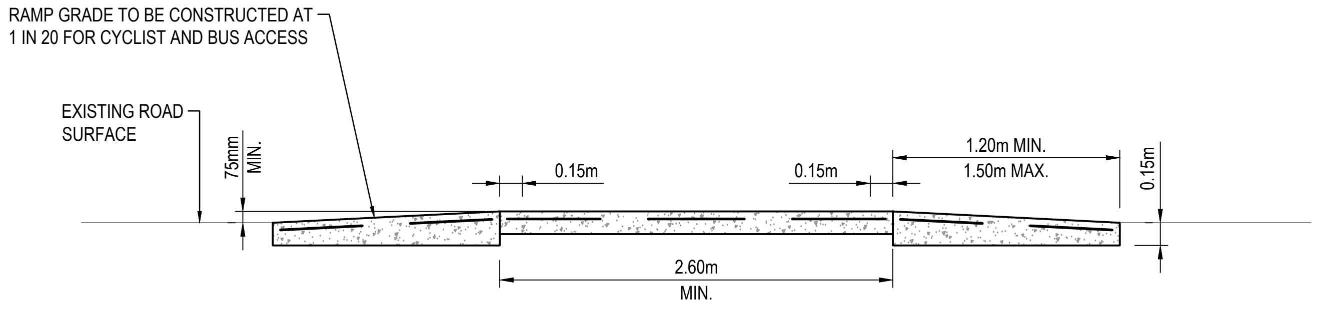
SCALE 1:250



SECTION A
SCALE 1:50

FLAT-TOP ROAD HUMP TYPICAL DETAIL

No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR COSTING PURPOSES	JM	LM	LM	

Original Scale (A3)			
1:250	Design	N.HU	??.??.??
1:50	Drawn	J.MURRAY	??.??.??
1:25	Dsg Verifier	A.WASHINGTON	??.??.??
	Dwg Check	L.MADZOSKI	??.??.??

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: INTERGRATED TRAFFIC CALMING SHEET 1 OF 4

Discipline: CIVIL ENGINEERING

Drawing No.: SK-CV-0101 Rev.: A

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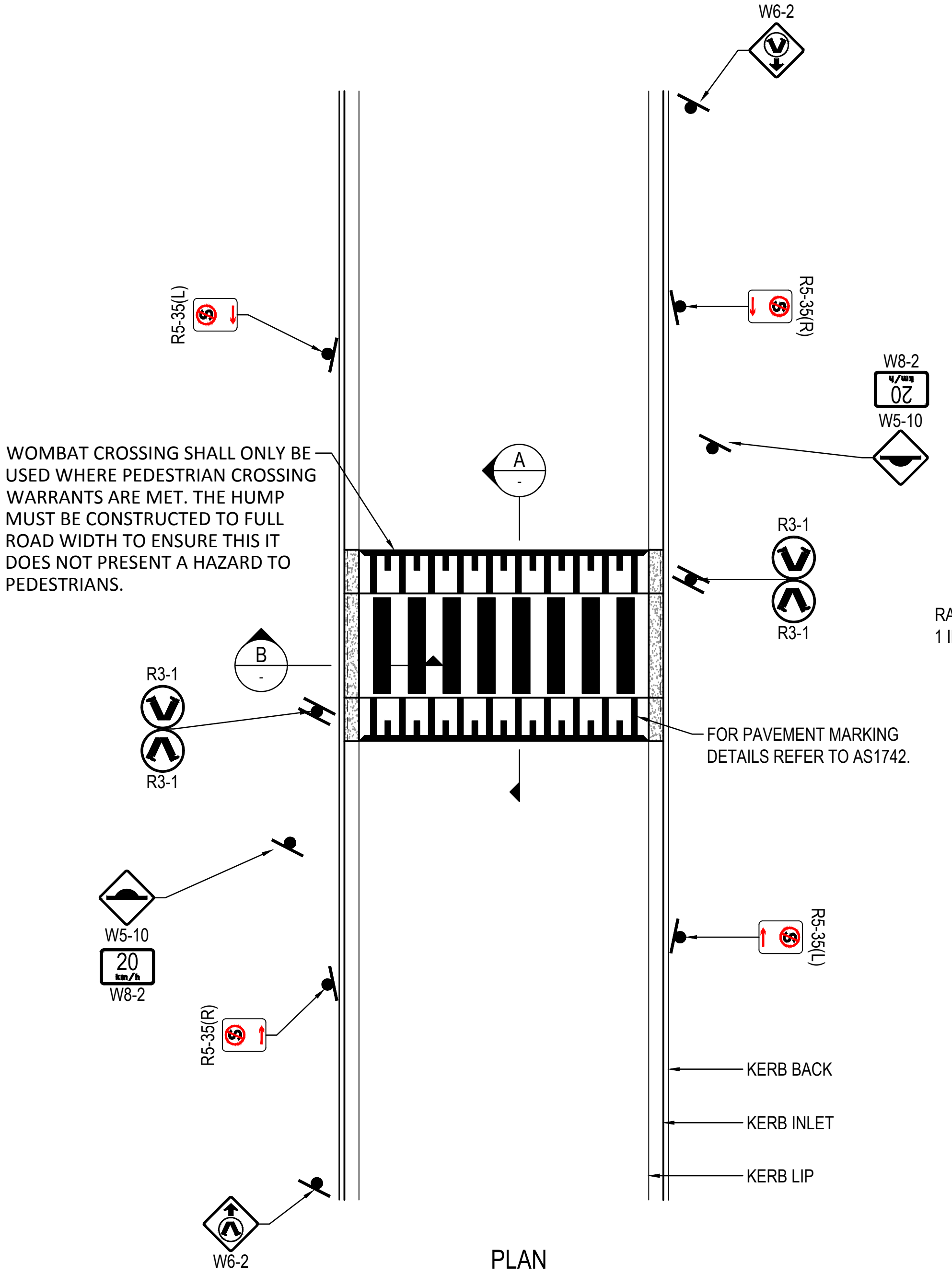

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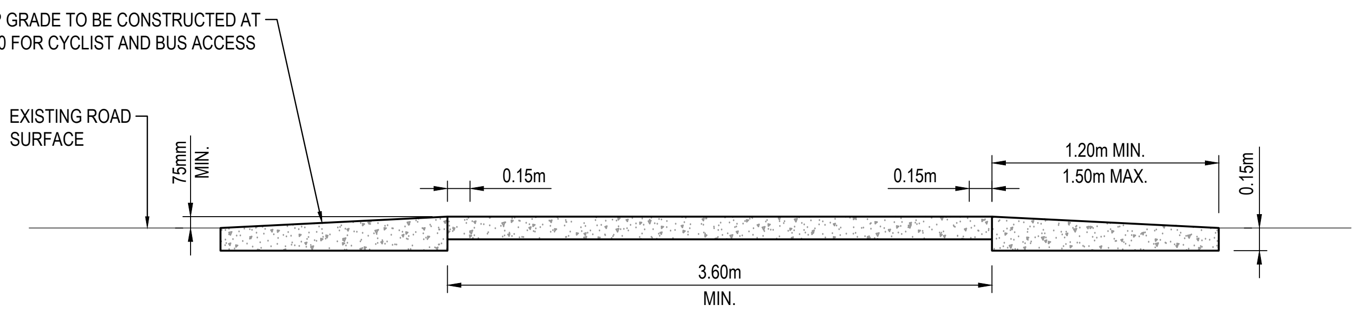

SECTION A

SCALE 1:50

WOMBAT CROSSING TYPICAL DETAIL

NOTES

1. THE GEOMETRY OF THE INTERSECTION IS BASED ON 11m WIDE ROADS. GEOMETRIC DESIGN SHOULD BE CONFIRMED BY USE OF TURNING PATHS APPROPRIATE TO SPECIFIC INTERSECTION CONDITIONS.
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10. REQUIRED SIGNAGE FOR INTERSECTION MUST BE CONFIRMED DURING DETAILED DESIGN.

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A	ISSUED FOR COSTING PURPOSES	JM	LM	LM	

Original Scale (A3)			
1:250	Design	N.HU	??.??.??
	Drawn	J.MURRAY	??.??.??
1:50	Dsg Verifier	A.WASHINGTON	??.??.??
1:25	Dwg Check	L.MADZOSKI	??.??.??

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: INTERGRATED TRAFFIC CALMING SHEET 2 OF 4

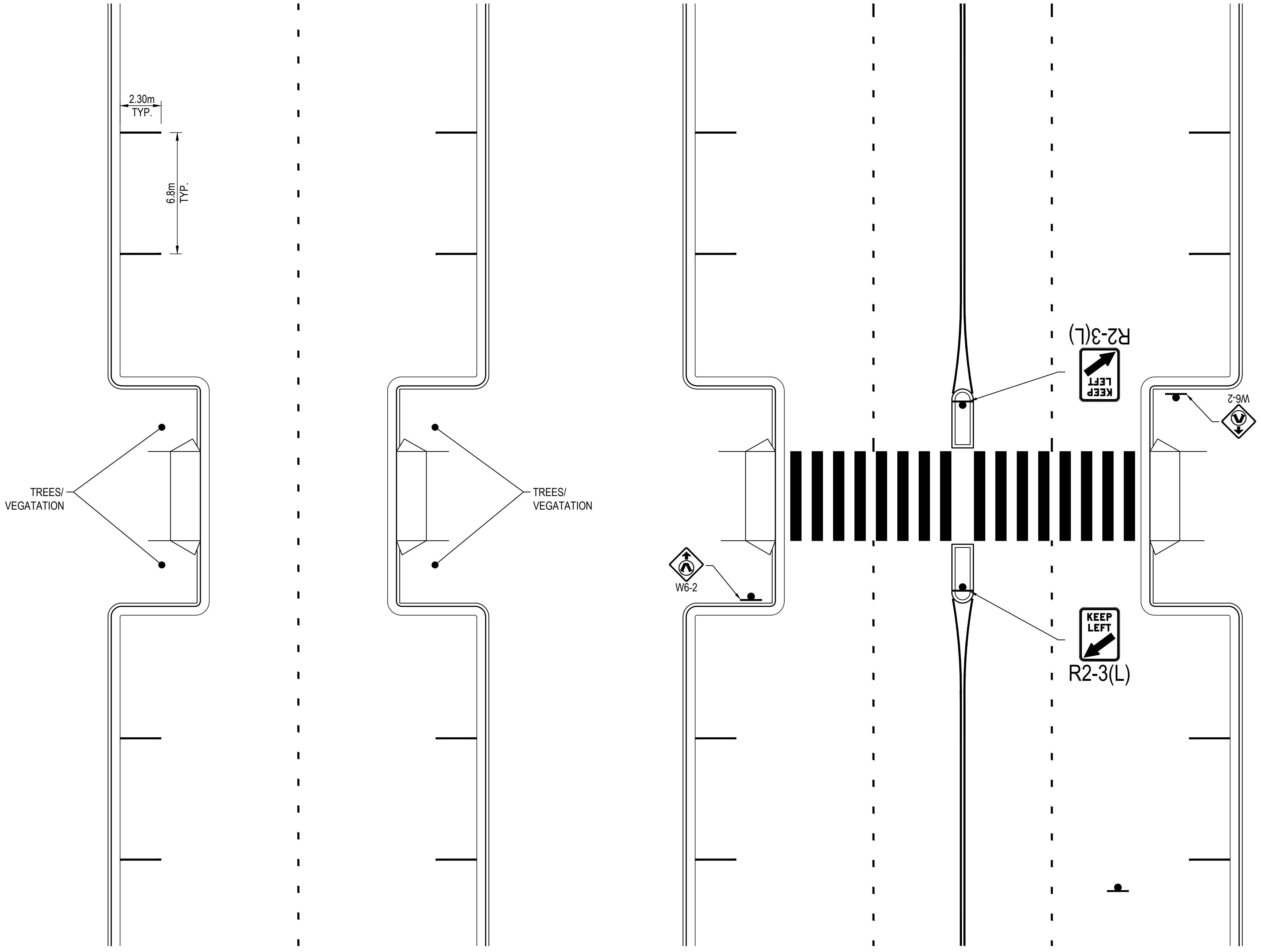
Discipline: CIVIL ENGINEERING

Drawing No.: SK-CV-0102 Rev. A

FOR INFORMATION NOT FOR CONSTRUCTION

Document No. P:\3493493636\7. CAD\SK-CV-0102.DWG

Drawing Plotted: 08 Mar 2018 3:38 PM



PLAN

SCALE 1:250

2 - LANE

PLAN

SCALE 1:250

4 - LANE WITH PEDESTRIAN CROSSING

KERB EXTENSIONS TYPICAL DETAILS

NOTES

1. THE GEOMETRY OF THE INTERSECTION IS BASED ON 11m WIDE ROADS. GEOMETRIC DESIGN SHOULD BE CONFIRMED BY USE OF TURNING PATHS APPROPRIATE TO SPECIFIC INTERSECTION CONDITIONS.
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10. REQUIRED SIGNAGE FOR INTERSECTION MUST BE CONFIRMED DURING DETAILED DESIGN.

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No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR COSTING PURPOSES	JM	LM	LM	

Original Scale (A3) 1:250

Design	N.HU	??.??.??
Drawn	J.MURRAY	??.??.??
Dsg Verifier	A.WASHINGTON	??.??.??
Dwg Check	L.MADZOSKI	??.??.??

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: INTERGRATED TRAFFIC CALMING SHEET 3 OF 4

Discipline: CIVIL ENGINEERING

Drawing No.: SK-CV-0103

Rev.: A

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NOTES

1. THE GEOMETRY OF THE INTERSECTION IS BASED ON 11m WIDE ROADS. GEOMETRIC DESIGN SHOULD BE CONFIRMED BY USE OF TURNING PATHS APPROPRIATE TO SPECIFIC INTERSECTION CONDITIONS.
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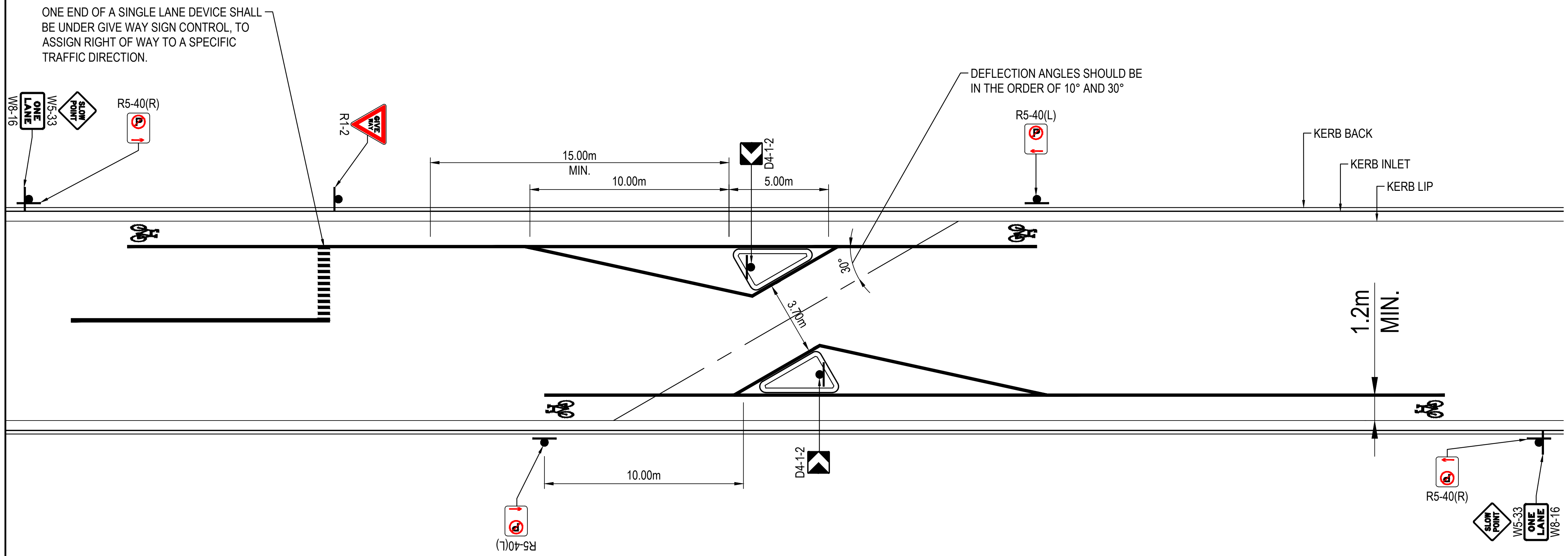
10. REQUIRED SIGNAGE FOR INTERSECTION MUST BE CONFIRMED DURING DETAILED DESIGN.



PLAN

SCALE 1:250

ONE LANE ANGLED SLOW POINT

TYPICAL DETAIL

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No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR COSTING PURPOSES	JM	LM	LM	

Original Scale (A3) 1:250

Design	N.HU	??.??.??
Drawn	J.MURRAY	??.??.??
Dsg Verifier	A.WASHINGTON	??.??.??
Dwg Check	L.MADZOSKI	??.??.??

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: INTERGRATED TRAFFIC CALMING SHEET 4 OF 4

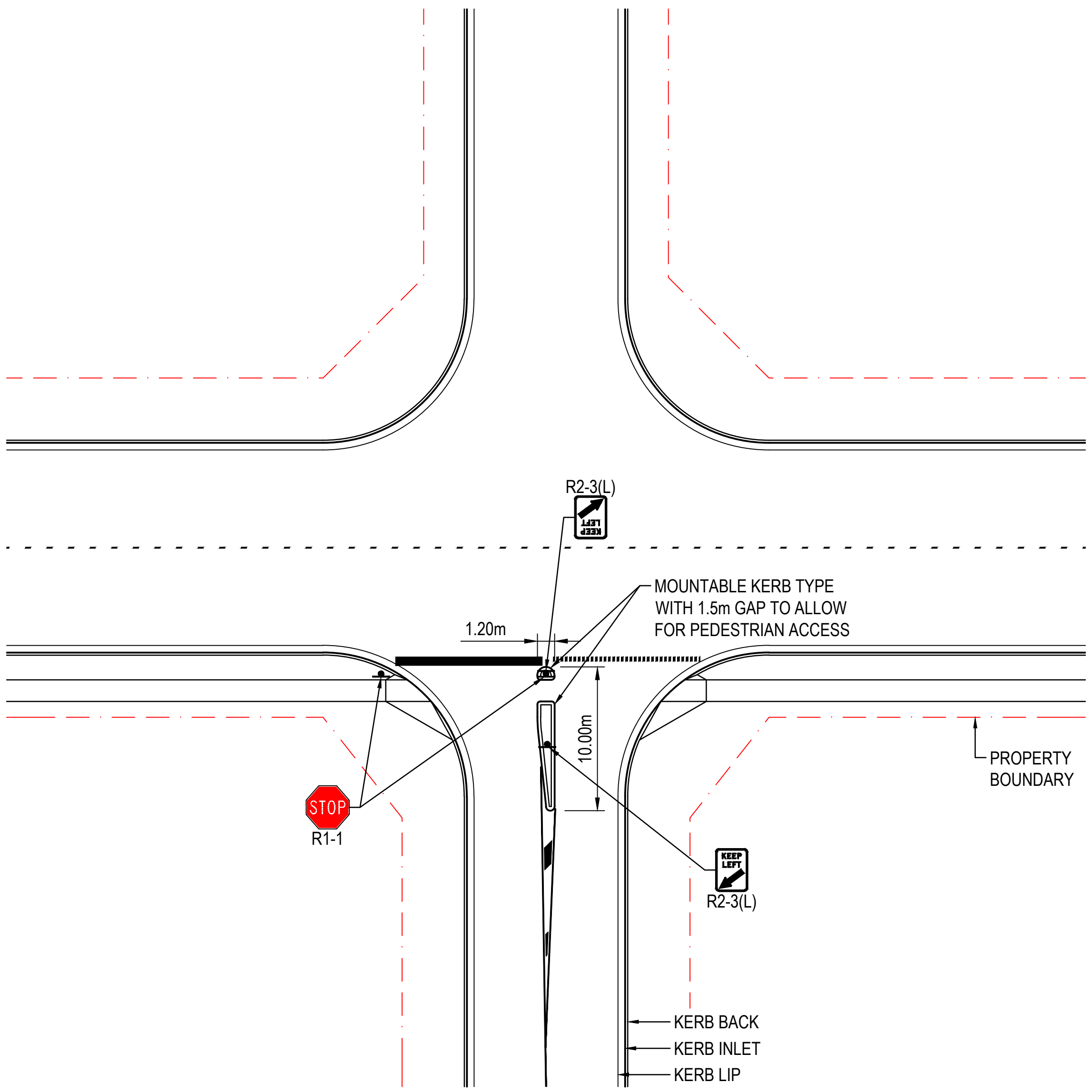
Discipline: CIVIL ENGINEERING

Drawing No.: SK-CV-0104 Rev. A

FOR INFORMATION NOT FOR CONSTRUCTION

Document No. P:\3493493\3617. CAD\SK-CV-0104.DWG

Drawing Plotted: 08 Mar 2018 3:38 PM



PLAN
SCALE 1:500
UPGRADED PRIORITY CONTROLLED INTERSECTION
TYPICAL DETAIL

NOTES

1. THE GEOMETRY OF THE INTERSECTION IS BASED ON 11m WIDE ROADS. GEOMETRIC DESIGN SHOULD BE CONFIRMED BY USE OF TURNING PATHS APPROPRIATE TO SPECIFIC INTERSECTION CONDITIONS.
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5. CONSIDERATION MUST BE GIVEN TO IMPACT ON EXISTING DRAINAGE FLOWS.
6. STREET LIGHTING SHOULD BE DESIGNED AND INSTALLED IN ACCORDANCE WITH AS1158.
7. PROPOSED KERBS TO BE TYPE SA. KERBING FOR MEDIAN ISLANDS TO BE SEMI-MOUNTABLE. REFER TO RMS STANDARD DRAWING R0300-01 FOR DETAILS.
8. FOR REQUIRED PAVEMENT AND LINE MARKINGS REFER TO RMS DELINEATION MANUAL.
9. CONSIDERATION MUST BE GIVEN TO IMPACT OF EXISTING PEDESTRIAN ACCESS THROUGH INTERSECTION. FOR KERB RAMP POSITIONING AND DETAILS REFER TO RMS STANDARD DRAWING R0300-11.
10. REQUIRED SIGNAGE FOR INTERSECTION MUST BE CONFIRMED DURING DETAILED DESIGN.

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No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR COSTING PURPOSES	JM	LM	LM	

Original Scale (A3) 1:500			
	Design	N.HU	??.??.??
	Drawn	J.MURRAY	??.??.??
	Dsg Verifier	A.WASHINGTON	??.??.??
	Dwg Check	L.MADZOSKI	??.??.??

Drawing Originator: Beca

Client: INNER WEST COUNCIL

Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: INTERSECTION MODIFICATIONS SHEET 1 OF 4

Discipline: CIVIL ENGINEERING

Drawing No.: SK-CV-0105 Rev.: A

FOR INFORMATION
NOT FOR CONSTRUCTION

Document No. P:\3493493636\7. CAD\SK-CV-0105.DWG

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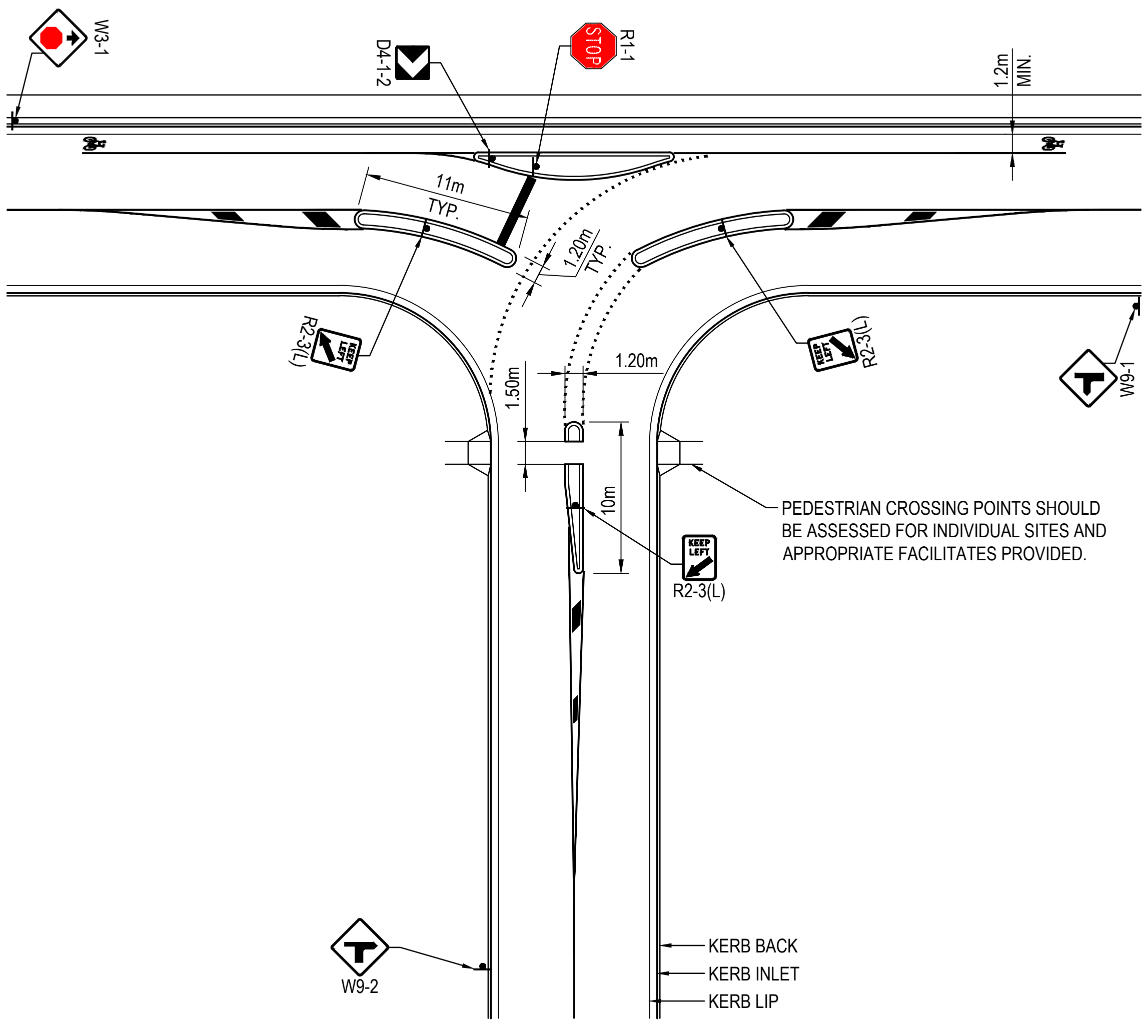

PLAN

SCALE 1:500

MODIFIED PRIORITY FOR T-INTERSECTION
TYPICAL DETAIL

NOTES

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Project: WESTCONNEX LOCAL AREA IMPROVEMENT STRATEGY STRATEGIC DESIGN

Title: INTERSECTION MODIFICATIONS SHEET 2 OF 4

Discipline: CIVIL ENGINEERING

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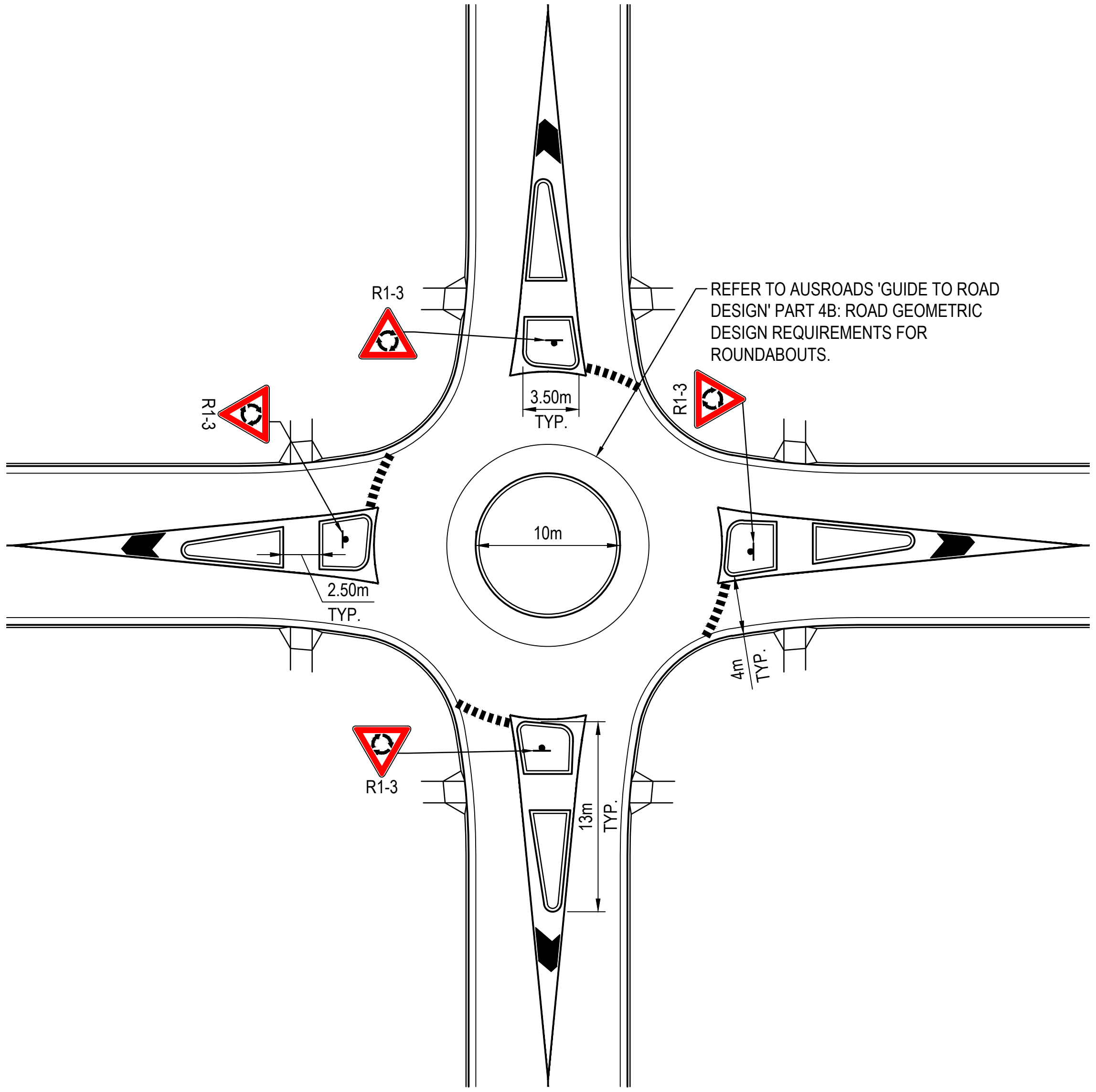

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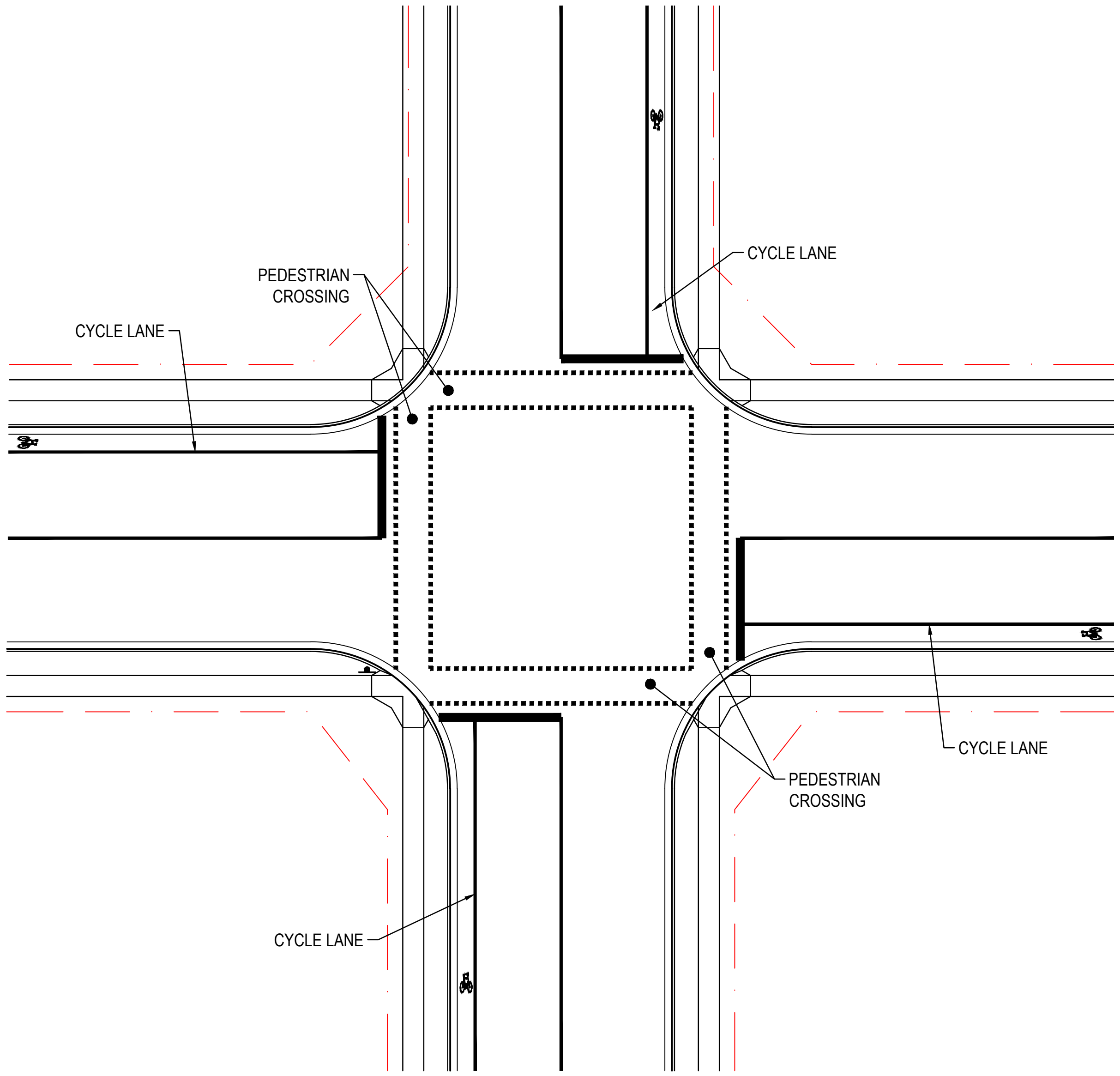

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MODIFIED SIGNALISED INTERSECTION
TYPICAL DETAIL

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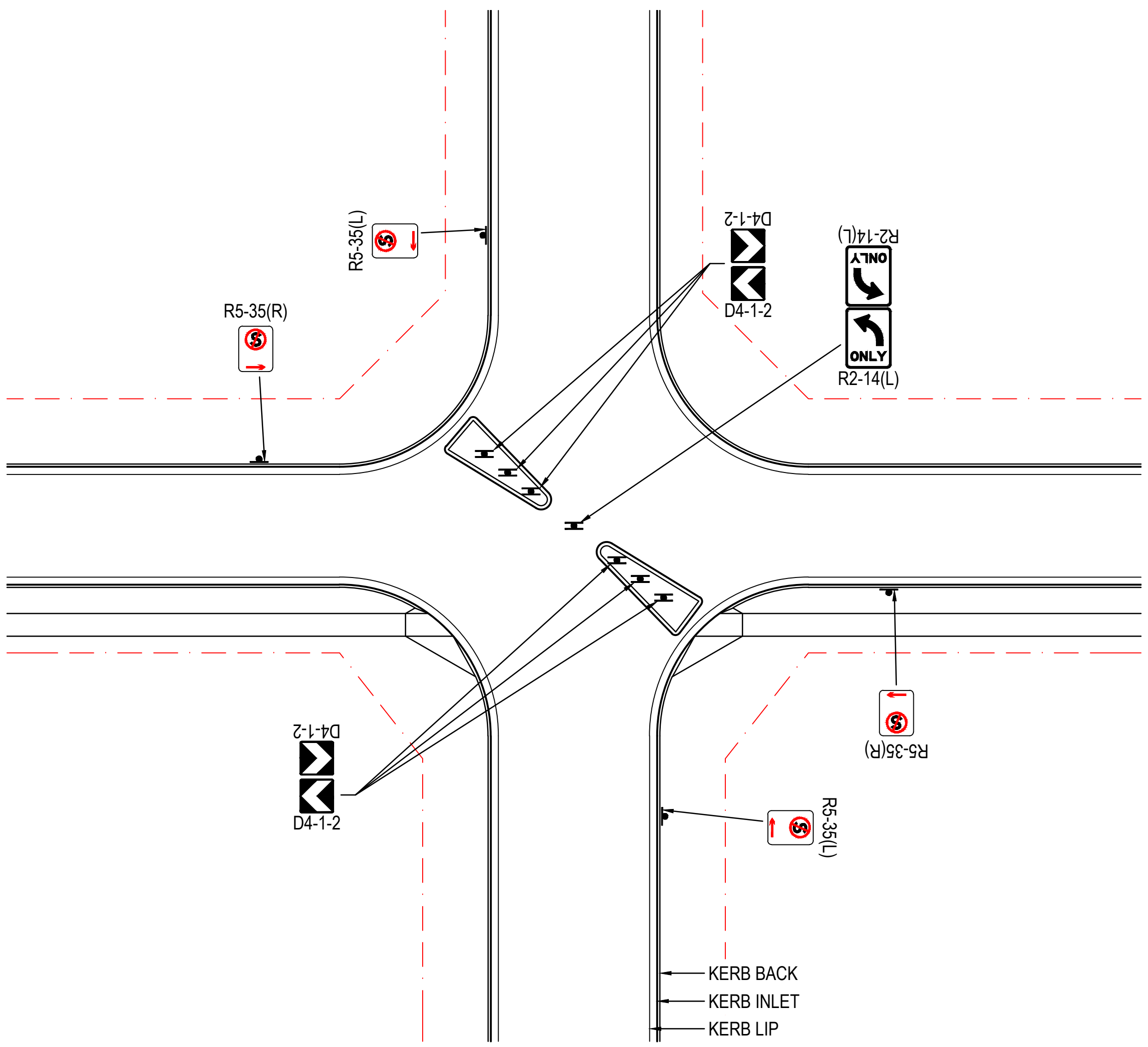

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DIAGONAL ROAD CLOSURE
TYPICAL DETAIL

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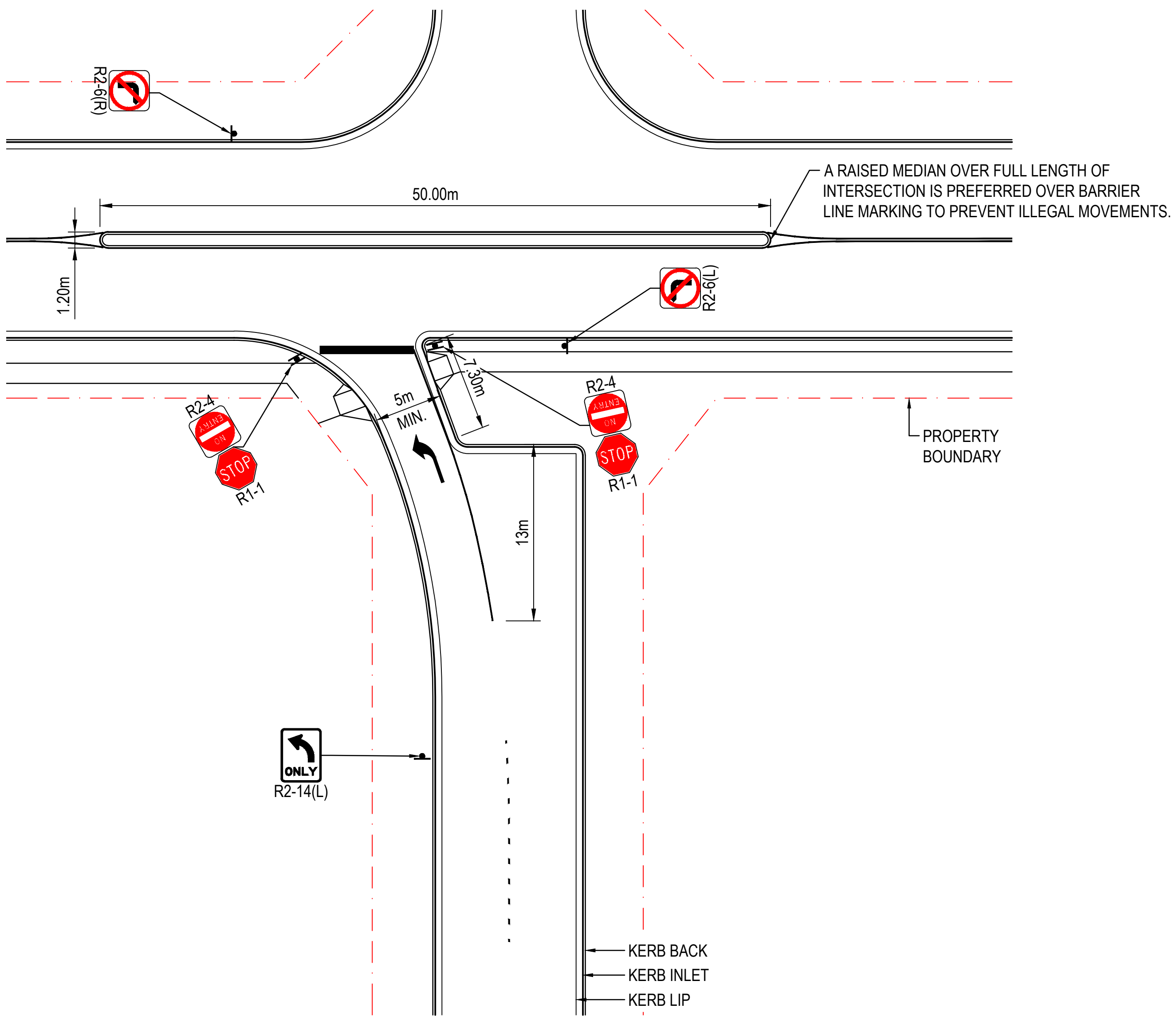

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PARTIAL ROAD CLOSURE TYPICAL DETAIL

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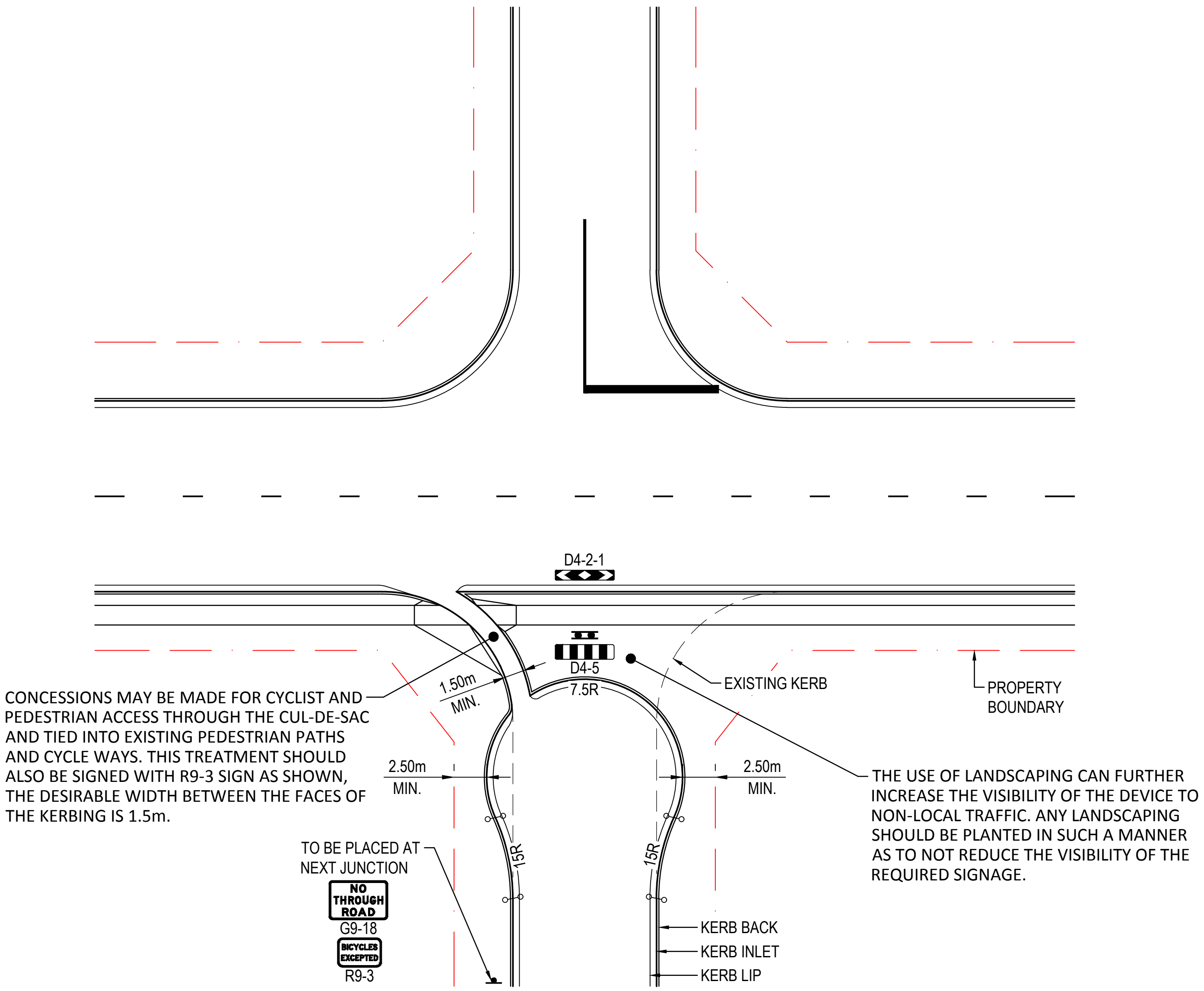

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FULL ROAD CLOSURE TYPICAL DETAIL

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Appendix E - Veitch Lister Consulting Traffic Modelling Report

Veitch Lister Consulting Pty Ltd

Prepared for

INNER WEST COUNCIL

Modelling Report

Traffic Modelling for Inner West Council

July, 2017

Traffic Modelling for Inner West Council

Modelling Report

17-028

Date	Revision	Prepared By	Checked By	Approved By	Description
19/07/2017	1	TS	ACF		Validation only
28/07/2017	2	TS	ACF		Modelling results added
21/08/2017	6	TS	ACF		Full report - draft
12/4/2018	7	ACF	ACF	ACF	Full Report - Final

Contents

List of Figures

List of Tables

1. Introduction

VLC has been appointed by the Inner West Council to undertake a transport modelling study of the area to understand the impacts of WestConnex on local roads. In particular, the assessment aims to:

- Investigate the potential for rat-running of vehicles accessing/egressing from WestConnex interchanges
- Assess the level of service on roads more sensitive to an increase in traffic due to adjacent land use, such as schools, shopping strips and quiet suburban streets)
- Highlighting roads where a reduction in traffic provides an opportunity to reclaim road space to improve local amenity

The proposed WestConnex motorways will run, effectively along three sides of the Inner West Local Government Area (LGA).By 2023, WestConnex Stages 1 and 3 will run along the north of Leichhardt, separating Rozelle and Balmain from the rest of the LGA. Stage 3 will run along the eastern length of the LGA and Stage 2 will run along the southern edge of the LGA.

The general purpose of this project is to examine the local road network within the Inner West LGA, and identify impacts of the WestConnex motorway on those roads. The project also aims to identify the impact on traffic around sensitive land uses and ultimately to inform the preparation of precinct-wide traffic management measures that mitigate the impacts of traffic.

The central tool used for the project is a strategic transport model of Sydney's Greater Metropolitan Area (GMA).While the Inner West LGA occupies only a small part of the GMA, WestConnex is extensive new infrastructure that has the potential for changing trip-making patterns across the entire GMA. The location of the Inner West LGA, almost surrounded by WestConnex, makes its road network vulnerable to potential traffic impacts. The modelling is aimed at a typical weekday: a day in the school term that is not a public holiday and not a Monday or Friday. Historically, the major peaks occur on these days, and are the times of major congestion. Weekend travel has been growing, and in some areas weekend congestion may now rival weekday congestion. However, weekend travel is fundamentally different to weekday travel (especially in the peak periods) and occur on fewer days of the year than on weekdays. For these reason, weekday peaks are still the focus of traffic engineering and planning.

The model was used to examine the potential traffic flows in 2021 and 2031, with and without WestConnex infrastructure. Other infrastructure changes in the transport networks have been included only if they have government commitment to funding. At the time of forecasting, some major projects have been discussed and proposed but do not have funding commitment. Projects excluded from modelled future networks include the F6 (SouthConnex) and the Western Harbour Tunnel.

Evaluation of the likely local impacts of the new motorway was then based on these forecasts. In particular, the volumes, levels of service and other measures of congestion were used to identify areas that would require permanent traffic management measures in the future. This does not include management of construction traffic, which is addressed as part of approval conditions.

2. Background

The Inner West LGA comprises the agglomeration of three former LGAs in Sydney's inner western area:

- Ashfield
- Leichhardt, and
- Marrickville.

The combined LGA covers approximately 35 square kilometres and has a population of around 190,000 as of the 2016 census. The region is located in the heart of WestConnex a tolled motorway, 33 km in length. The provision of the new motorway is staged:

- Stage one consists of widening the M4 motorway and providing the M4 East tunnel which connects onto Parramatta Rd and Wattle St
- Stage two consists of intersection upgrades on the M5 and a new M5 tunnel from King Georges Rd to the St Peters Interchange
- Stage three connects the first two stages, via a new underground link. It connects two new interchanges at Rozelle and St Peters.

Stages one and two (associated with the M4 and M5 respectively) are currently being built, while completion of stage three is expected around 2023.

The WestConnex project includes a link to Victoria Road, south of Iron Cove Bridge. There are also plans to provide the Western Harbour Tunnel, which is expected to connect WestConnex to the Warringah Freeway in North Sydney. Figure 2-1 shows the location and alignment of WestConnex and associated infrastructure.

The impacts of WestConnex were to be assessed by forecasting to 2021 and 2031, comparing the base and project scenarios shown in Table 2-1

Table 2-1: Future scenarios

Variant	WestConnex Inclusions
2021 Base	No WestConnex
2021 Project	WestConnex stage 1 and 2 completed
2031 Base	WestConnex stage 1 and 2 completed
2031 Project	All three stages of WestConnex and Western Harbour Tunnel completed

The effects of stage one and two are analysed by comparing 2021 Base with 2021 Project, while impacts of stage three and western harbour tunnel are analysed by comparing 2031 Base with 2031 Project.

This report documents the transport modelling procedure, model outputs and the analysis of the forecasts.

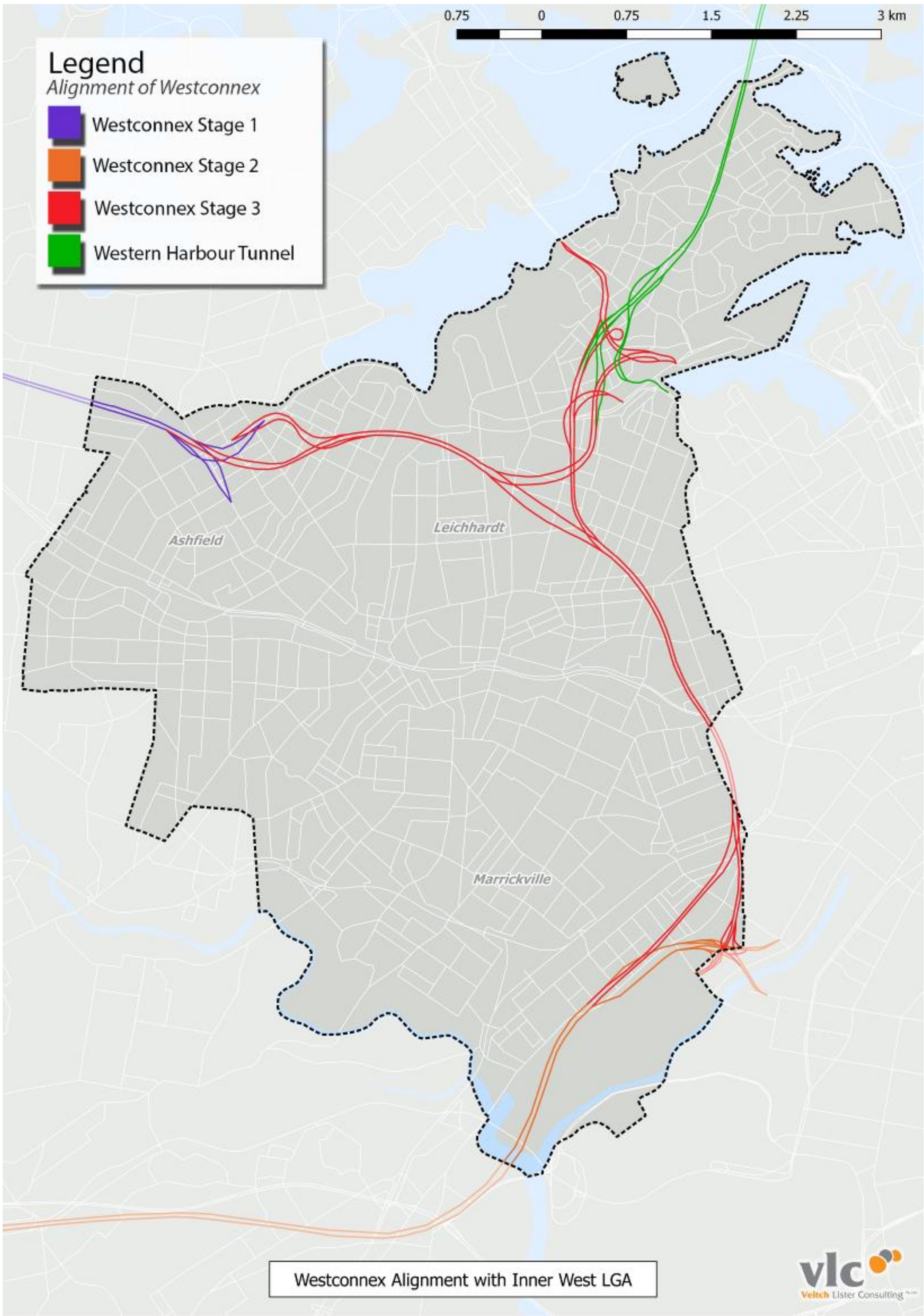


Figure 2-1: WestConnex Alignment

3. The Model

The primary purpose of a strategic transport model is to represent travel behaviour and the way it changes in response to changes in external factors, like population and employment, provision of services and government policy.

To assess the impact of WestConnex on the Inner West area, a strategic model has been used to determine the change in travel demand on the local road network in the future resulting from the motorway's opening. The modelling results may then be used to for a more detailed analysis of key intersections. For this purpose, the Sydney Zenith model was refined and validated specifically for the study area.

Initial work involved validating the model to a base year of 2011 for both the study area and the full extent of the model, aiming to improve the model's reliability. The 2011 Sydney Zenith transport model has been rigorously calibrated and validated, and is tried and tested. Additionally, 2011 is the most recent year for which census data is available.

3.1 Zenith

The Zenith model is designed for strategic evaluation of travel behaviour in response to changes in land use, transport infrastructure, services or policy. It contains a detailed representation of the multimodal transport system in the Inner West area and Sydney, as well as distribution of activities for which its residents, workers and visitors undertake travel. It describes travel for a wide range of activities for certain periods within an average weekday. The model also specifically considers active travel, and assigns walk and cycle trips to the transport network. More information about the Zenith Travel Model is provided in Appendix B. Figure 3-1 shows the extent of the full model.

3.1.1 Limitations of strategic transport models

All strategic transport models have limitations that are particularly relevant for detailed traffic assessments in local areas. These limitations include:

Observed travel data
Models are calibrated to observed measures of travel demand that are considered to represent travel on a 'typical' weekday in a given base year. However, the nature, duration and location of activities in which people participate can vary significantly from one day to the next, resulting in uncertainty in the observations.
Traffic queuing
Strategic models, including Zenith, are link-based models and measure congestion as a function of the total traffic volume on a link relative to its hourly capacity. Congestion measures, such as queues, are not represented specifically in strategic models.
Modelling of static time periods
Strategic models deal with traffic in static traffic periods and treat trips within a time period as simultaneous. The model is calibrated to provide average levels of traffic and passenger volumes, congestion and travel times over each period of the model.
Interactions between trip-makers within the same household
The Zenith trip generation models are calibrated to reflect the current rates of travel observed in the base year in each region. At present, the models do not include individual activities, schedules and interactions between household members in the associated travel decisions.
Forecasting Uncertainty
There is always a level of uncertainty around forecasts. Models are calibrated to past traffic patterns and there is no certainty that these patterns will persist. Uncertainty in strategic models is most prominent in roads with low volumes

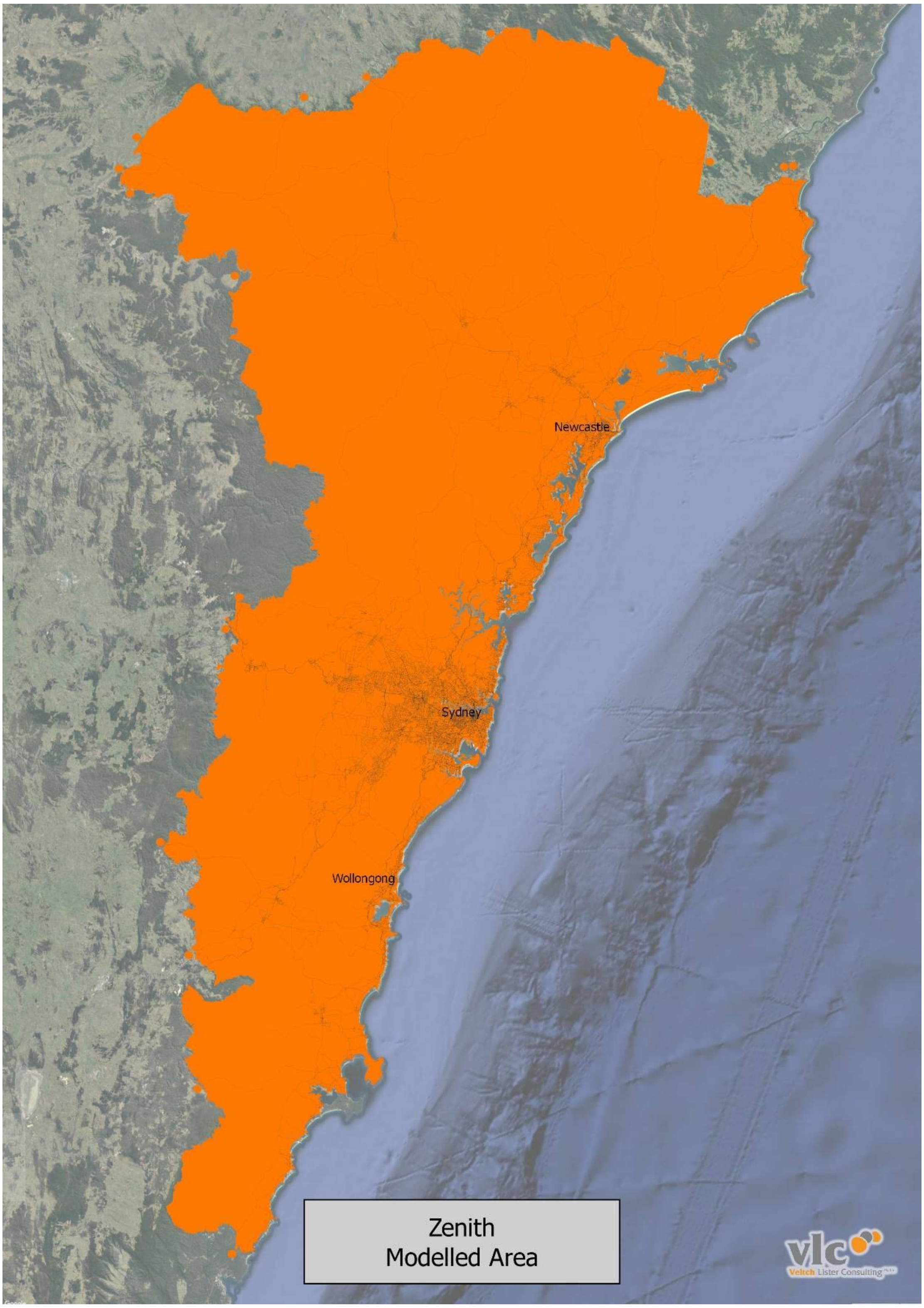


Figure 3-1: Extent of the Greater Sydney Metropolitan Area Model

3.2 Model Assumptions

This section summarises the data sources used to produce base year model assumptions.

3.2.1 Demographics

The model uses demographic and land use datasets to estimate changes in travel patterns. These are key inputs for both base and forecasting models, and are used to estimate the amount and type of travel generated on a typical weekday.

The datasets provide information such as the number of residential households and their locations, employment places and their locations, shopping precincts, schools, universities, entertainment and recreation centres and other community facilities. These are used to estimate the amount of travel generated.

Details on the demographic and land use variables, as well as the sources of data used to estimate these variables for the base year model, are provided in Table 3-1 and subsequent sections.

Table 3-1: Demographic and land use variables

Input	Description	Source	Forecast assumption
Population	The total number of people who live in the area, including average household profiles that determine: • the number of households, • household size, • three age profiles (0-17, 17-65, 65+), • car ownership, and • number of visitors.	2011 Census data - estimated residential population, satellite imagery and land use zoning	BTS population forecasts by STM 2011 Travel zone. Average household profile maintained as at 2011 Census
Employment	The number of employed persons at their place of work (not the number of people who are employed and live in the area).	2011 Census data, satellite imagery and land use zoning	BTS employment category forecast by STM 2011 Travel zone
Enrolments	The total number of students enrolled at primary, secondary and tertiary institutions, including private and public schools. These are full time equivalent enrolments.	Variety of sources, including Department of Education and Training, Schools Annual Report, and direct contact with schools.	Primary and secondary enrolments grown by model-wide growth in dependents (0-17). Tertiary enrolments grown by model-wide growth in dependents (18-64)

To increase model resolution in the study area, the travel zones in the study area were disaggregated to better capture local movements, shown in Figure 3-2.

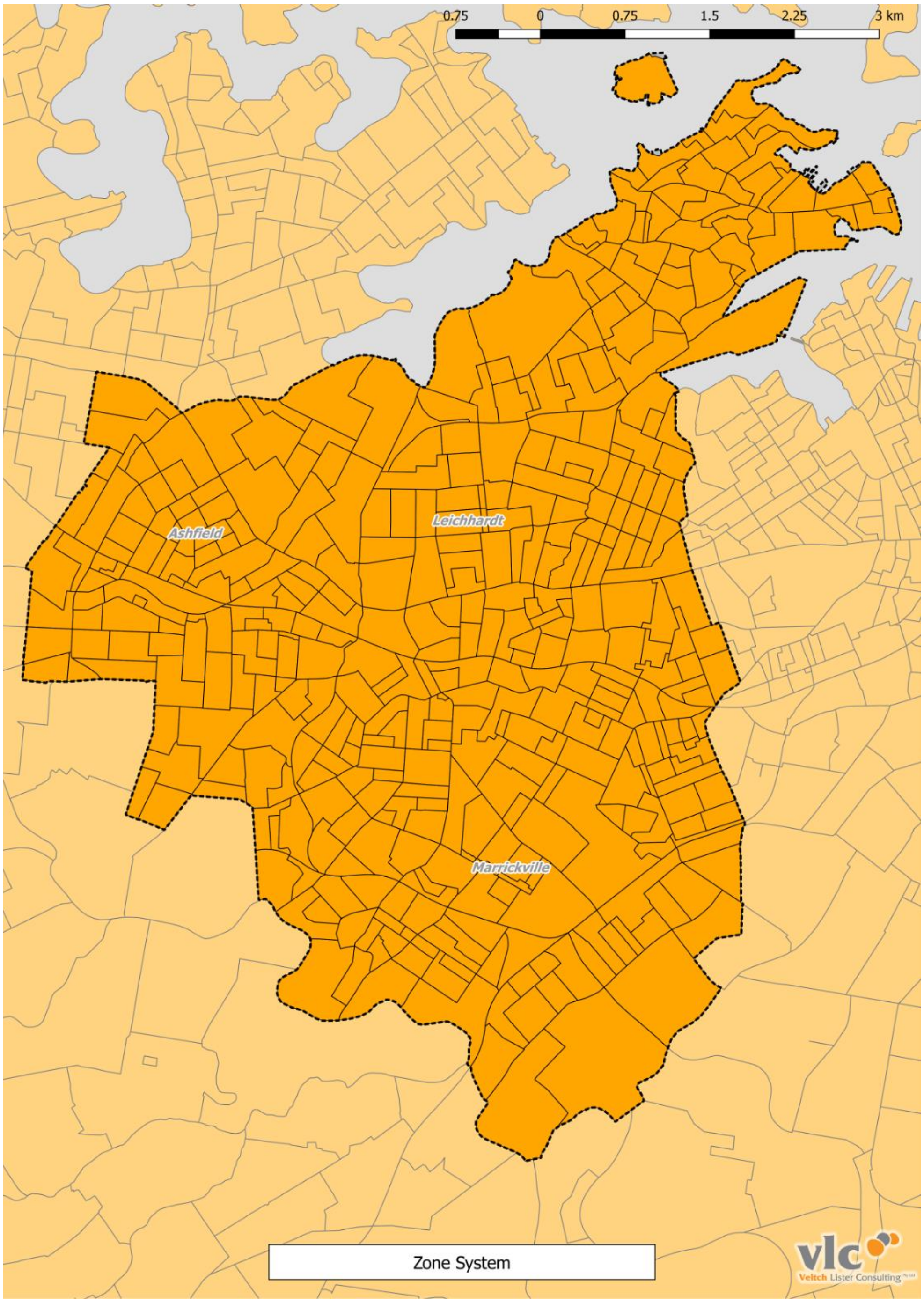


Figure 3-2: Zone system in Study Area

3.2.2 Future Infrastructure Assumptions

In defining future scenarios, both road and public transport infrastructure project assumptions have been refined to assess the most likely status of infrastructure in each respective forecast year. Infrastructure projects assumed to be in the base case for modelling purposes relevant to the project are listed in Table 3-2, while a full list of infrastructure assumptions is attached in Appendix A. Infrastructure assumptions are also shown graphically in Figure 3-3.

Table 3-2: Infrastructure Assumptions

Year	Project Name
2021	The Hunter Expressway - new 40km highway
2021	M5 West Widening
2021	M2 Widening
2021	Western Sydney Employment Area - Southern Link Road
2021	Western Sydney Employment Area - Old Wallgrove Road upgrade
2021	M2 to F3 Corridor (NorthConnex)
2021	Great Western Highway - Woodford to Hazelbrook
2021	South West Rail Link
2021	Inner west LRT Dulwich Hill extension
2021	Sydney Metro
2021	CBD and South East Light Rail
2021	Mona Vale to CBD bus priority (Bus Rapid Transit)
2021	Newcastle Light Rail
2021	Bourke St / O'Riordan St project
2021	Victoria Road Clearway (from The Crescent to Iron Cove Bridge; Rozelle)
2031	M12 Motorway
2031	M4 Widening
2031	City and South West Metro
2031	Parramatta Road bus priority - Burwood to CBD
2031	WestConnex Stage 1
2031	WestConnex Stage 2

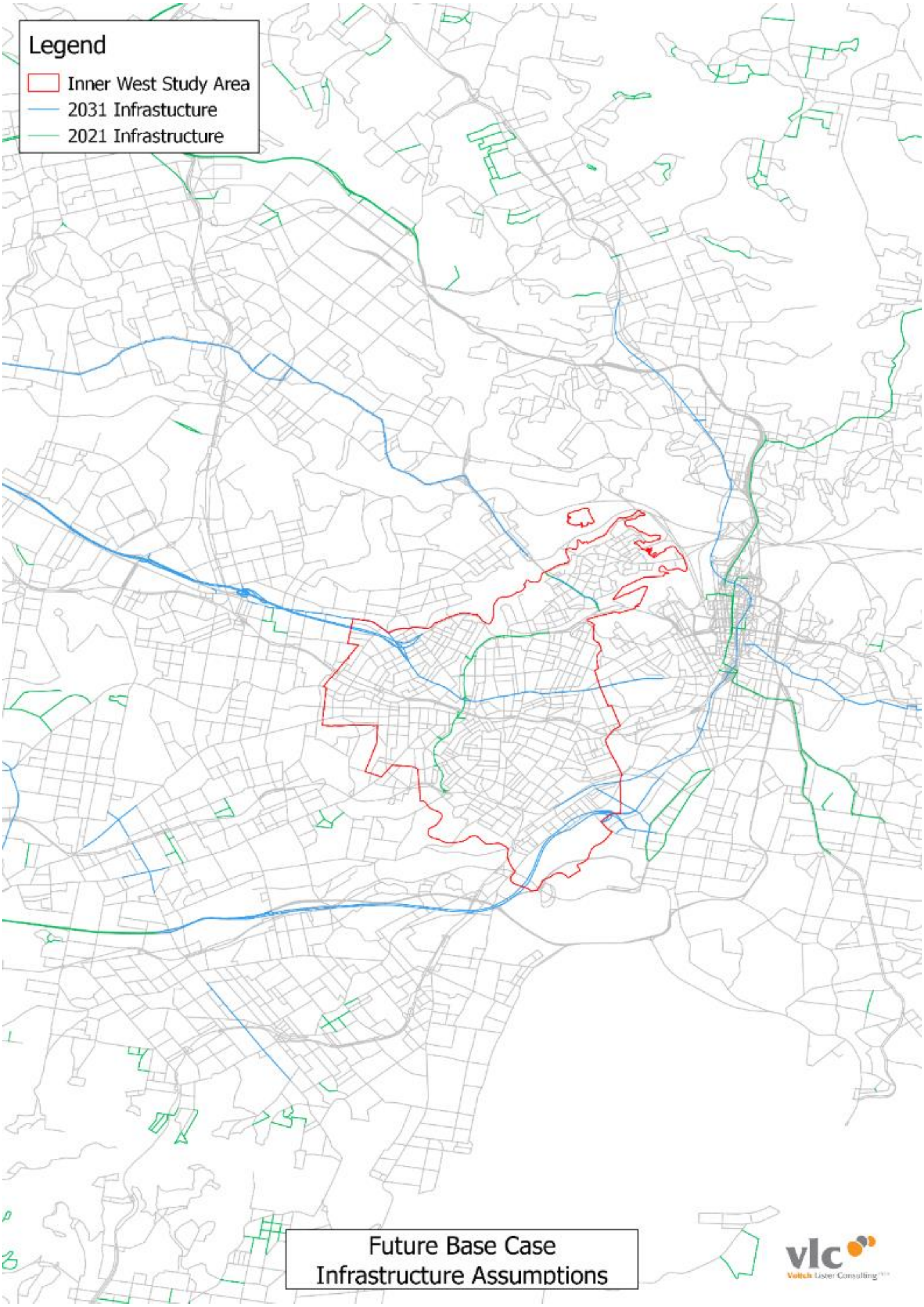


Figure 3-3: Future infrastructure assumptions

3.2.3 WestConnex Assumptions

Assumptions for WestConnex were obtained from the WestConnex website[1]. The alignment coded is shown in Figure 2-1. Toll values were also obtained from the website[2] in Figure 3-4. Future tolls were estimated from assuming a CPI of 2.5% and escalating the tolls accordingly.

ELEMENT	2017 $
Flagfall	$1.22
Toll per km	$0.45
Toll cap	$8.60
Truck multiplier	x3
Escalation	Minimum of 4% or CPI whichever is greater
Concession term	To 2060

Figure 3-4: WestConnex tolls

[1] https://www.westconnex.com.au/, accessed on 13/07/2017
[2] https://www.westconnex.com.au/using-westconnex/tolls, accessed on 13/07/2017

3.3 Model Validation

Model validation is the process that determines the extent to which a transport model represents the traffic and transport conditions in a particular year. In effect, this demonstrates the confidence with which the model can be used for forecasting traffic and transport demand. Typically, for validation, modelled traffic volumes and public transport loads are compared to observed traffic counts and public transport patronage.

This section contains a summary of the validation results; a more complete treatment of the validation can be found in Appendix C.

For this project, the validation was undertaken at two geographic levels;

- Across the entire modelled region, which includes Sydney, Newcastle and Wollongong
- And for the Inner West LGA, the extent of which is shown in Figure 3-5.

Figure 3-5: Inner West LGA

The Zenith 2017 Release Model of the Greater Sydney Metropolitan Area is based on 2011, which is the year of latest available census data and supporting data. The model includes all freeway, arterial and collector roads, as well as some significant local roads. Generally, in a strategic transport model, local roads fall entirely within a single travel zone and would therefore not attract traffic. As a result, they are generally not represented in strategic models.

For the Inner West model, however, the zone system was refined in the Inner West LGA, allowing smaller zone sizes. More local roads cross zone boundaries, are therefore significant in the model and have been added to the model road network.

Local roads that were added to the network in the Inner West version of the model are shown in Figure 3-6.

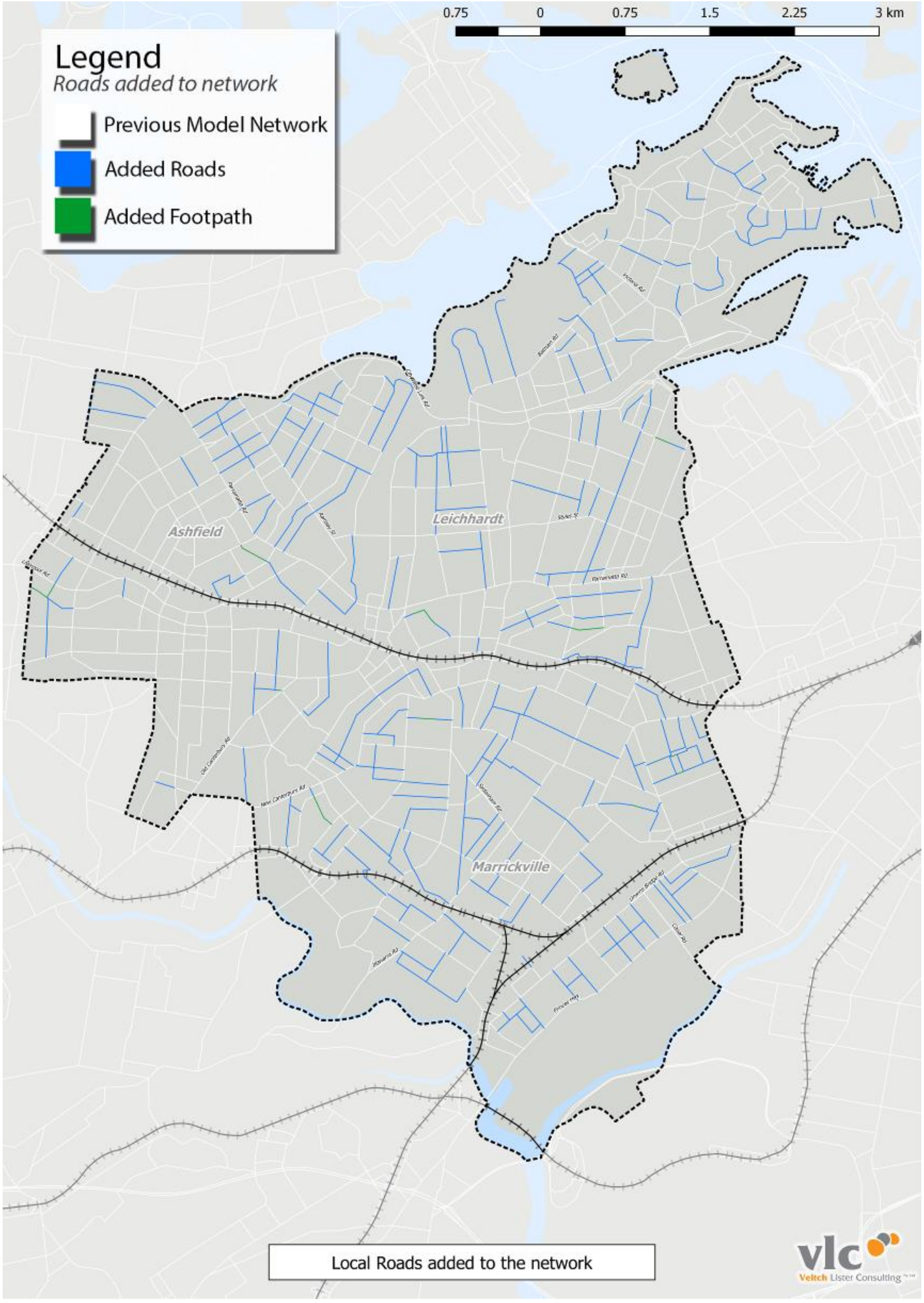


Figure 3-6: Local roads added to the network

3.3.1 Model Wide Validation

The model has been previously validated and was re-validated for this project to ensure that the refinement of zones and road network has no effect on the validity of the model across its entire extent. Validation standards from the RMS *"Traffic Modelling Guidelines (2013)" and* were applied.

The counts used for validation were from a database managed by VLC with a collection of 671 AWDT traffic counts, and 324 public transport station and stop entry counts. The counts are from a variety of sources. The majority of traffic counts were provided by RMS, while the public transport counts were predominantly supplied by Transport Performance Analytics (TPA), formerly BTS (Bureau of Transport Statistics) and Transport for NSW.

Table 3-3 shows that the modelled traffic volumes validate well across all time periods in aggregate.

Table 3-3: Model-wide counts 2011

Summary	Daily	AM	PM
Number of counts	671	671	671
Total count volume	12,566,400	1,763,500	1,870,300
Total modelled volume	12,434,100	1,727,700	1,830,600
Difference	-132,300	-35,700	-39,600
Difference (%)	-1.1%	-2.0%	-2.1%

A comparison of the modelled traffic volumes and traffic count shows that the model's highway assignment meets the RMS Guidelines recommendations on all but peak period %RMSE, a measure that indicates the extent to which the comparisons are scattered. In this case, we have introduced into the validation a number of counts that are not fully consistent with the model assumptions. The count is averaged over seven days of the week, while the model deals with an average of the three middle days of the week. In addition, a full daily profile for weekdays has been inferred for these counts. On this basis we have accepted that the small discrepancies in meeting the RMS criteria.

Although we are focussing on roads for this project, the model is a multi-modal one and its mode split estimates are crucial for its traffic volume forecasts. The model's performance on the public transport network is important for its validation of road network volumes.

Public transport validation was undertaken for all public transport modes.

The validation shows that there is a good match on entries and exits at stations on the rail network. The fit for ferries is also good, but less important because of the low volumes they carry and because ferries have a small impact on transport demand in the Inner West LGA.

3.3.2 Study Area Validation

Because of the importance of the road network in the Inner West LGA, traffic assignments on roads in the Inner West LGA were validated in more detail.

Inner West Council provided Average Daily Traffic (ADT) counts, which were used in the validation. The model works with weekday traffic, excluding school holidays, weekends and public holidays. In general, AWT volumes are higher than ADT because weekend traffic volumes (which are excluded from AWT) are lower than weekday traffic.

Factors to convert average daily counts to average weekday counts were estimated from those counts that included both measures. As a result, all daily traffic counts were increased by 5% and commercial vehicle counts were increased by 16% to estimate average weekday movements. This procedure, however, and the lack of specific peak period and weekday counts has in inherent observation error that may affect accuracy of the validation. We have taken as much care as possible to measure the inconsistent sets of data to the model volumes, but inevitably, a level of judgement regarding the validation acceptability has been needed.

The results of individual comparisons have been examined closely and explanations were sought where there were significant differences. In general, it was found that:

- there are a large number of counts with low volumes. Percentage errors on low volume counts are disproportionately large because of the low base on which they are calculated.
- The general factor used to convert ADT to AWT is not accurate for all counts, with a potentially wide variation across the study area, with roads around schools and workplaces needing a higher conversion and roads close to shopping centres needing a lower conversion.

Validation test indicate that RMS criteria are generally met. Commercial vehicles were examined separately and it was found that validation is not as close as for all traffic. In general, there is a degree of uncertainty about the commercial vehicle assignment and it appears that the model overestimates volumes by around 10%.

Much less is known about commercial vehicle trip making than about car trips, and inevitably commercial vehicle modelling has more uncertainty around it. Strategic models do not include factors such as road grade, low radius turns, narrow lanes, low hanging trees and other non-technical factors that are important in commercial vehicle route choices.

There are no criteria for model validation specifically for commercial vehicles in modelling guidelines.

Despite the relatively lower performance of the model with commercial vehicles, the model satisfies validation criteria, especially as the foundation of the study will be comparisons of a project case against a base case. Additional care will be needed in dealing with forecasts of commercial vehicles to ensure that the uncertainty associated with their modelling is accounted for.

As an additional exercise, we looked at the model's estimate of level of service during the morning peak period. Levels of Service are defined by as:

LOS A: free flow. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes. LOS A generally occurs late at night in urban areas and frequently in rural areas.

LOS B: reasonably free flow. LOS A speeds are maintained, manoeuvrability within the traffic stream is slightly restricted. Motorists are of physically and psychologically comfortable.

LOS C: stable flow, at or near free flow. Ability to manoeuvre across lanes is noticeably restricted and lane changes require more driver awareness. Experienced drivers are comfortable, roads remain safely below capacity, and posted speed is maintained. Minor incidents impact localised service and traffic queues will form behind the incident.

LOS D: approaching unstable flow. Speeds decrease slightly as traffic volume increases. Freedom to manoeuvre within the traffic stream is limited and driver comfort levels decrease. Minor incidents create delays. Examples are a busy shopping corridor in the middle of a weekday, or a functional urban highway during commuting hours.

LOS E:unstable flow, operating at capacity. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to manoeuvre in the traffic stream. Speeds rarely reach the posted limit. Any disruption to traffic flow, such as merging ramp traffic or lane changes, will create a shock wave affecting traffic upstream. Incidents create serious delays. Drivers' level of comfort becomes poor.

LOS F:forced or breakdown flow. Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing or stopping required. Travel time cannot be predicted, with generally more demand than capacity. A road in a constant traffic jam is at this LOS, because LOS is an average or typical service rather than a constant state.

A level of service scheme was defined using the following volume/capacity ratio bands:

- **LOS A**: 0 to 0.35
- **LOS B**: 0.35 to 0.65
- **LOS C**: 0.65 to 0.75
- **LOS D**: 0.75 to 0.9
- **LOS E**: 0.9 to 1
- **LOS F**: > 1

This LOS scheme has been used in previous studies in New South Wales, but the actual level of service measure is flexible, in line with the wording of the definitions listed above. The model's network LOS was plotted and compared to the observed AM peak level of service from the RMS Live Traffic Service website[3] in Figure 3-7.The comparison shows that the two images are quite similar. Nevertheless, this comparison is simply an illustration; it is not a suitable test for validation.

[3] https://www.livetraffic.com/desktop.html, accessed 25/07/2017

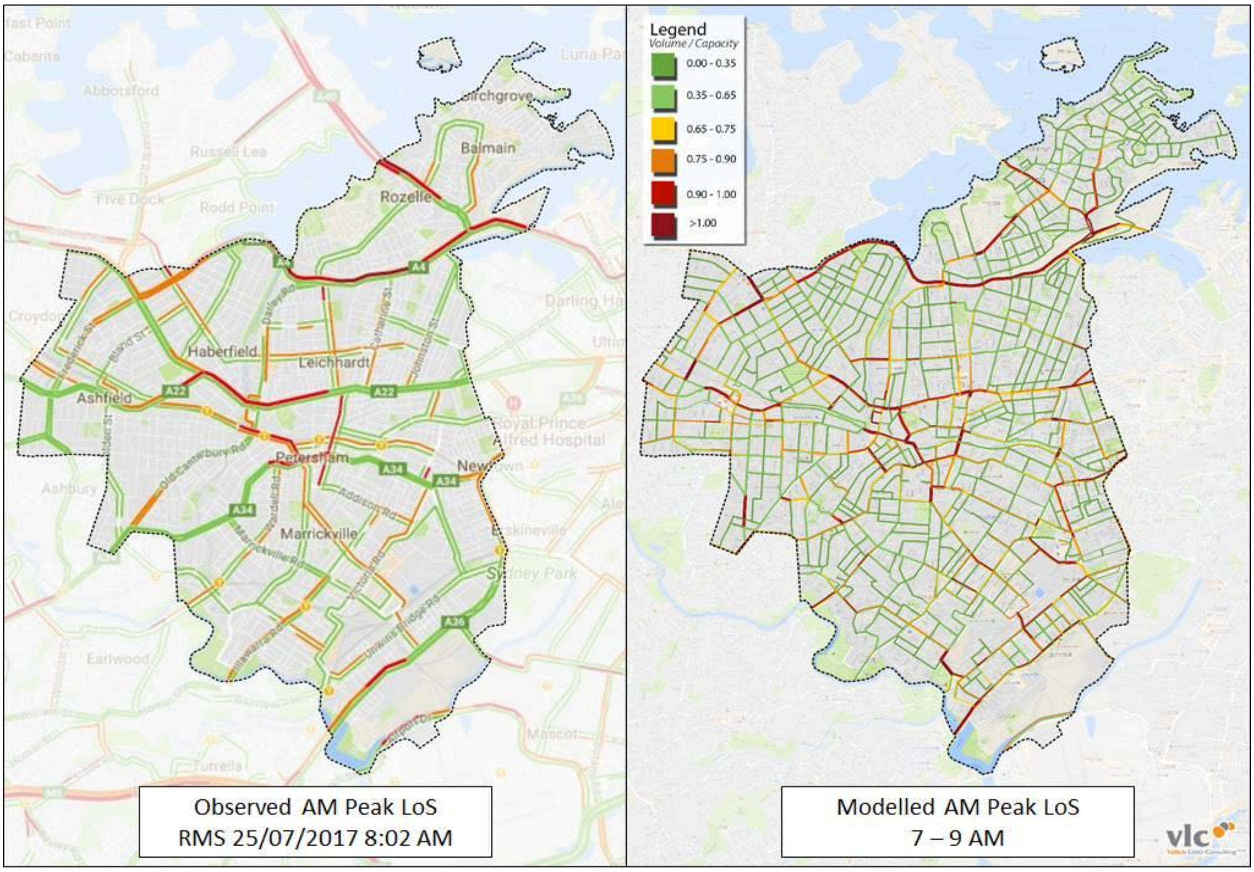


Figure 3-7: Modelled vs observed AM Peak level of service

It should be noted that strategic transport models do not replicate queues, which, in reality, can affect the level of downstream roads links. In reality, a reduction in capacity on a link may result in a long queue, stretching back over several road links. This reduces the level of service on roads that may have adequate capacity, at least in theory. In a strategic model, traffic is associated with single links, which are independent of each other and effects of blocking back are not replicated.

3.4 Validation Conclusion

The model validates well on a model-wide basis .Within the study area, the validation is affected by comparisons between AWT and ADT volumes. The use of an average conversion factor for locations where both measures are not available does not fully compensate for having the actual comparable numbers. The local area validation is also affected by commercial vehicles.

Commercial vehicle validation is weaker than that of passenger travel. This is a common issue with strategic transport models, which are primarily aimed at passenger travel. There is a paucity of travel data for commercial vehicle trip generation and mode split.

Forecasts of commercial vehicle demands will be post-processed to provide more certainty around the impact of WestConnex on commercial vehicle volumes in the Inner West LGA.

4. Base Year Results

This section examines the volume capacity ratio of the 2011 network during the morning peak (7-9am) and afternoon peak (4-6pm). The volume capacity ratio is determined by dividing the modelled load in one hour by the road's capacity.

In strategic models, the volume (which is a demand) may exceed the capacity. However, on links where demand exceeds capacity, increasing demand is limited as far as possible by high perceived costs of travelling on the link. A high volume/capacity ratio should be interpreted as indicating a need for peak spreading.

Figure 4-1 and Figure 4-2 show the levels of service (as defined in section 3.2.2) during the peak periods in 2011. The results show that some roads were already at capacity during peak periods in 2011. All crossings of the T1 Western Railway Line were highly congested during peak periods. Roads in the corridor between Summer Hill and Sydenham along Marrickville and Sydenham Roads are also subject to significant congestion. In addition, there are isolated lengths of road that are congested, such as Frederick Street in Ashfield, Balmain Road in Rozelle and Marion Street around Marion light rail station. In more detail, the roads that are most congested include:

- Balmain Road, Rozelle
- Some sections of Frederick Street
- Toothill Street, eastbound in the AM Peak
- Edinburgh Road, especially AM inbound and PM outbound
- Marion Street, especially AM inbound and PM outbound
- Roads crossing the Inner West and South Rail Line in both the north bound and south bound directions:
  - Old Canterbury Road
  - West Street
  - Crystal Street
  - Liberty Street
  - Enmore Road
  - Liverpool Road

Roads in the suburbs of Haberfield and Annandale are less congested during the peaks, with most roads operating at a level of service A.

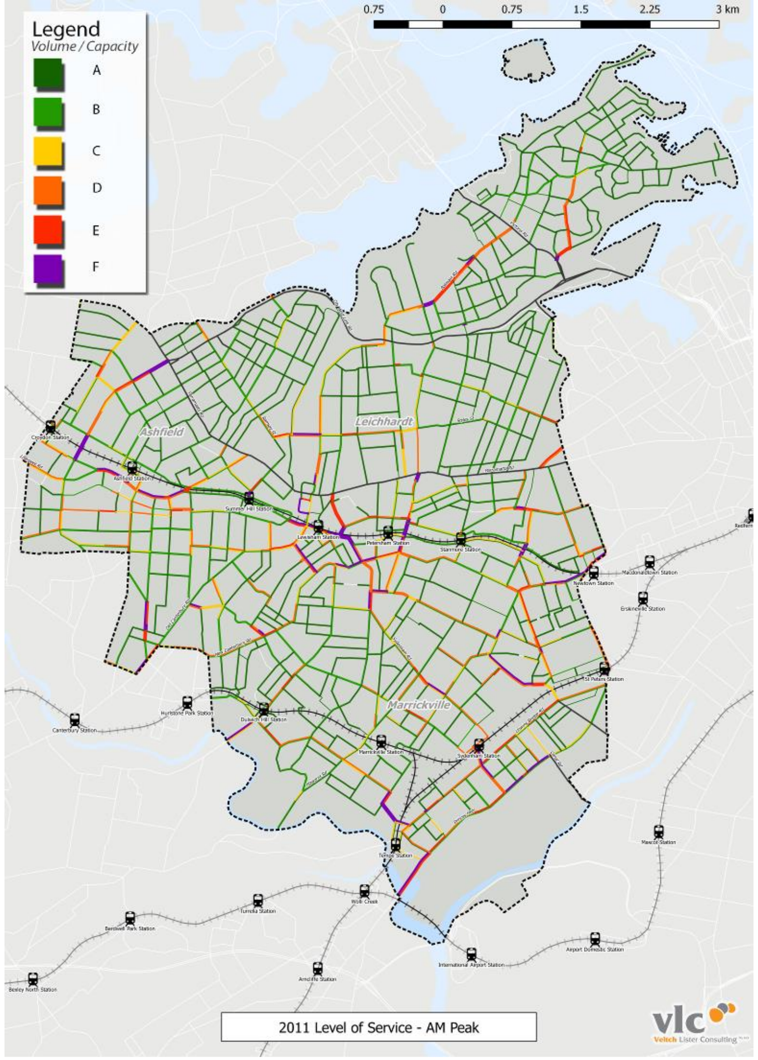


Figure 4-1: 2011 AM Peak Volume/Capacity

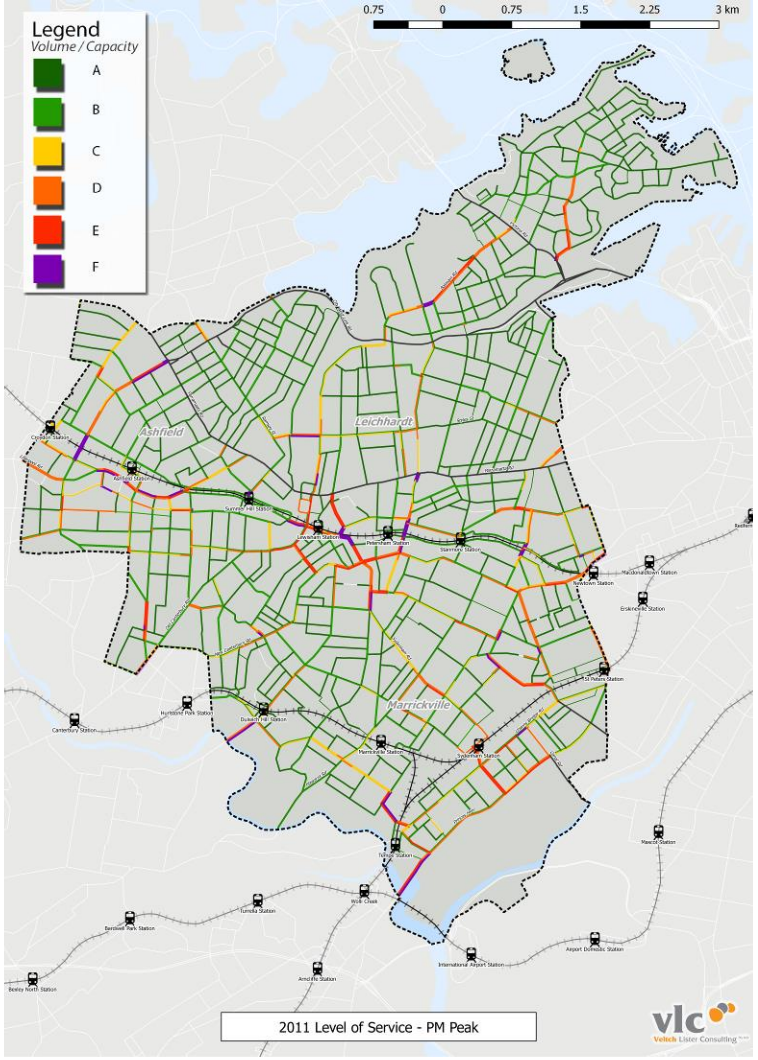


Figure 4-2: 2011 PM Peak Volume/Capacity

5. Forecasts

This section presents and describes the transport model forecasts for 2021 and 2031 forecasts. For the purpose of the model outputs and network performance observations below, the peak periods are:

- AM peak: 7 to 9 AM
- PM peak: 4 to 6 PM

Base Case and Project Case were considered for each forecast year. Only WestConnex differs between Base and Project Cases. The following table summarises the WestConnex configuration for each scenario.

Table 5-1: Scenario Configuration

Scenario	Stage One	Stage Two	Stage Three	Western Harbour Tunnel
2021 Base	✘	✘	✘	✘
2021 Project	✓	✓	✘	✘
2031 Base	✓	✓	✘	✘
2031 project	✓	✓	✓	✓

5.1 Base Case Results

Forecasts of traffic volumes during the peak periods for base case networks are discussed in this section.

5.1.1 2021

In 2021, congestion on roads that were already congested in 2011 can be expected to worsen.

Figure 5-1 and Figure 5-2 show the forecast levels of service (as defined in section 3.2.2) during the peak periods in 2021. All crossings of the T1 Western Railway Line are likely to experience increased congestion during peak periods, with more extended lengths of congested road. Roads in the corridor between Summer Hill and Sydenham along Marrickville and Sydenham Roads are likely to attract increased volumes, which will result in worsening congestion, both in extent and severity. In addition, the isolated lengths of road identified as being congested in 2011 will also worsen in service. Additional traffic is likely on Frederick Street in Ashfield, while the increased volumes on Balmain Road in Rozelle will extend congestion to Darley Road and Foster Street in Leichhardt. Poor levels of service on Marion Street are likely to spread along its length.

More specifically, the following roads will experience worsening traffic conditions:

- The length of Balmain Rd and Perry Street in Rozelle, extending to Darley Road and Foster Street in Leichhardt
- Frederick Street south of Parramatta Road
- Toothill Street in Lewisham
- Unwins Bridge Road
- Addison Road and Livingstone Road
- Edinburgh Road
- Marion Street
- Edgeware Road in Enmore

- Queen St, between Griffiths St and Armstrong St
- All crossings of the Inner West and South Rail Line
- Crossings of the Bankstown Rail Line, including:
    - King Street
    - Bedwin Road
    - Gleeson Avenue
    - Richardsons Crescent

Roads around the suburb of Haberfield are mostly uncongested in this scenario.

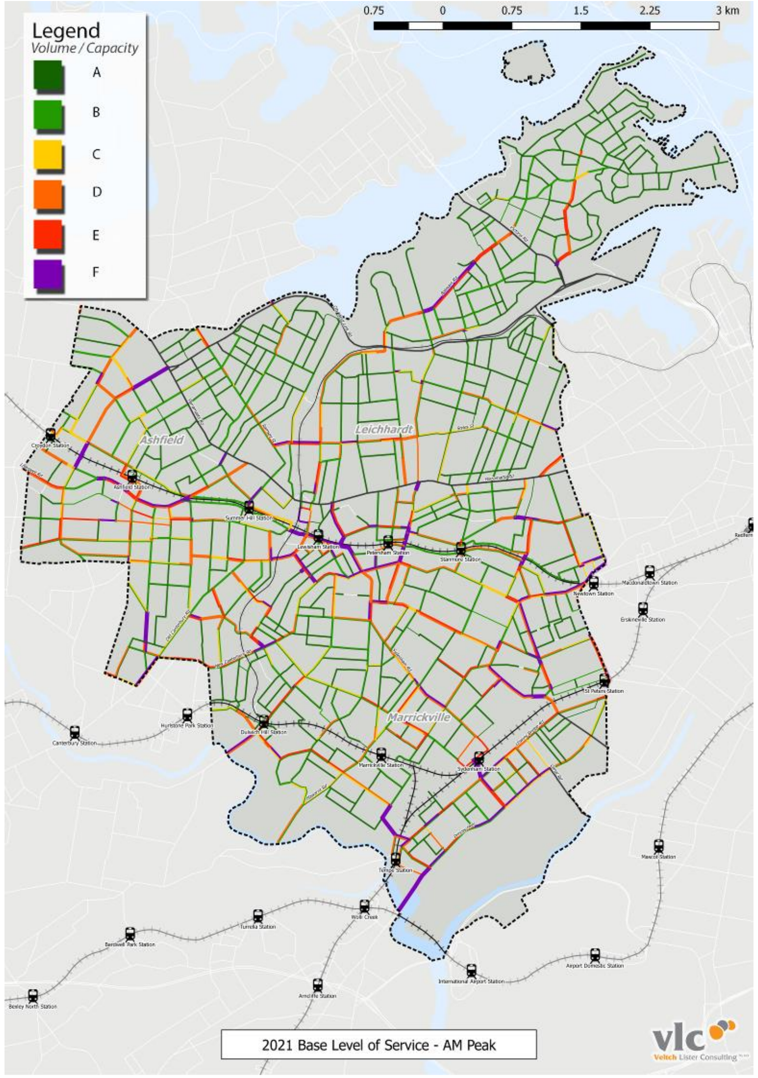


Figure 5-1: 2021 Base AM Peak LoS

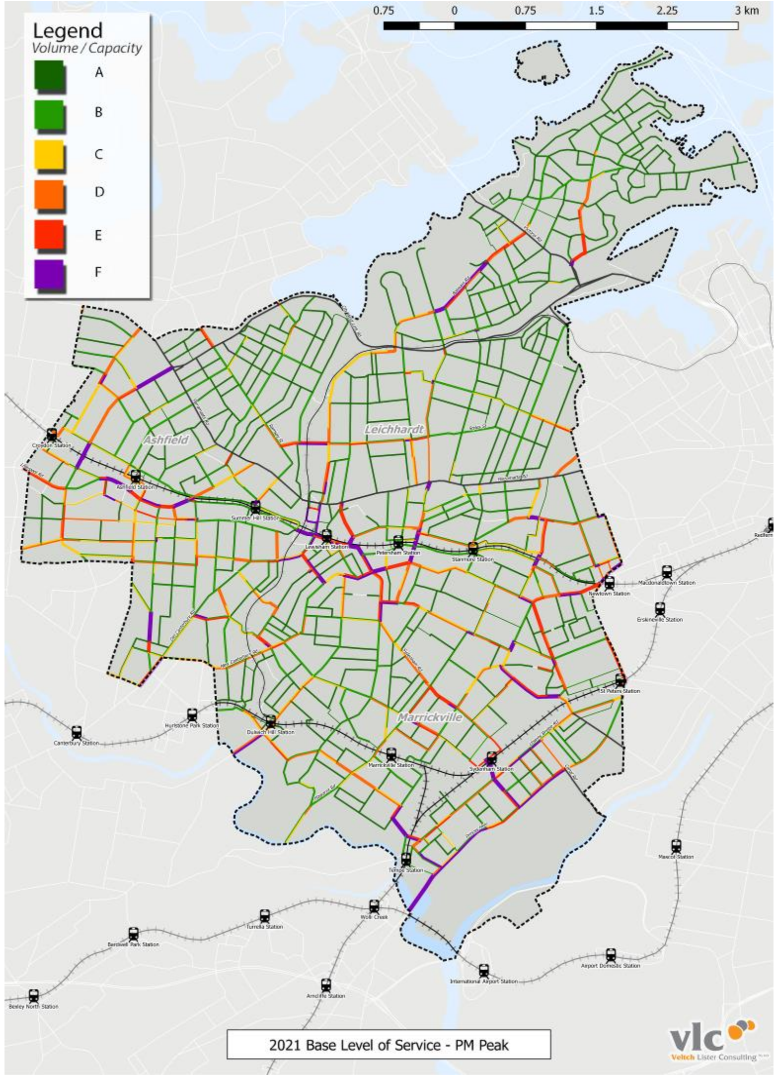


Figure 5-2: 2021 Base PM Peak LoS

5.1.2 2031

With Stages 1 and 2 of WestConnex operating by 2031, congestion is anticipated to be in significantly worse than in 2021 on local roads and levels of service will worsen across the road network, mostly as a result of growth of traffic demand that is not ameliorated by WestConnex. Figure 5-3 and Figure 5-4 show that, in general, the pattern of increasing congestion follows a similar pattern to 2021. Traffic volumes in the corridor along Balmain Road, Perry Street, Darley Road and Foster Street will grow significantly, reducing levels of service. Roads on the corridor between Summer Hill and Sydenham will also experience lower levels of service than in 2021, especially Bedwin Road and Edinburgh Road. All road crossings of the railway lines in the area are likely to be severely congested.

More specifically, roads where traffic volumes are likely to increase include:

- The corridor defined by Balmain Road, Perry Street, Darley Road and Foster Street.
- Frederick Street
- Toothill Street
- Addison and Livingstone Roads
- Edinburgh and Bedwin Roads
- Unwins Bridge Road
- Marion Street
- Edgeware Road
- Queen St, between Griffiths St and Armstrong St
- Hawthorne Parade between Barton Avenue and Marion Street
- All crossings of railway lines

Growth of traffic to 2031 will leave few areas in the Inner West LGA with uncongested roads during the peak periods.

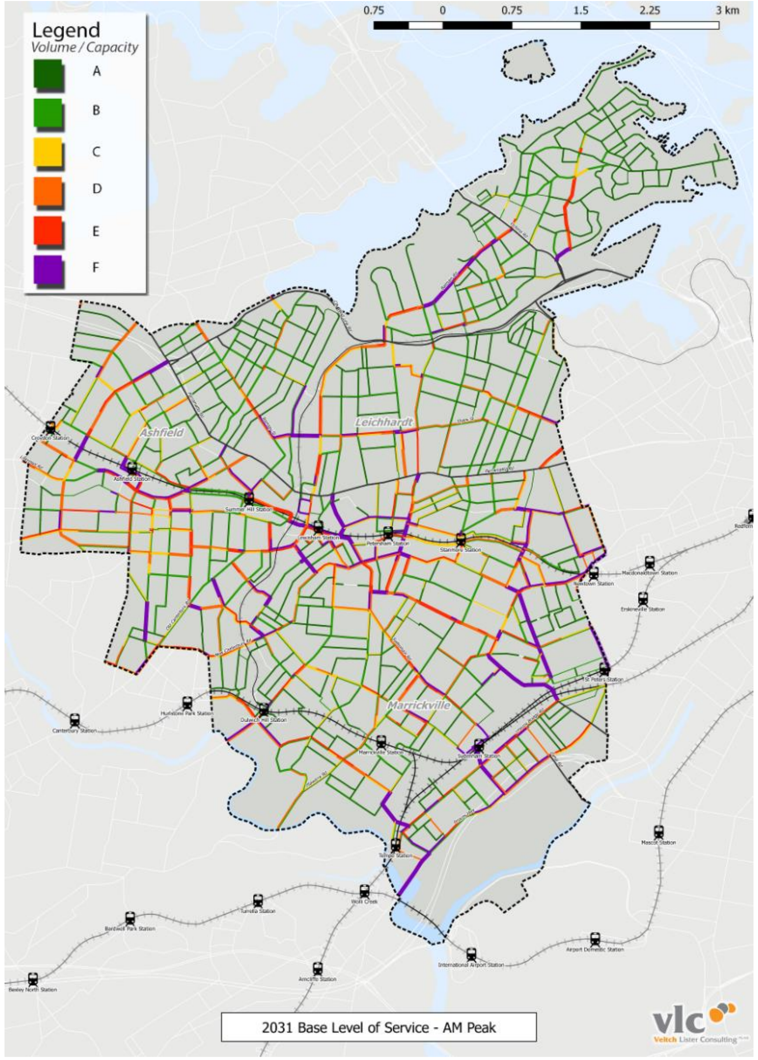


Figure 5-3: 2031 Base AM Peak LoS

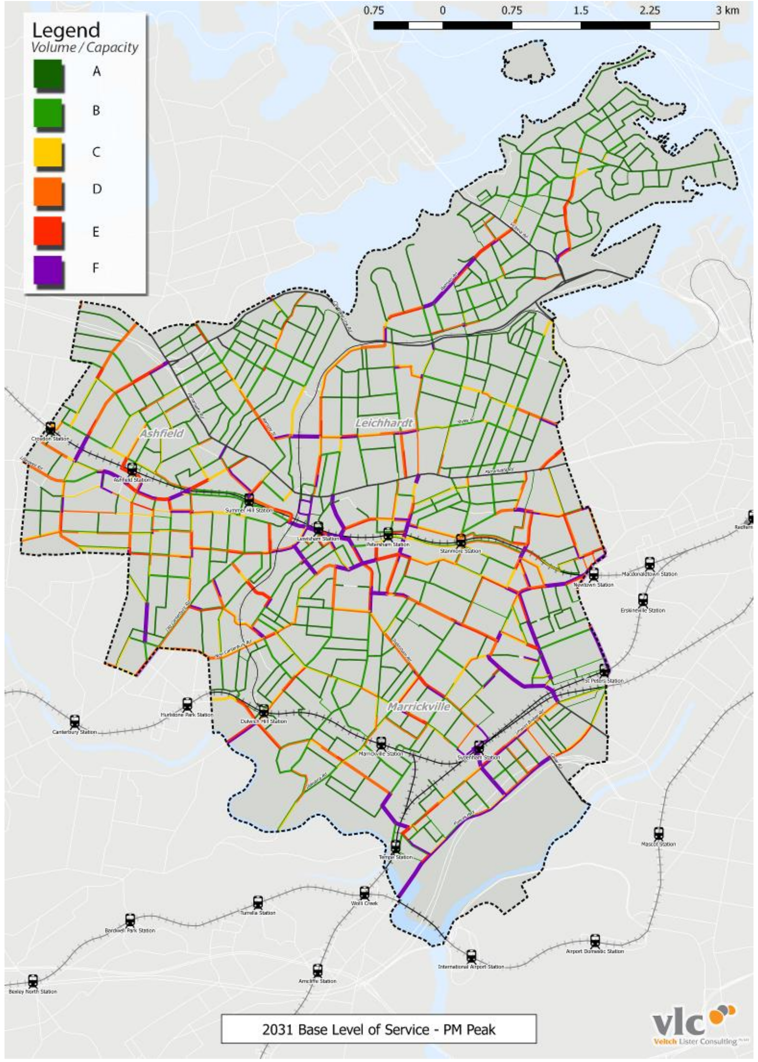


Figure 5-4: 2031 Base PM Peak LoS

5.2 Project Case Results

This section summarises the Level of service on roads with Stages 1 and 2 of WestConnex completed by 2021, and Stage 3 completed by 2031.

5.2.1 2021

Even with Stage 1 and 2 of WestConnex completed in 2021, traffic congestion will continue to worsen in the same areas as for the base case. Figure 5-5 and Figure 5-6 show the forecast levels of service (as defined in section 3.2.2) during the peak periods in 2021 after the opening for stages 1 and 2. As with the base case, all crossings of the T1 Western Railway Line are likely to experience increased congestion during peak periods, with more extended queues and delays. Roads in the corridor between Summer Hill and Sydenham, around Marrickville and Sydenham Roads, are likely to attract increased volumes that result in delays, both in extent and severity. In addition, levels of service on the isolated lengths of road identified as being congested in 2011 will reduce. Traffic volumes on Frederick Street in Ashfield are likely to worsen, while the areas of queueing and delay on Balmain Road in Rozelle will extend to Darley Road and Foster Street in Leichhardt. Most of the length of Marion Street is likely to experience long queues and delays. In more detail, the roads that are most likely to experience an increase in traffic include:

- The length of Balmain Rd and Perry Street in Rozelle, extending to Darley Road and Foster Street in Leichhardt
- Frederick Street south of Parramatta Road
- Toothill Street in Lewisham
- Addison Road and Livingstone Road
- Edinburgh Road
- Unwins Bridge Road
- Marion Street
- Edgeware Road in Enmore
- Queen Street, between Griffiths Street and Armstrong Street
- All crossings of the Inner West and South Rail Line
- Crossings of the Bankstown Rail Line, including:
    - King Street
    - Bedwin Road
    - Gleeson Avenue
    - Richardsons Crescent

Roads around the suburb of Haberfield are mostly uncongested in this scenario.

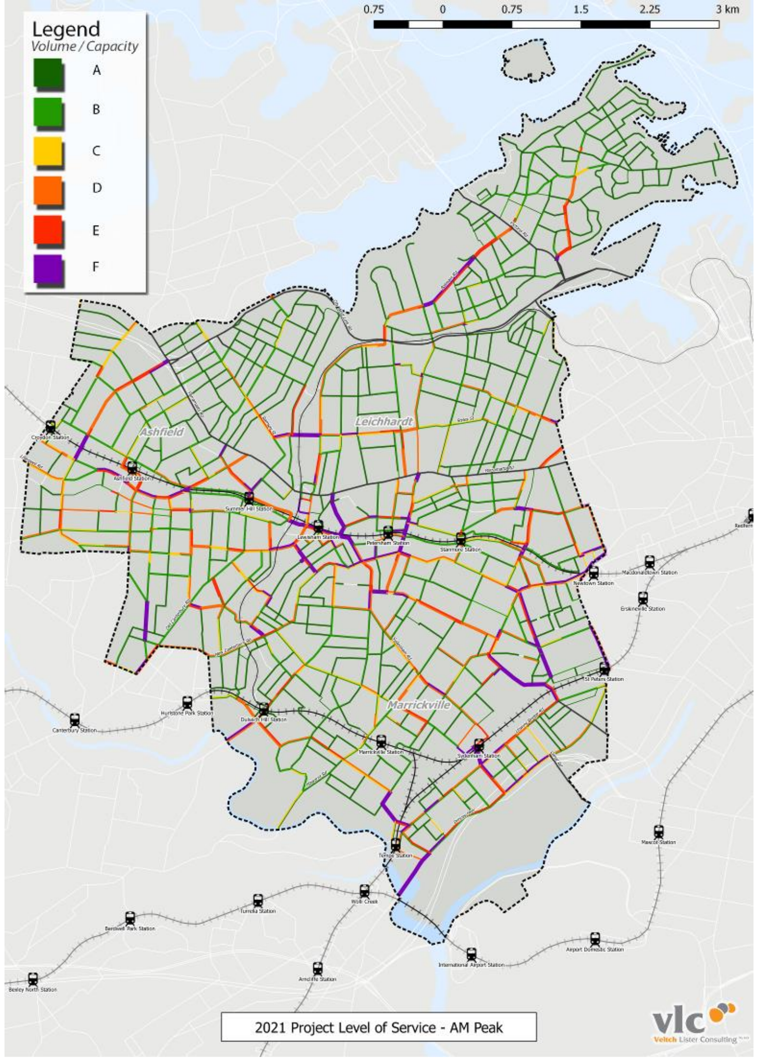


Figure 5-5: 2021 Project AM Peak LoS

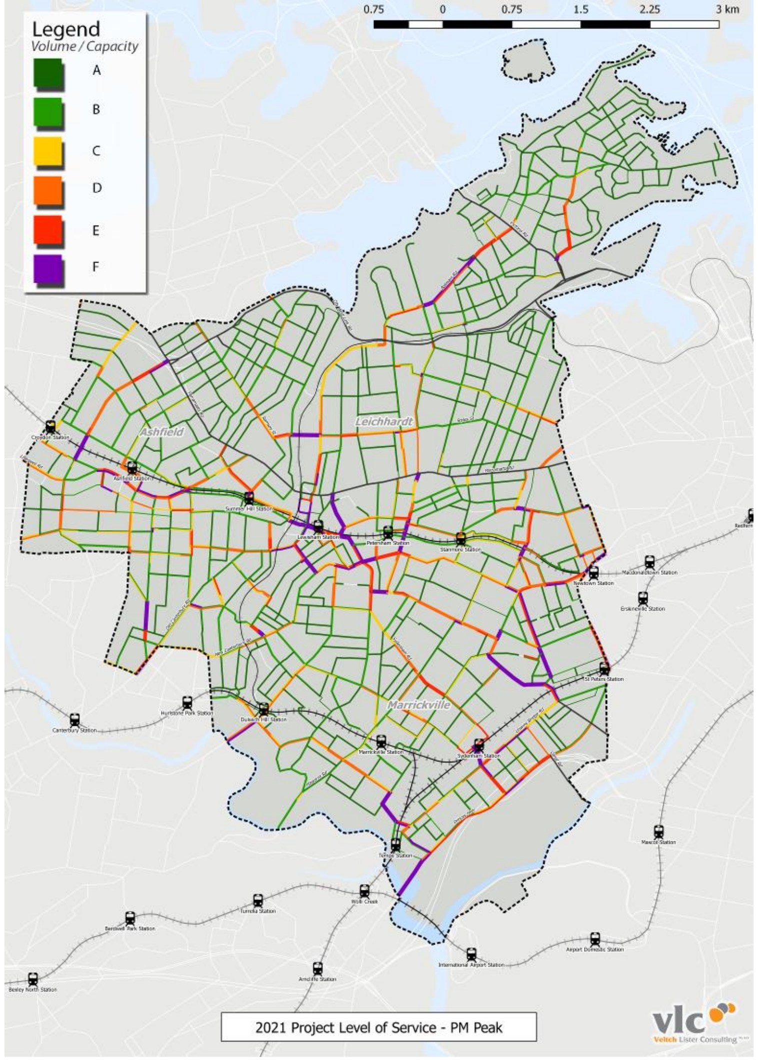


Figure 5-6: 2021 Project PM Peak LoS

5.2.2 2031

Even with Stage 3 of WestConnex operating by 2031, it is anticipated that traffic volumes are likely to be significantly higher than in 2021 on local roads, and levels of service will worsen across the road network, in general. Figure 5-7 and Figure 5-8 show that, in general, the pattern of increasing congestion on the same corridors and roads as in 2021. The corridor along Balmain Road and Perry Street will experience significant increases in traffic volumes. Roads on the corridor between Summer Hill and Sydenham are still likely to experience increased traffic and worsening levels of service, especially Bedwin Road and Edinburgh Road. All road crossings of the railway lines in the area are likely to be congested, as with other scenarios tested.

More specifically, roads with increased traffic volumes will include:

- The corridor defined by Balmain Road, Perry Street, Darley Road and Foster Street.
- Frederick Street
- Toothill Street
- Addison and Livingstone Roads
- Edinburgh and Bedwin Roads
- Unwins Bridge Road
- Marion Street
- Edgeware Road
- Queen St, between Griffiths St and Armstrong St
- Hawthorne Parade between Barton Avenue and Marion Street
- All crossings of railway lines

Growth of traffic to 2031 will leave few areas in the Inner West LGA with uncongested roads during the peak periods.

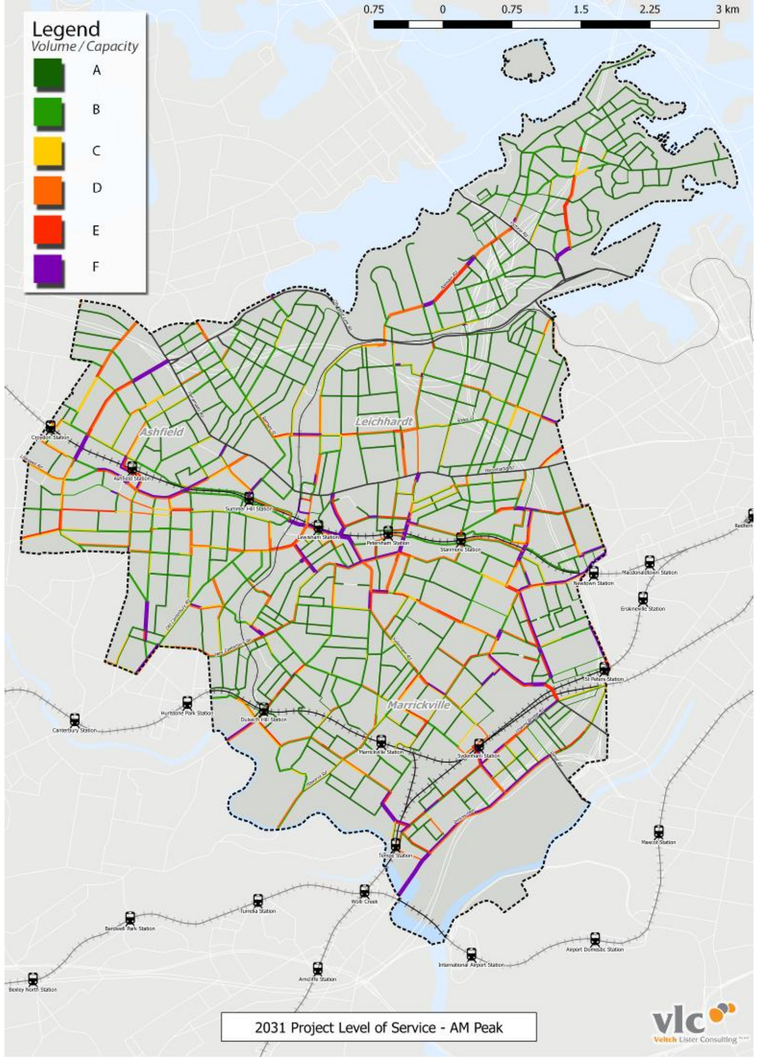


Figure 5-7: 2031 Project AM Peak LoS

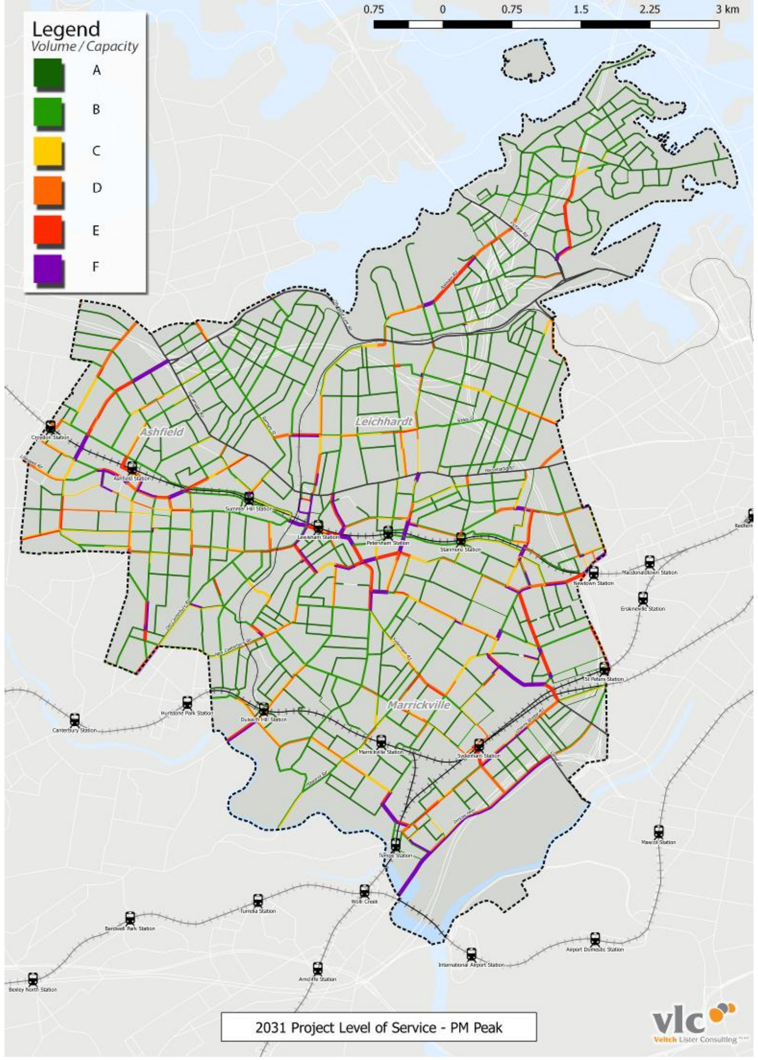


Figure 5-8: 2031 Project PM Peak LoS

6. Impact Analysis

This section summarises the modelled differences between scenarios in order to identify changes in travel behaviour resulting from the opening of the stages of WestConnex. A full account of the analysis can be found in Appendix D.

6.1 Impact on Network Operation

The average total delay was calculated for each scenario by calculating the vehicle weighted difference between the modelled speed and the free flow speed on each link and totalling the result for all local links in the Inner West LGA. The delay was estimated by time period and by vehicle type.

The results of the calculation are shown in Table 6-1. For the purpose of model outputs, the modes and time periods are:

- AM: 7 to 9 AM
- PM: 4 to 6 PM
- OP: 9 AM to 4 PM, and 6PM to 7AM.
- Car: Standard passenger car
- LCV: Light Commercial Vehicle (AustRoads vehicle class 3)
- HCV: Heavy Commercial Vehicle (AustRoads vehicle class 4+)

Table 6-1: Average Total Delay on Roads within the Inner West LGA

Time	Mode	2011	2021 Base	2021 Project	2031 Base	2031 Project
AM	Car	2,542 hrs	4,103 hrs	3,888 hrs	5,789 hrs	3,954 hrs
AM	LCV	94 hrs	157 hrs	153 hrs	229 hrs	157 hrs
AM	HCV	91 hrs	152 hrs	151 hrs	219 hrs	136 hrs
AM	Total	2,727 hrs	4,411 hrs	4,192 hrs	6,237 hrs	4,247 hrs
PM	Car	2,261 hrs	3,701 hrs	3,553 hrs	5,369 hrs	3,757 hrs
PM	LCV	73 hrs	123 hrs	121 hrs	183 hrs	129 hrs
PM	HCV	72 hrs	121 hrs	122 hrs	181 hrs	113 hrs
PM	Total	2,407 hrs	3,944 hrs	3,796 hrs	5,733 hrs	3,999 hrs
OP	Car	7,444 hrs	12,423 hrs	12,756 hrs	19,970 hrs	14,291 hrs
OP	LCV	313 hrs	523 hrs	541 hrs	834 hrs	605 hrs
OP	HCV	310 hrs	518 hrs	555 hrs	836 hrs	541 hrs
OP	Total	8,066 hrs	13,464 hrs	13,852 hrs	21,640 hrs	15,437 hrs
Daily	Car	12,247 hrs	20,226 hrs	20,197 hrs	31,127 hrs	22,002 hrs
Daily	LCV	480 hrs	802 hrs	815 hrs	1,246 hrs	891 hrs
Daily	HCV	473 hrs	791 hrs	828 hrs	1,237 hrs	790 hrs
Daily	Total	13,200 hrs	21,819 hrs	21,841 hrs	33,610 hrs	23,683 hrs

This analysis suggests the following:

- In general, delays will increase in the future, because congestion and traffic will increase.
- In 2021, with WestConnex stages one and two, there will be slightly less total delay during the peak periods than for the base case without WestConnex
- More delay during off-peak times compared to the no-WestConnex scenario. This increase is likely to be the result of more vehicles choosing not to travel on

WestConnex. Outside of peak periods, there is less advantage to be gained from paying to travel on a faster, less congested road, because the non-tolled roads will be relatively uncongested.

- In 2031, when WestConnex Stage 3 is operating, total delay will be significantly reduced at all times of the day.

To assess the impacts on traffic movements on the study area as a whole, the number of kilometres travelled on local roads was calculated and the totals for base and project cases were compared.

The percentage increase shown in Table 6-2 is determined from the total kilometres travelled daily on local study area roads in the project case, divided by the base case.

Table 6-2: Percentage Traffic Kilometre Increase

Time	Mode	2021 Project vs 2021 Base	2031 Project vs 2031 Base
AM	LCV	1%	-9%
AM	HCV	3%	-17%
AM	Car	-1%	-10%
AM	Total	-1%	-10%
PM	LCV	1%	-10%
PM	HCV	2%	-17%
PM	Car	-1%	-10%
PM	Total	-1%	-10%
MD	LCV	1%	-9%
MD	HCV	4%	-16%
MD	Car	-1%	-9%
MD	Total	-1%	-10%
Daily	LCV	1%	-9%
Daily	HCV	3%	-16%
Daily	Car	-1%	-9%
Daily	Total	-1%	-10%

The model results suggest that in general, WestConnex Stages 1 and 2 will reduce slightly the total travel on the local roads across all time periods in 2021compared to a scenario without WestConnex. However, slightly more commercial vehicle traffic will be present across all time periods.

It is important to note that conclusions regarding travel of commercial vehicles are subject to more error, given the poorer validation of commercial vehicles.

The addition of WestConnex Stage 3 and Western Harbour tunnel will reduce the total travel on the local roads significantly, including commercial vehicle traffic (subject to further examination), across all time periods in 2031 compared with the scenario without WestConnex Stage 3.

6.2 Short Term Impacts: 2021

The impacts of WestConnex on local roads in the Inner West LGA are complex. In general, the impacts can be classified as short term, to 2023 (those resulting from the provision of WestConnex Stages 1 and 2). In general, while traffic volumes on some roads may change significantly, modelling results indicate that WestConnex stages 1 and 2 will not have a significant impact on levels of service in the study area during peak periods. Rather, there is likely to be a diversion of trips between alternative routes that results in increased traffic in some areas and reduced traffic in other areas.

A summary of short term impacts is shown in Figure 6-1 and a comprehensive list of roads with short term changes is provided in Appendix E.

There will be a general degradation of traffic conditions in the north-south corridor between Cooks River and the interchange of Parramatta Road with the M4. Traffic conditions on Bland Street are likely to worsen, while Brown Street and Prospect Road, in particular, may expect a significant increase in traffic volumes.

Increased traffic volumes that cause a reduction in level of service are likely on roads in the corridor between the WestConnex Stage 1 interchange at Parramatta Road south eastwards to the WestConnex Stage 2 interchange at St Peters. Vehicles travelling towards the M5 from the M4 re-route to the Parramatta Road interchange instead of exiting at Concord Road to access routes such as The Boulevarde. Edinburgh, Edgeware and Bedwin Roads are likely to be affected most, but other roads where traffic volumes are likely to increase, reducing level of service significantly include:

- Gower Street (Kensington Street, a parallel road, may share this impact)
- Grosvenor Crescent
- Juliett Street

Other roads that likely to be affected, to a lesser extent are:

- Hawthorne Parade
- Ramsay Street
- West Street
- Brighton Street
- Addison Road
- Hunter Street

On the other hand, traffic conditions can be expected to improve on roads around the former Ashfield LGA and in the southern areas of the former Marrickville LGA. Reduced traffic volumes and improved level of service on these roads is the result of trips shifting to the extra capacity provided by WestConnex Stage 1, staying on the M4 and bypassing some local streets.

In Ashfield, west of the Parramatta Rd Interchange, roads where traffic conditions improve include:

- Church Street
- Croydon Road
- Ramsay Street, west of the interchange
- Frederick Street

Roads in the east - west corridor in Ashfield between Cooks River and the WestConnex Stage 1 interchange with Parramatta Road will also experience an improvement traffic conditions brought about by diversion of trips to the upgraded M4 from local streets.

These roads include:

- Elizabeth Street
- Thomas Street
- Norton Street (in Ashfield)
- Arthur St
- Park Ave

Improvements in traffic conditions can be expected on roads in the corridor running between the south west and the north east through Marrickville towards Petersham and Enmore. The new M5 tunnel to St Peters interchange relieves traffic on the competing local routes. The roads affected include:

- Illawarra Road
- Victoria Road
- Livingstone Road

6.2.1 Sensitive Areas

Some roads impact on vulnerable communities, including schools, local shops, and residential streets. For public safety and suburban serenity, roads where volumes increase and pass through these land uses have been identified and include

- Trinity Grammar School, on Prospect Road between Seaview St and Old Canterbury Rd where there is expected to be :
    - +18% more northbound traffic in AM peak
    - +14% more southbound traffic in PM peak
- Petersham Primary School on Hunter Street, where traffic will increase by 24% (+1,000) over the day
- Ramsay Street shopping strip, where daily traffic volumes can be expected to increase by 14% (+2,000) and pedestrians currently cross the street at unmarked locations due to lack of alternative options

Current streets with a quiet suburban environment that may be substantially impacted by WestConnex Stage 1 and 2 traffic include:

- Gower Street where daily traffic can be expected to increase by 29% (+2,000). Kensington Street, which runs parallel to Gower Street, may also be affected.
- Juliett Street, where daily traffic may more than double with an expected increase of 122% (+2,000).

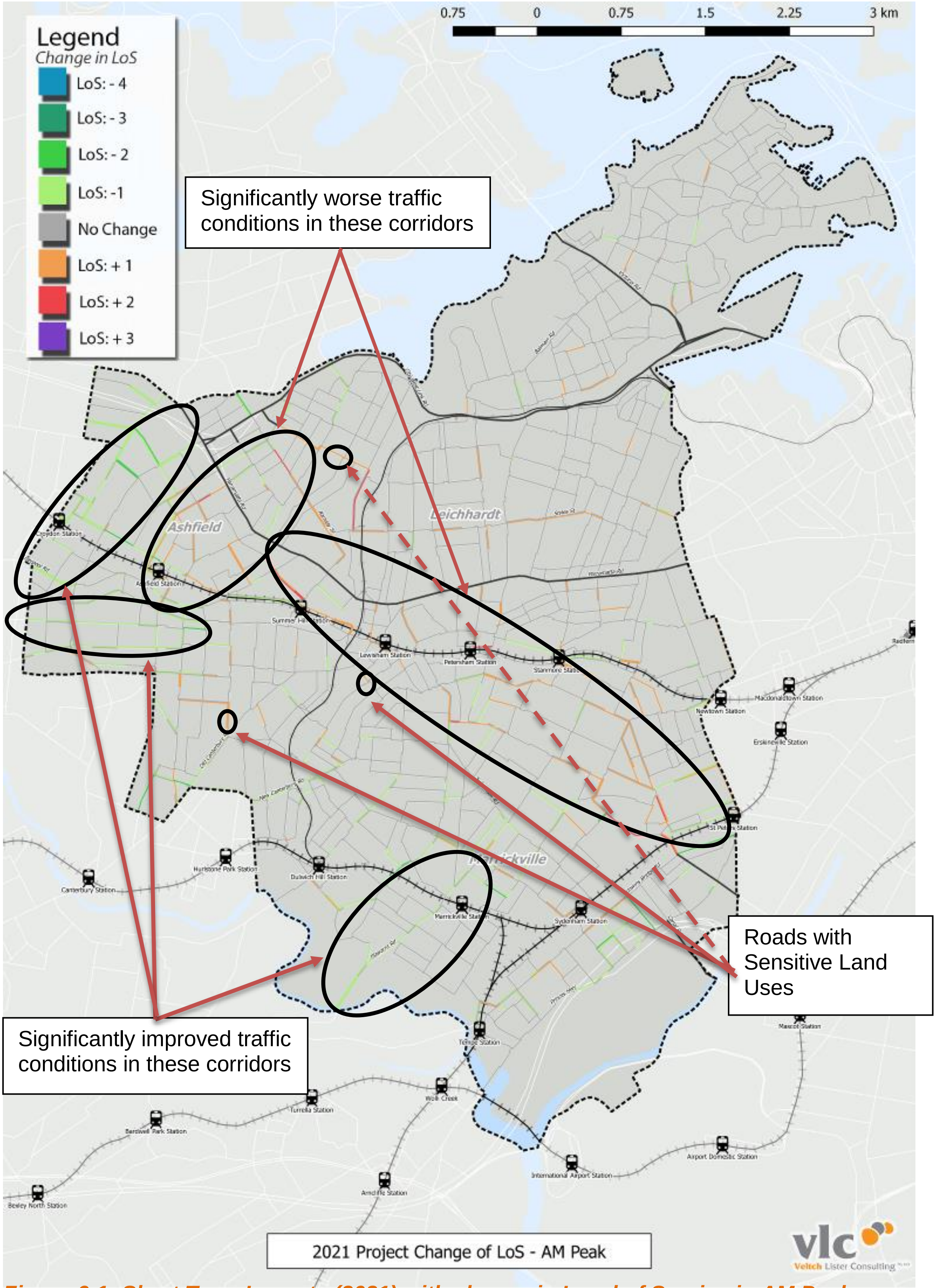


Figure 6-1: Short Term Impacts (2021) with change in Level of Service in AM Peak

6.3 Long Term Impacts: 2031

Forecasts for 2031, based on model results, suggest that the addition of WestConnex Stage 3 and the Western Harbour tunnel will generally reduce traffic volumes on roads in the Inner West Council area during peak periods. Most of the roads where traffic conditions are impacted adversely by WestConnex Stages 1 and 2 will be relieved to varying degrees after WestConnex Stage 3 opens.

There are some exceptions, though, where traffic conditions may worsen further.

The location of impacts is summarised in Figure 6-2 and a table with full forecast changes in traffic volumes on these roads can be found in Appendix F.

Some impacts of WestConnex may remain beyond 2031 even with the provision of WestConnex Stage 3. These impacts may be categorised into two classes:

- Impacts caused by WestConnex Stages 1 and 2 that are not afforded amelioration by WestConnex Stage 3
- Impacts that result from the operation of WestConnex Stage 3

Roads where there may be longer term impacts are the result of:

- Trips accessing the WestConnex Stage 3 from local roads, which are likely to reduce level of service on individual roads north of the Parramatta Rd Interchange. Typical of this is the north - south corridor between Cooks River and the WestConnex interchange at Parramatta Road. These roads include Bland Street, Alt Street, Frederick Street and Queen Street. Ramsay Street, north of the interchange and Ash Lane (a minor one-way road) may also be impacted.
- Diversion of trips accessing the Rozelle interchange from Parramatta Road will result in worsening traffic conditions in the north-south corridor running through Annandale between Parramatta Road and The Crescent. This is likely to occur on roads that include Annandale Street and Johnson Street

The provision of WestConnex Stages 1 and 2 are expected to improve level of service on Frederick Street. The impact of WestConnex Stage 3 will return the level of service to normal growth. Reductions in general traffic and commercial vehicle volumes across the network may be expected and indications are that WestConnex will reduce commercial vehicle traffic significantly. Consideration of the impact of uncertain route choices and validation issues, identified in section 3.3 of this report, have been taken into account.

6.3.1 Sensitive Areas

Three educational facilities are located on Bland Street, between Elizabeth Street and Charlotte Street:

- De La Salle College
- Bethlehem College, and
- St Vincent’s Catholic Primary School.

WestConnex Stages 1 and 2 will introduce an additional 14% (+900) to daily traffic past these schools. WestConnex Stage 3 is more likely to increase daily traffic further (by up to 5% or 300 vehicles) than to provide amelioration.

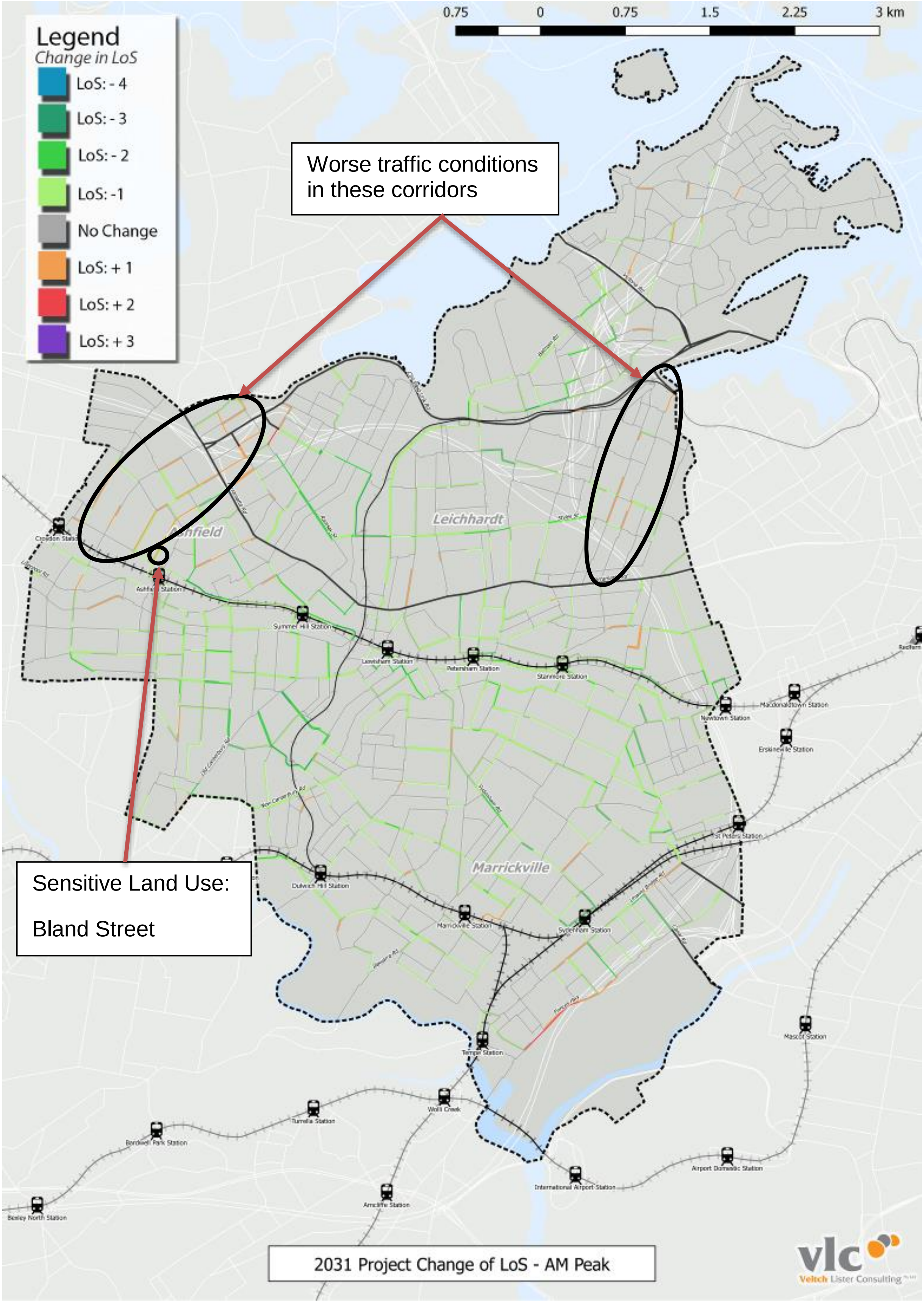


Figure 6-2: Long Term Impacts (2031) with change in Level of Service

6.4 Impacts on Cordons around Interchanges

The forecast volumes on local roads crossing cordons around suburbs in the vicinity of the WestConnex Interchanges were examined, for each of the road network scenarios modelled.

Table 6-3 presents a summary of the daily traffic volumes crossing the Haberfield suburb boundary for all scenarios modelled. It shows that in general, WestConnex reduces the volumes on local roads.

Table 6-3: Daily volumes on roads crossing the Haberfield suburb boundary

Road	Direction	2011 Base	2021 No WestConnex	2021 WestConnex	2031 No Stage 3	2031 Stage 3	2021 Project Impact	2031 Project Impact
Marion Street	In	9,700	11,700	10,400	14,200	11,300	-1,300	-2,900
	Out	10,700	12,000	9,800	13,950	11,000	-2,200	-2,950
Sloane Street	In	4,300	5,200	5,300	5,900	5,200	100	-700
	Out	4,000	4,600	4,200	3,600	4,800	-400	1,200
O'Connor Street	In	1,300	1,500	300	200	900	-1,200	700
	Out	1,400	1,300	500	600	900	-800	300
St Davids Road	In	400	400	300	300	400	-100	100
	Out	400	400	400	400	400	-	-
Dalhousie Street	In	2,400	3,400	2,800	3,500	2,900	-600	-600
	Out	2,800	3,300	3,600	4,600	3,200	300	-1,400
Rogers Avenue	In	400	600	700	1,100	900	100	-200
	Out	-	-	-	-	-	-	-
Wolseley Street	In	-	-	-	-	-	-	-
	Out	200	200	300	200	300	100	100
Ramsay Street	In	7,500	9,000	5,900	7,500	8,100	-3,100	600
	Out	6,500	8,100	6,600	8,500	8,500	-1,500	-
Mortley Avenue	In	5,200	6,300	12,600	14,800	12,300	6,300	-2,500
	Out	5,000	6,300	11,330	13,200	13,700	5,030	500
Boomerang Street	In	1,400	1,800	200	2,900	1,600	-1,600	-1,300
	Out	-	-	-	-	-	-	-
Hawthorne Parade	In	300	300	300	300	400	-	100
	Out	1,300	2,000	2,200	3,200	1,700	200	-1,500
Total	In	32,900	40,200	38,800	50,700	44,000	-1,400	-6,700
	Out	32,300	38,200	38,930	48,250	44,500	730	-3,750

Table 6-3 shows the daily traffic volumes on roads crossing the Rozelle suburb boundary for all scenarios modelled. It shows that WestConnex has a minor impact on local roads entering and leaving Rozelle

Table 6-4: Daily volumes crossing the Rozelle suburb boundary

Roads	Direction	2011 Base	2021 No Project	2021 S12	2031 S12	2031 S123	2021 Project Impact	2031 S123 Impact
Terry Street	**In**	500	600	500	600	500	-100	-100
	Out	500	500	500	500	500	-	-
Darling Street	**In**	6,400	6,700	6,900	7,500	7,500	200	-
	Out	6,200	6,900	6,700	7,500	7,800	-200	300
Beattie Street	**In**	4,900	5,200	5,300	5,900	5,400	100	-500
	Out	4,900	5,200	5,200	5,400	5,500	-	100
Evans Street	**In**	1,000	2,100	2,100	2,800	3,400	-	600
	Out	1,800	2,300	2,100	2,500	1,820	-200	-680
Goodsir Street	**In**	200	200	200	200	200	-	-
	Out	200	200	200	200	200	-	-
Mullens Street	**In**	8,800	9,000	8,900	9,300	9,600	-100	300
	Out	8,600	8,900	9,000	9,200	9,300	100	100
Reynolds Street	**In**	200	200	300	300	300	100	-
	Out	300	300	200	300	300	-100	-
Robert Street	**In**	1,500	1,500	1,300	1,800	1,800	-200	-
	Out	1,300	1,300	1,500	2,000	2,200	200	200
Darling Street (South)	**In**	13,700	15,200	15,400	16,300	14,200	200	-2,100
	Out	13,200	14,600	14,800	16,400	14,500	200	-1,900
Total	**In**	37,200	40,700	40,900	44,700	42,900	200	-1,800
	Out	37,000	40,200	40,200	44,000	42,120	-	-1,880

Table 6-5 contains a list of the daily traffic volumes crossing the St Peters suburb boundary for all scenarios modelled. It shows an overall reduction in volumes on roads crossing into and out of St Peters. However, there are likely to be significant increases in traffic volumes on Bedwin Street in 2021, while in 2031, the Princes Highway in the south is likely to experience increased traffic volumes.

Table 6-5: Daily volumes on roads crossing the St Peters suburb boundary

Road	Direction	2011 Base	2021 No Project	2021 S12	2031 S12	2031 S123	2021 Project Impact	2031 S123 Impact
Bedwin St	In	14,600	16,800	21,500	23,800	20,700	4,700	-3,100
	Out	15,300	17,900	22,500	24,700	21,100	4,600	-3,600
May St	In	11,800	13,400	11,600	13,200	13,400	-1,800	200
	Out	11,900	14,500	12,500	12,300	13,300	-2,000	1,000
Princes Highway (N)	In	17,000	20,800	16,900	18,800	17,000	-3,900	-1,800
	Out	17,500	22,800	18,000	18,900	17,600	-4,800	-1,300
Princes Highway (S)	In	23,400	24,000	24,400	26,100	28,000	400	1,900
	Out	23,800	25,000	24,800	26,700	29,300	-200	2,600
Unwins Bridge Road	In	10,400	13,000	12,000	14,300	15,100	-1,000	800
	Out	10,800	12,000	13,200	13,300	14,000	1,200	700
Marrickville Rd	In							
	Out	17,300	20,300	20,800	23,400	18,600	500	-4,800
Sydenham Road	In	16,600	19,900	20,200	23,100	18,700	300	-4,400
	Out							
Total	In	93,800	107,900	106,600	119,300	112,900	-1,300	-6,400
	Out	96,600	112,500	111,800	119,300	113,900	-700	-5,400

6.5 Reclaiming Public Space

The addition of WestConnex benefits some areas by reducing the amount of traffic carried by some routes. This provides an opportunity to reclaim some public space and reduce the road hierarchy, improving the amenity for local residents.

There may be opportunities to take advantage of reduced traffic in:

- Church Street in Ashfield
- John Street in Petersham
- O'Connor Street
- Grove Street, Edith Street and Frederick Street in St. Peters

Some of these roads will experience an increase in traffic due to some elements of WestConnex; however such roads also undergo a significant decrease in traffic due to other elements of the project. The changes in volume predicted for these roads can be found in Appendix G.

7. Conclusion

The transport modelling provides an indication of the potential impacts of WestConnex on local roads. Through this process, changes in travel behaviours have been highlighted and an understanding of short and long term implications have been developed.

The analysis concludes that:

- The majority of traffic increases incurred from WestConnex will result from rerouting of vehicles accessing or egressing interchanges for stage one or two, but will be alleviated once stage three is constructed, which is expected in 2023
- Stage three of WestConnex will mostly reduce traffic demand across the network, including addressing most of the traffic increases incurred from stages one and two
- Some roads may experience, after WestConnex begins operations, an increase in traffic volumes that will be permanent in nature.

High priority areas have also been highlighted where increases in traffic exist around sensitive land use areas such as schools and shopping strips. This will ultimately inform the preparation of pre-emptive traffic calming on local roads within the Inner West Council area to mitigate the potential impacts of increased traffic.

Appendix A: Full Infrastructure Assumptions

Year	VLC ID	Project Name
2021	001	Alfords Point Rd - Davies Rd to Fowler Rd
2021	002	Hoxton Park Rd
2021	003	Great Western Hwy - Station Rd to Tableland Rd (Wentworth)
2021	004	Boundary Street upgrade – April 2012; replaced rail bridge over Boundary Road
2021	006	Camden Valley Way upgrade
2021	007	Camden Valley Way upgrade between Cobbitty Road and Narellan Road
2021	008	Camden Valley Way upgrades Stage 1 and 2 - Ingleburn Rd to Raby Rd, and Raby Rd to Oran Park Dr
2021	009	Camden Valley Way upgrades Stage 3 - Bringelly Rd to Ingleburn Rd
2021	013	F5 Freeway - Stage 3 -Widen to 3 lanes in each direction between Raby Road and Narellan Road
2021	015	improved exit ramp to Campbelltown Road
2021	016	Pedestrian and bike bridge between Claymore and Woodbine
2021	026	Permanent closure of Jones Street to Broadway
2021	036	Wallarah Creek; Pacific Highway Upgrade
2021	071	The Ponds supporting infrastructure (including The Ponds Boulevard)
2021	089	South West Growth Centre - Oran Park 2012
2021	020	Cumberland Highway and M4 intersection. Lane number edits
2021	022	Powers Road extra lane
2021	033	Upgrade of central coast highway between Carlton Road and Matcham Road
2021	035	Pedestrian underpass across central coast hwy; kariong
2021	041	Extra minor Roads for 2013 PT network
2021	043	M2 Upgrade Project - Windsor Rd west facing ramps and Herring Road west bound off ramp
2021	065	Improving traffic flow on Marsden Road; Eastwood
2021	070	The Ponds - Ridgeline Drive
2021	072	The Ponds - Greenview Parade
2021	085	M2 Upgrade Project - Christie Rd east facing ramp
2021	090	South West Growth Centre - Oran Park 2013
2021	095	South West Growth Centre - Turner Rd 2013
2021	098	Eagle Vale Road Upgrade
2021	148	Upgrade 6 intersections along 13 km between the M1 Motorway at Seahampton and Newcastle
2021	150	New two lane bridge over the Great Northern Railway line
2021	PT006	Monorail removal
2021	PT012	Cessation of services at Balmain West wharf
2021	019	Taren Point Rd sth to hold & nrth to toorak- increasing length of slip turning lanes by 110m.
2021	021	Erskine Park Link Road
2021	030	Princes Highway Upgrade - South Nowra. 2 to 4 lanes
2021	034	Upgrade of central coast highway between Matcham rd and ocean view drive
2021	038	The Hunter Expressway - new 40km highway
2021	042	M2 Upgrade Project
2021	056	Reconciliation Road; Pemulwuy
2021	091	South West Growth Centre - Oran Park 2014
2021	129	Newcastle Inner City Bypass; Shorland to Sandgate
2021	146	Victoria Road Clearway (from The Crescent to Iron Cove Bridge; Rozelle)
2021	151	Extra minor Roads for 2014 PT network - Greater Sydney Area
2021	152	Extra minor Roads for 2014 PT network - Woollongong & South
2021	153	Extra minor Roads for 2014 PT network - Campbelltown & South
2021	154	Extra minor Roads for 2014 PT network - Penrith & West
2021	155	Extra minor Roads for 2014 PT network - Central Coast
2021	156	Extra minor Roads for 2014 PT network - Newcastle & West & North
2021	158	Great Western Highway - Woodford to Hazelbrook
2021	PT002	Inner west LRT Dulwich Hill extension
2021	017	The Northern Road; Cranebrook
2021	023	Richmond Road Upgrade - Stage 1
2021	025	Schofields Road Corridor Upgrade - Stage 1

Year	VLC ID	Project Name
2021	037	Nelson Bay Road Upgrade; Bob's Farm to Annay Bay
2021	040	M5 West Widening
2021	044	M2 Upgrade Project - Lane Cove Road East-bound on-Ramp and Lane widening
2021	049	Great Western Hwy Upgrade at Bullaburra
2021	130	Princes Highway; Gerringong upgrade
2021	176	Mona Vale Rd improvements - Stages 1 and 2
2021	PT001	South West Rail Link
2021	032	Brisbane Water Drive and Manns Road at West Gosford Intersection upgrade
2021	062	Fullers Road; Chatswood
2021	064	Boundary Street Upgrade; Roseville
2021	069	North West Growth Centre - Alex Avenue Precinct
2021	078	North West Growth Centre - Marsden Park Precinct
2021	082	North West Growth Centre - Colebee
2021	086	Spring Farm Road Infrastructure Stage 1
2021	088	Elderslie Road Infrastructure
2021	092	South West Growth Centre - Oran Park 2016
2021	096	South West Growth Centre - Turner Rd 2016
2021	099	Eagle Vale Road Upgrade
2021	101	South West Growth Centre - Edmondson Park 2016
2021	145	Pennant Hills Road and Marsden Road; Carlingford - Intersection upgrade
2021	147	Maitland roundabout improvements (Station Roundabout)
2021	159	Cambridge Avenue upgrades and realignments
2021	161	Kooragang Island Connectivity (Tourle Street bridge duplication)
2021	169	Moore Park pedestrian bridge
2021	170	Nepean River Green Bridge at Memorial Avenue
2021	184	Wynyard to Barangaroo - 'Wynyard Walk'
2021	199	Glenfield Road upgrade
2021	200	Griffiths and Chatham roads at Hamilton North
2021	201	Cary Street Upgrades
2021	202	George Street closure/pedestrianisation
2021	PT014	Barangaroo Wharf
2021	024	Richmond Road Upgrade - Stage 2
2021	046	Western Sydney Employment Area - Old Wallgrove Road upgrade
2021	050	Schofields Road Upgrade and Extension - Stage 2
2021	051	Werrington Arterial Road - Stage 1; Claremont Meadows
2021	059	Bringelly Road Upgrade
2021	067	Showground Road Upgrade; Castle Hill
2021	060	Narellan Road Upgrade
2021	093	South West Growth Centre - Oran Park 2018
2021	131	Princes Highway; Foxground and Berry Bypass
2021	132	Bringelly Road Upgrade
2021	177	F3 to Raymond Terrace
2021	182	Memorial Avenue Upgrade - Widening between Old Windsor Rd and Windsor Rd
2021	083	M2 to F3 Corridor
2021	162	M1 Productivity Package
2021	185	St James Station to Town Hall under Elizabeth Street
2021	186	Georges River Green Bridge
2021	187	Wynyard Station to Martin Place
2021	188	Central Station east-west link
2021	189	Bourke St / O'Riordan St project
2021	203	Northern Road upgrade | Littlefields Road to Jamison Road
2021	207	Project 1&2 - Epping Road upgrade
2021	208	Warnervale town centre - Sparks Road
2021	160	Jane Street and Mulgoa Road Infrastructure Upgrade
2021	171	Chullora Intermodal
2021	179	Northern Road upgrade | Mersey Road to Littlefields Road
2021	180	Northern Road upgrade | Peter Brock Drive to Mersey Road

Year	VLC ID	Project Name
2021	183	Northern Road upgrade | The Old Northern Road to Peter Brock Drive
2021	PT041	Northern Road upgrade | Mersey Road to Littlefields Road | PT
2021	PT042	Northern Road upgrade | Peter Brock Drive to Mersey Road | PT
2021	PT043	Northern Road upgrade | The Old Northern Road to Peter Brock Drive | PT
2021	PT044	Northern Road upgrade | Littlefields Road to Jamison Road | PT
2021	PT003	Sydney Metro
2021	PT004	CBD and South East Light Rail
2021	045	Western Sydney Employment Area - Southern Link Road
2021	053	Prospect Highway upgrade
2021	058	Schofields Rd Upgrade and Extension - Stage 3
2021	063	North West Growth Centre - Schofields Precinct
2021	066	Mona Vale Road Upgrade
2021	068	Alford's Point Road Southern Approach
2021	073	North West Growth Centre - Area 20 Precinct
2021	074	North West Growth Centre - Riverstone Precinct
2021	075	North West Growth Centre - Riverstone West Precinct
2021	076	North West Growth Centre - Box Hill Precinct
2021	077	North West Growth Centre - North Kellyville Precinct
2021	080	North West Growth Centre - Riverstone East Precinct
2021	087	Spring Farm Road Infrastructure Stage 2
2021	094	South West Growth Centre - Catherine Fields (Part)
2021	097	South West Growth Centre - Turner Rd 2021
2021	100	South West Growth Centre - Austral & Leppington
2021	102	South West Growth Centre - Edmondson Park
2021	106	South West Growth Centre - Marylands
2021	113	South West Growth Centre - East Leppington
2021	122	Upgrade of Moorebank Avenue to 4L as part of the terminal development
2021	133	Anzac Rd upgrade
2021	PT008	Mona Vale to CBD bus priority
2021	PT034	Bennelong Bridge
2021	PT037	Permanent closure of heavy rail line between Hamilton and Newcastle
2021	PT038	Newcastle Light Rail
2031	195	WestConnex Stage 1
2031	196	WestConnex Stage 2
2031	211	M12 Motorway
2031	PT026	Sydney Metro - Waterloo alignment
2031	054	M4 widening
2031	055	Upgrade of Campbelltown Road
2031	103	South West Growth Centre - Leppington
2031	107	South West Growth Centre - Marylands
2031	114	Upgrade of Denham Court Rd
2031	134	King Georges Road
2031	135	Stacey Street
2031	138	Moorebank Avenue
2031	047	Archbold Road
2031	048	Western Sydney Employment Area - Long-term Improvements
2031	057	Richmond Road Upgrade - Stage 3
2031	079	North West Growth Centre - Schofields West Precinct
2031	081	North West Growth Centre - Vineyard
2031	104	South West Growth Centre - Catherine Fields North
2031	105	South West Growth Centre - Catherine Fields
2031	116	Additional lanes for Northern Road/Bringelly Road/Camden Valley Way
2031	117	Additional Badgerys Creek Airport access roads
2031	118	Additional lanes for Elizabeth Drive and Northern Road
2031	136	King Georges Road
2031	137	King Georges Road
2031	204	Newcastle Inner city bypass- between Rankin Park and Jesmond

Year	VLC ID	Project Name
2031	PT009	North Bondi to CBD bus priority
2031	PT010	Castle Hill to Liverpool via Parramatta and T-way bus priority
2031	PT011	Parramatta to CBD via Ryde bus priority
2031	PT018	Rail : Leppington - Bringelly - Western Line (St Marys)
2031	PT019	Parramatta Road bus priority

Appendix B: The Zenith Travel Model

The Zenith model is a classical four step model, the four steps being:

- Trip Generation (how often to travel and for what purpose);
- Destination Choice (where to travel to);
- Mode Choice (what transport mode to use);
- Trip Assignment (what route to take).

The main inputs to the Zenith model are:

- A digital representation of the transportation network, including all freeway, arterial and collector roads, all public transport routes and stops, and in some cases, walking and cycling paths;
- Demographic and land use data, describing in a high level of detail the locations of households, firms and other trip generators (e.g. schools, universities, airports, ports, etc.);
- Policy variables including fuel prices, parking costs, toll prices and public transport fares;
- Model parameters which specify the travel behaviour of the local market.

Separate sets of inputs are maintained by VLC for various forecasting horizons (typically 2021, 2026, 2031, etc.).

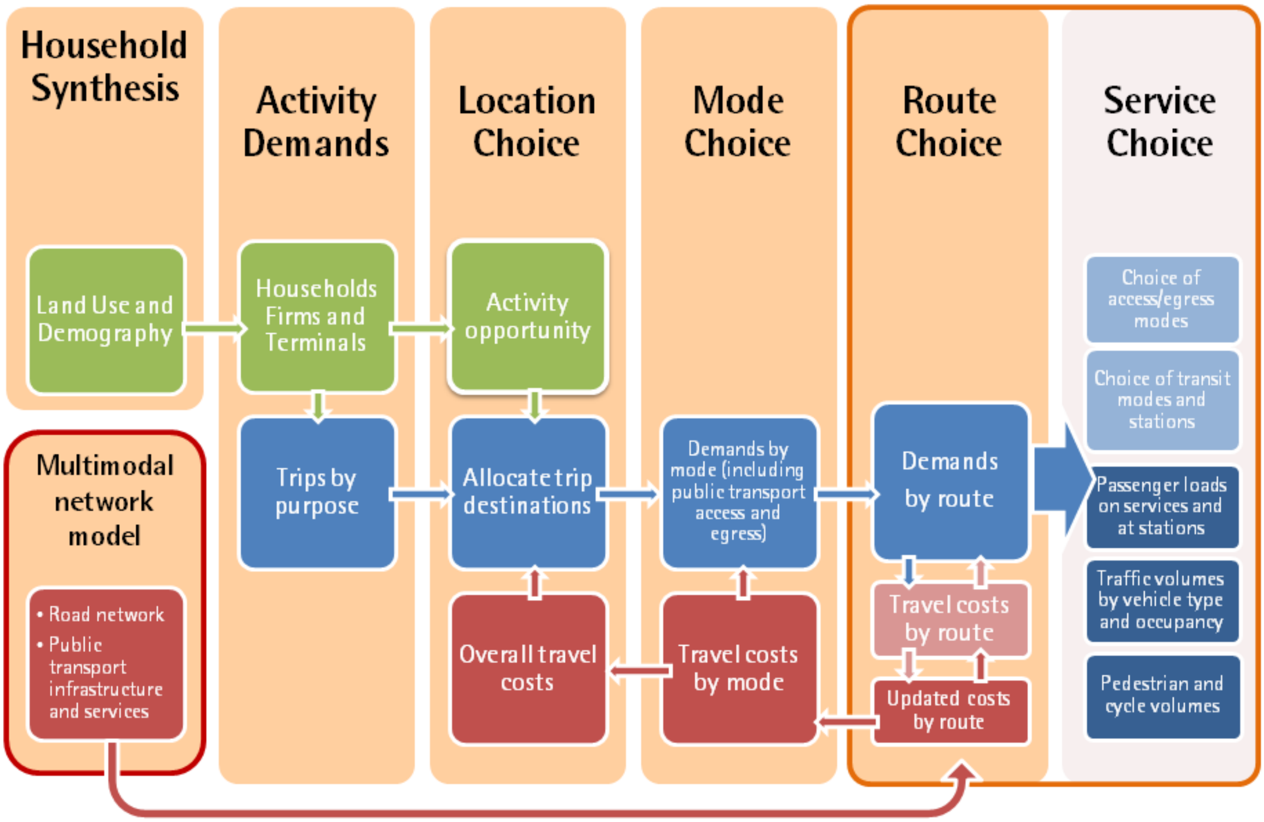
The overall architecture of the Zenith model is shown in Figure B-1 below.

The parameters used in the Zenith model of Victoria are primarily based on household travel surveys conducted in Victoria between 2007 and 2010 (the VISTA survey).Those parameters are documented in technical papers that are available on VLC's website.

For more information on the general methodology used by the Zenith model, see http://www.veitchlister.com.au/zenith/documentation.

For specific information about the Victorian implementation of the Zenith model (including the parameters used), see http://www.veitchlister.com.au/zenith/documentation/victoria.

Figure B-1: Key Stages of the Zenith Models



Appendix C: MODEL VALIDATION

C.1 Overview

Model validation is the process that determines the extent to which a transport model represents the traffic and transport conditions in a particular year. In effect, this demonstrates the confidence with which the model can be used for forecasting traffic and transport demand. Typically, for validation, modelled traffic volumes and public transport loads are compared to observed traffic counts and public transport patronage.

For this project, the validation was undertaken at two geographic levels;

- Across the entire modelled region, which includes Sydney, Newcastle and Wollongong
- And for the Inner West LGA (shown in Figure 3-5).

Figure C-1: Inner West LGA

The Zenith 2017 Release Model of the Greater Sydney Metropolitan Area has 2011 as a base-year. The model includes all freeway, arterial and collector roads, as well as some local roads. Local roads that are not represented in the modelled network usually fall entirely within a single travel zone, and would therefore not attract any demand. However, for this model, the zones in the Inner West area were refined and this enabled the inclusion of some additional local roads.

Local roads that were added to the study area in the Inner West version of the model are shown in Figure 3-6.

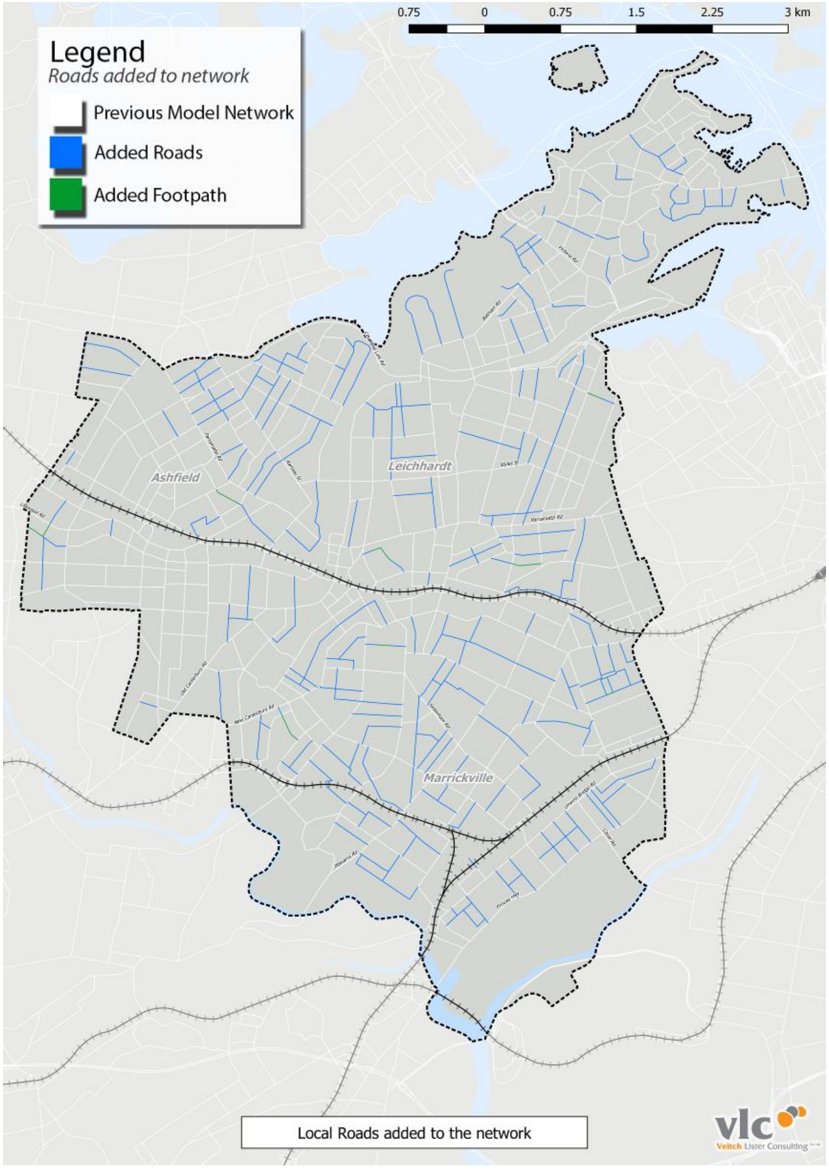


Figure C-2: Local roads added to the network

C.1.2 Impact of Induced Trips

Strategic models such as Zenith do not usually contain every road, for several reasons:

- The extra roads significantly increased model run time
- They increase the maintenance required for the network
- The impact of local roads is negligible in the context of the remainder of the model

One issue with adding new links in a specific area is that model may route additional trips through the study area because of the extra capacity. If the road network outside of the Inner West LGA has a lower level of detail, there is potential for the model to divert trips that would previously bypass the study area to routes that pass through the area.

To test whether this in an issue in the Inner West model, the Inner West base year model traffic volumes were compared to the Release model's traffic volumes. The comparison focussed on the traffic volumes on links that cross the Inner West LGA boundary. The results indicate that the addition of local roads in the Inner West model has had a negligible impact on traffic into the study area. Figure C-3 shows the plot of the trips into and out of the Inner West LGA for the Release version of the model (Original Volume) and the Inner West version of the model. The plotted points lie close to a line with a slope of 1.

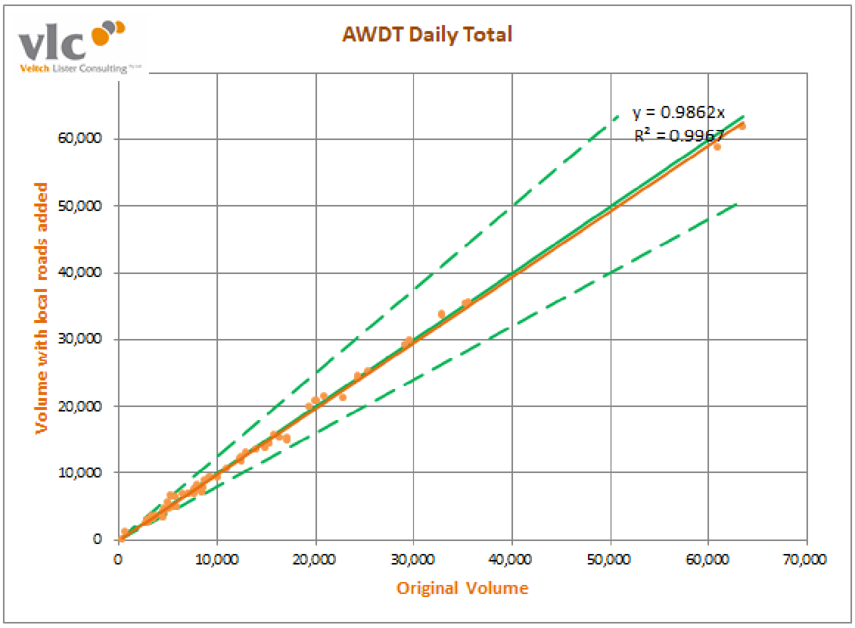


Figure C-3: Cordon volumes with local roads vs without local roads

C.1.3 Model Convergence

The Zenith model is an equilibrium model. It iterates through its modelling procedures, each time adjusting travel volumes and travel speeds until, or until the adjustments are so small that they make no difference to the result. The model iterates through its full processes six times, and in its road assignment model, iterates until the changes in volumes and travel times between zones become insignificant.

For this project, the base-year 2011 model was iterated through the demand model six times using a trip matrix averaging technique, while the highway assignment was iterated 50 times using a volume averaging technique. In this section, the convergence of both the demand model and the assignment model are examined.

Convergence is important in comparisons of different scenarios. If the model does not converge satisfactorily, there is increased potential for the results of scenarios to include falsely high or low volumes in one scenario and not the other.

C.1.3.1 Demand model convergence

Table C-1 details the convergence of the model's demand component. Convergence is identified through the change in the generalised cost skim total (by mode) between the penultimate and final model cycles.

Table C-7-1: Demand model convergence 2011

Mode	Final iteration cost skim total change		
	AM peak	Inter-peak	PM peak
Walk	0.00%	0.00%	0.00%
Car	-0.04%	0.01%	-0.02%
Light commercial vehicle	-0.04%	0.01%	-0.02%
Heavy commercial vehicle	-0.03%	0.01%	-0.02%
Public transport – walk access	0.00%	0.00%	0.00%
Public transport – car access	0.00%	0.00%	-0.01%

C.1.3.2 Traffic assignment convergence

Table C-2 details the convergence of the Zenith model's traffic assignment. The assignment converges to VLC's standards for traffic volume forecasting (Epsilon < 10^{-2}).

Table C-7-2: Traffic assignment convergence 2011

Measure	AM peak	Inter-peak	PM peak
Epsilon (RGAP)	0.005	0.002	0.004
Max. absolute link volume change	63.86	66.33	65.01
Max. percentage link volume change	0.46%	0.96%	2.80%

C.1.4 Model Wide Validation

Model validation was undertaken at a model-wide level to give confidence that the model performs well at a high level. Figure C-4 shows the extent of the modelled area.

As the model represents an average weekday, counts used for validation are 'Average Weekday Daily Traffic' (AWDT). Acceptable targets for traffic validation were obtained from the RMS *"Traffic Modelling Guidelines (2013)"*.

The counts used for validation were from a database managed by VLC with a collection of 671 AWDT traffic counts, and 324 public transport station and stop entry counts. The counts are from a variety of sources. The majority of traffic counts were provided by RMS, while the public transport counts were predominantly supplied by Transport Performance Analytics (TPA), formerly BTS (Bureau of Transport Statistics) and Transport for NSW.

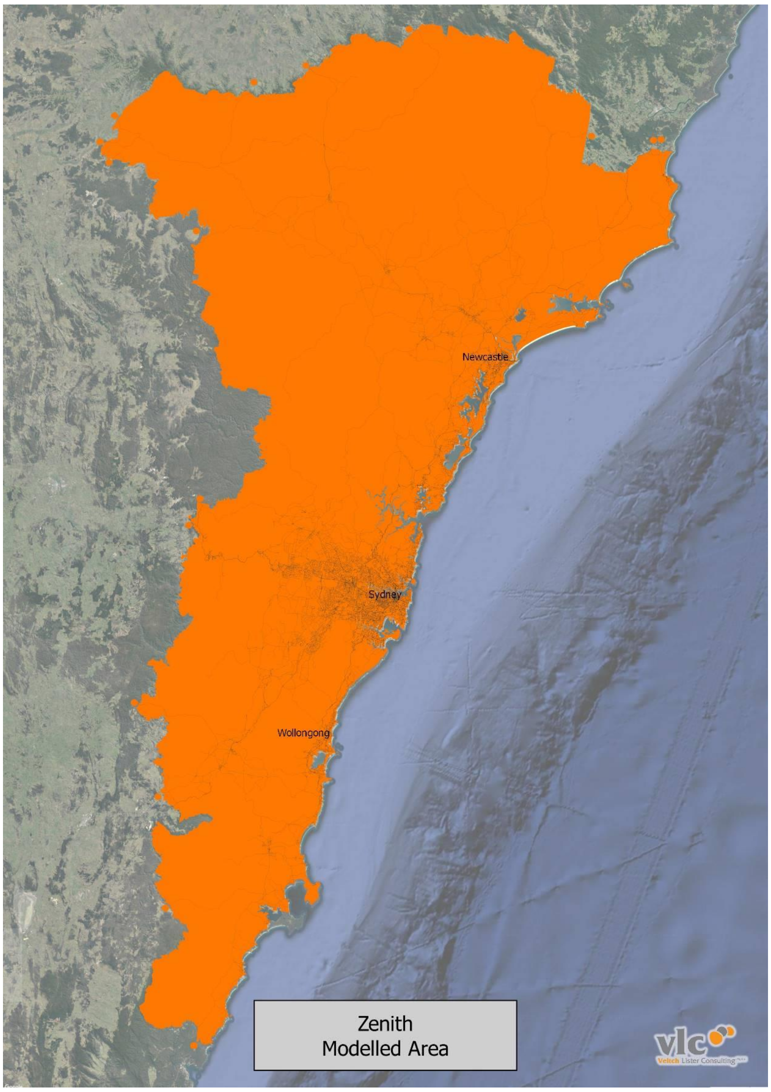


Figure C-4: Entire Modelled Area

C.1.5 Traffic Validation

The model was validated against 671 traffic counts, including 93 screenline counts, shown in Table C-3. The results contained in table C-4 indicate that the aggregate modelled traffic volumes validate well across all time periods.

Table C-7-3: Traffic count data available for model-wide validation

Count Data	**2011**		
	Daily	AM peak	PM Peak
Individual count stations	671	671	671
Screenline Counts	93	93	93

Road links with low volumes tend to make up most of the outliers because their percentage error is calculated from a low base.

Table C-7-4: Model-wide counts 2011

Summary	Daily	AM	PM
Number of counts	671	671	671
Total count volume	12,566,374	1,763,450	1,870,255
Total modelled volume	12,434,067	1,727,710	1,830,617
Difference	-132,307	-35,740	-39,638
Difference (%)	-1.05%	-2.03%	-2.12%

Table C-5 and table C-6 show how the modelled traffic volumes compare to observed traffic counts in terms of the %RMSE (Root Mean Square Error) statistic. The RMSE uses the square of difference between counted and modelled volumes and so outliers have a large For the Inner West model, the %RMSE for individual traffic counts are approximately 23% to 25% in the AM and PM peaks, which satisfy the RMS criterion of 30%. For daily counts, the %RMSE is also below the RMS criterion, at 18.

Table C-7-5: Validation to individual counts 2011 – peak periods (%RMSE)

Volume Ranges	AM	PM
0 - 999	59.1	41.8
1000 - 1999	33.7	31.5
2,000 - 4,999	19.6	20.3
5,000 - 9,999	16.6	22.3
10,000 +	11.1	-
ALL	23.5	25.2

Table C-7-6: Validation to individual counts 2011 – daily (%RMSE)

Volume Ranges	Daily		Volume Ranges	Daily
0 - 4,999	44.5		**25,000 - 49,999**	14.6
5,000 - 9,999	25.8		**50,000 +**	7.9
10,000 - 24,999	18.0		**ALL**	17.9

More detailed validation results are shown in the scatter plots in Figures C-5 to C-7. They show the daily, AM-peak and PM-peak one-way modelled traffic volumes compared to the traffic counts.

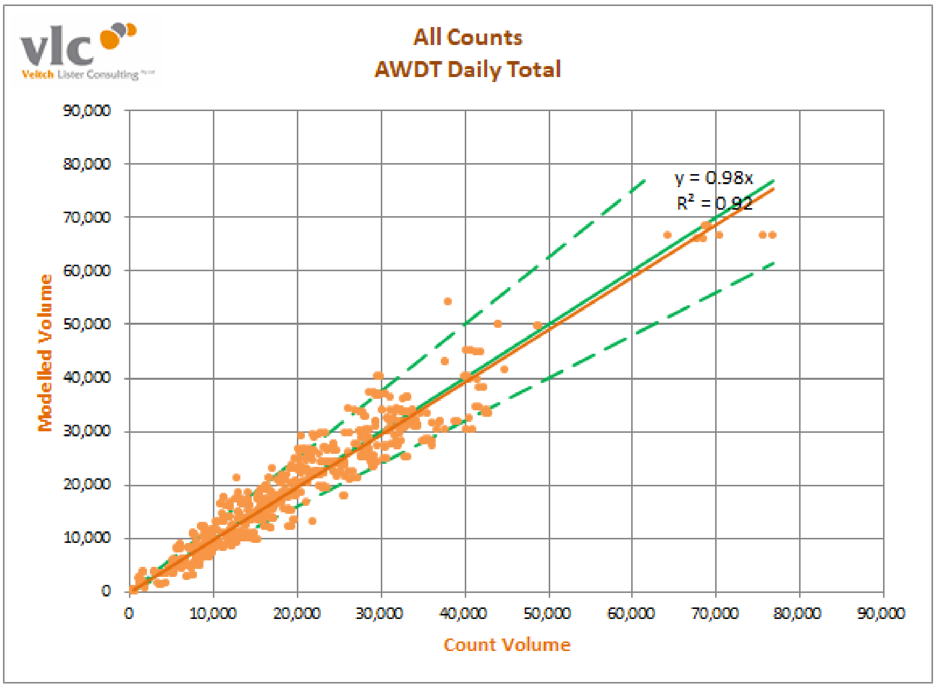


Figure C-5: Daily traffic count validation 2011

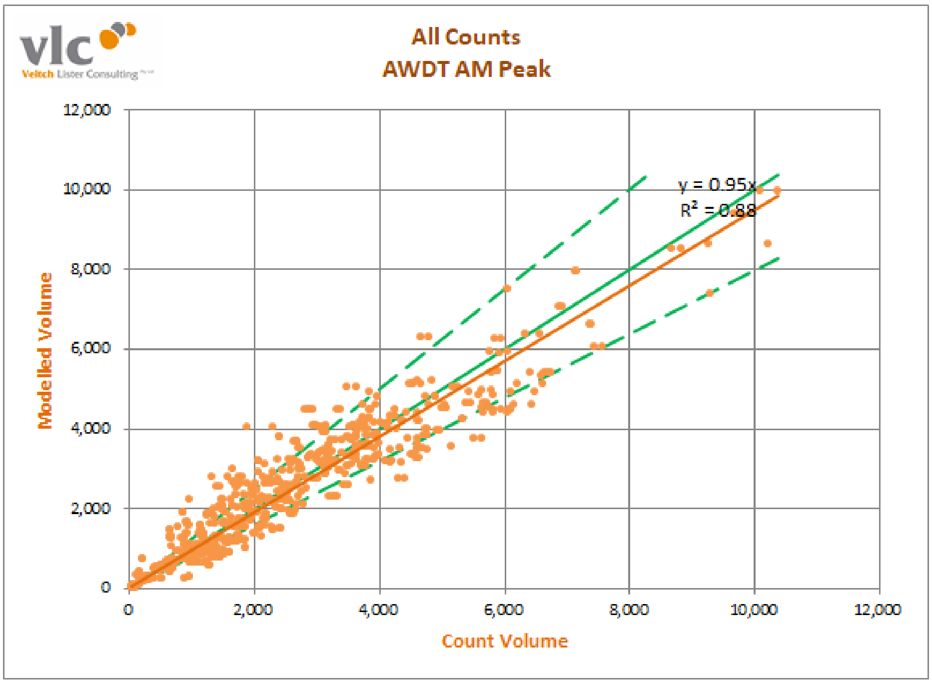


Figure C-6: AM peak traffic count validation 2011

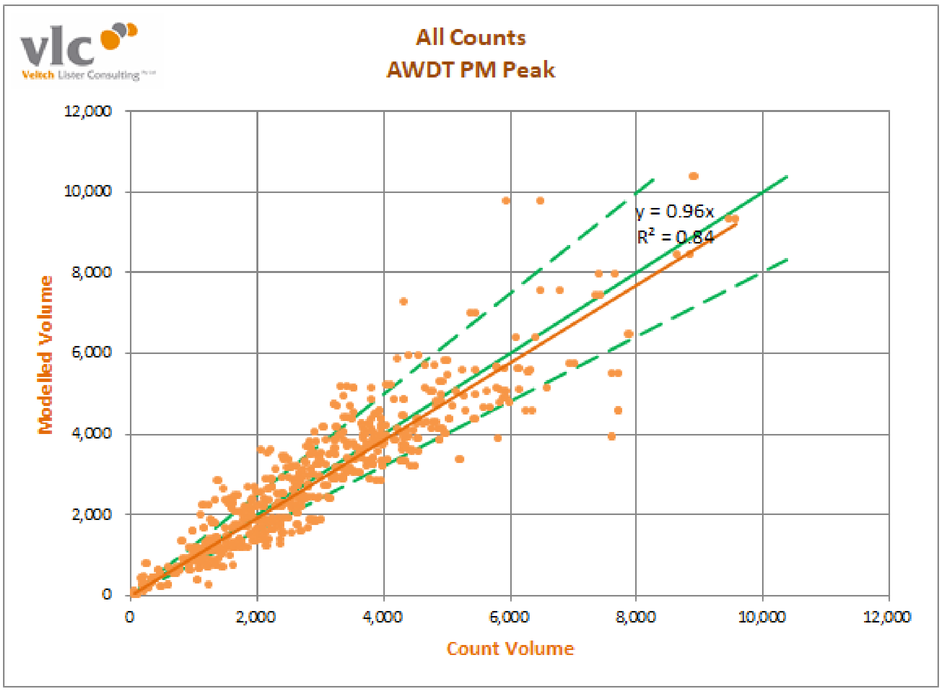


Figure C-7: PM peak traffic count validation 2011

The figures show that all time periods have a R^2 greater than 0.84, and a gradient between 0.95 and 0.98.

A summary of the model validation results against the targets specified by RMS is shown in Table C-7. The model meets all targets, except for the R^2 target for AM and PM peaks. However, the gradient for these periods is close to 1, which suggests that the model is performing well.

Table C-7-7: Model-wide validation results for individual counts 2011 – total traffic

Statistics	RMS targets	Daily	AM peak	PM peak
R-squared	>0.9	0.92	0.88	0.84
Gradient	0.9 to 1.1	0.98	0.95	0.96
%RMSE	<30	17.9	23.5	25.2

C.1.6 Public Transport Validation

While we are studying roads in this project, an examination of the model's public transport performance provides an indication of the strength of the model's mode choice sub-model. Public transport validation was undertaken for rail and ferry stops against the observed number of station boardings. Both modelled and observed data exclude rail-to-rail interchanges.

Figure C-8 shows the comparison of modelled and observed boardings on ferries. Ferries are relatively lightly used and will have little impact on road volumes in the Inner West area, but are included here for completeness

Figure C-9 shows the comparison of modelled and observed entries into rail stations. It shows a particularly good result across the broad range of stations.

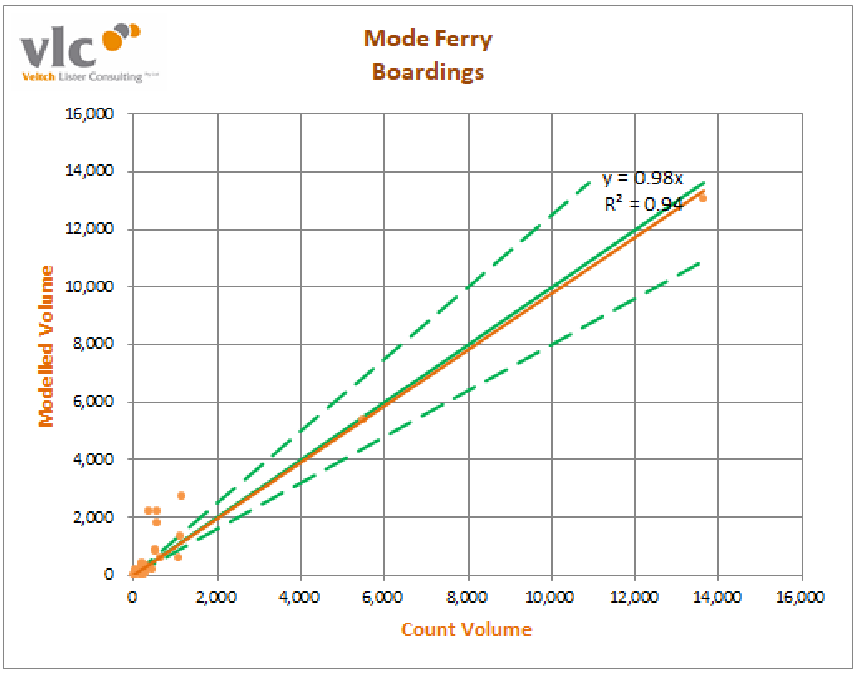


Figure C-8: Daily ferry boardings

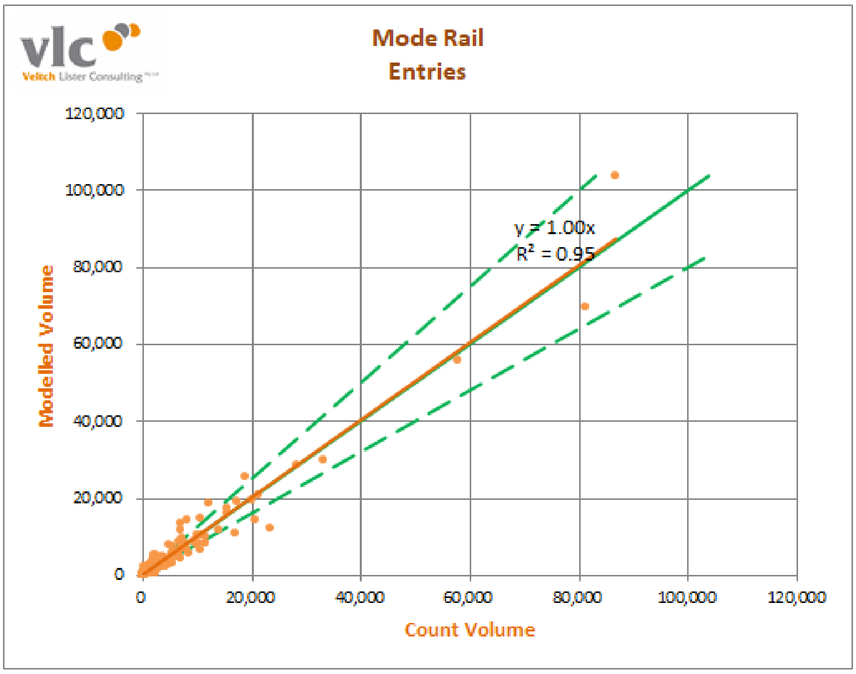


Figure C-9: Daily rail entries

The results demonstrate that the model is capable of accurately modelling public transport patronage.

C.2 Study Area Validation

The study area was examined in detail. The Inner West Council provided 'Annual Average Daily Traffic' (AADT) counts to use to validate the study area. To convert this data to an approximate average weekday, factors of 5% for 'All Traffic' and 16% for 'Commercial Vehicle' counts were derived from data where both sets of data were available. The factored counts were then combined with existing study area counts from VLC's database to form a dataset of 542 counts.

The model's road network in the study area was progressively refined to optimise the study area's validation. Existing turn bans, heavy commercial vehicle bans, one-way arrangements, centroid connector placement, and road speeds and capacities were heavily reviewed to ensure the model's network accurately represents the actual road network.

Table C-8 shows the results of the comparisons.

Table C-7-8: Study area counts 2011

Summary	Daily	AM peak	PM peak
Number of counts	542	38	38
Total count volume	1,687,505	104,145	111,660
Total modelled volume	1,987,859	123,908	126,068
Difference	300,354	19,763	14,408
Difference (%)	17.80%	18.98%	12.90%

Table C-9 and Table C-10 show how the modelled volumes compare against observed traffic counts in terms of the %RMSE statistic. In this respect, the %RMSE for the AM peak< PM Peak and Daily volumes are approximately 31%, 28% and 59% respectively. The figures indicate that, in general, the model may have a slight tendency for overstating traffic volumes on local roads.

The results of individual comparisons have been examined closely to find reasons for the overestimates. It was found that:

- there are a large number of counts with low volumes. Not only is it difficult to replicate low volumes in a strategic model, but also the percentage errors on low volume counts are disproportionately large because of the low base on which they are calculated.
- The general factor used to convert AADT to AWDT is not accurate for all counts, with a potentially wide variation across the study area, with roads around schools and workplaces needing a higher conversion and roads close to shopping centres needing a lower conversion.

Further results are shown in the scatter plots in Figure C-10 and Figure C-11. They show the total traffic and commercial vehicle modelled volumes compared to the traffic counts.

The figures indicate that the total traffic meets RMS criteria with an R^2 greater than 0.90, and a gradient of almost exactly 1.00. Commercial vehicle validation is not as close, with an R^2 of 0.64 and a gradient of 1.10. Much less is known about commercial vehicle trip making than about commuting, and inevitably commercial vehicle modelling has more uncertainty around it. For example, commercial vehicle route choice is influenced by factors not easily replicated in a strategic model. These factors include road grade, low radius turns, narrow lanes, low hanging trees and other non-technical factors.

There are no criteria for model validation specifically for commercial vehicles.

Table C-7-9: Validation to individual counts 2011 – peak periods (%RMSE)

Volume Range	AM	PM
0 - 999	120.35	-
1000 - 1999	87.61	60.07
2,000 - 4,999	23.65	24.35
5,000 - 9,999	8.05	5.86
10,000 +	-	-
ALL	31.26	28.13

Table C-7-10: Validation to individual counts 2011 – daily (%RMSE)

Volume Range	Daily		Volume Range	Daily
0 - 4,999	122.8		**25,000 - 49,999**	15.96
5,000 - 9,999	24.19		**50,000 +**	-
10,000 - 24,999	37.31		**ALL**	59.2

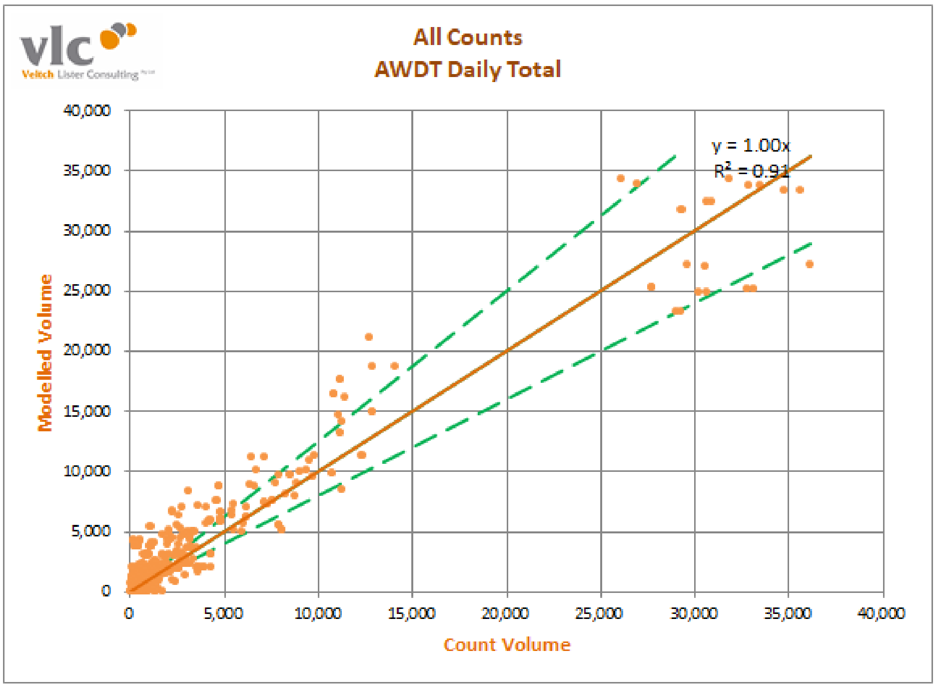


Figure C-10: Daily total traffic validation

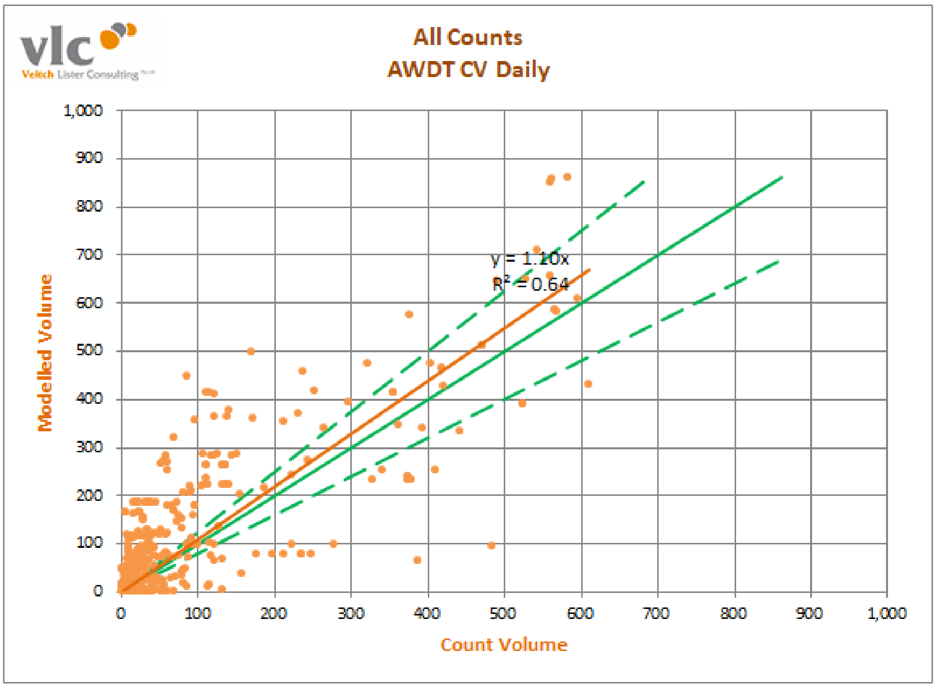


Figure C-11: Daily commercial vehicle validation

Despite the relatively lower performance of the model with commercial vehicles, the model satisfies validation criteria, especially as the foundation of the study will be comparisons of a project case against a base case. Additional care will be needed in dealing with forecasts of commercial vehicles to ensure that the uncertainty associated with their modelling is accounted for.

As an additional exercise, we looked at the model's estimate of level of service during the morning peak period. Levels of Service are defined by as:

LOS A: free flow. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes. LOS A generally occurs late at night in urban areas and frequently in rural areas.

LOS B: reasonably free flow. LOS A speeds are maintained, manoeuvrability within the traffic stream is slightly restricted. Motorists still have a high level of physical and psychological comfort.

LOS C: stable flow, at or near free flow. Ability to manoeuvre through lanes is noticeably restricted and lane changes require more driver awareness. Most experienced drivers are comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained. Minor incidents may still have no effect but localized service will have noticeable effects and traffic delays will form behind the incident.

LOS D: approaching unstable flow. Speeds slightly decrease as traffic volumes slightly increase. Freedom to manoeuvre within the traffic stream is much more limited and driver comfort levels decrease. Minor incidents are expected to create delays. Examples are a busy shopping corridor in the middle of a weekday, or a functional urban highway during commuting hours.

LOS E: unstable flow, operating at capacity. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to manoeuvre in the traffic stream and speeds rarely reach the posted limit. Any disruption to traffic flow, such as merging ramp traffic or lane changes, will create a shock wave affecting traffic upstream. Any incident will create serious delays. Drivers' level of comfort becomes poor.

LOS F: forced or breakdown flow. Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing or stopping required. Travel time cannot be predicted, with generally more demand than capacity. A road in a constant traffic jam is at this LOS, because LOS is an average or typical service rather than a constant state.

A level of service scheme was defined using the following volume/capacity ratio bands:

- **LOS A**: 0 to 0.35
- **LOS B**: 0.35 to 0.65
- **LOS C**: 0.65 to 0.75
- **LOS D**: 0.75 to 0.9
- **LOS E**: 0.9 to 1
- **LOS F**: > 1

This LOS scheme has been used in previous studies in New South Wales, but the actual level of service measure is flexible, in line with the wording of the definitions listed above. The model's network LOS was plotted and compared to the observed AM peak level of service from the RMS Live Traffic Service website[4] in Figure 3-7.The comparison shows that the two images are quite similar.

It should be noted that strategic transport models do not replicate queues, which, in reality, can affect the level of downstream roads links. On a real-worked road network, a reduction in capacity on a link may result in a long queue, stretching back over several road links. This reduces the level of services on roads that may have adequate capacity, at least in theory. In a strategic model, traffic is associated with single links, which are independent of each other and effects of blocking back are not replicated.

[4] https://www.livetraffic.com/desktop.html, accessed 25/07/2017

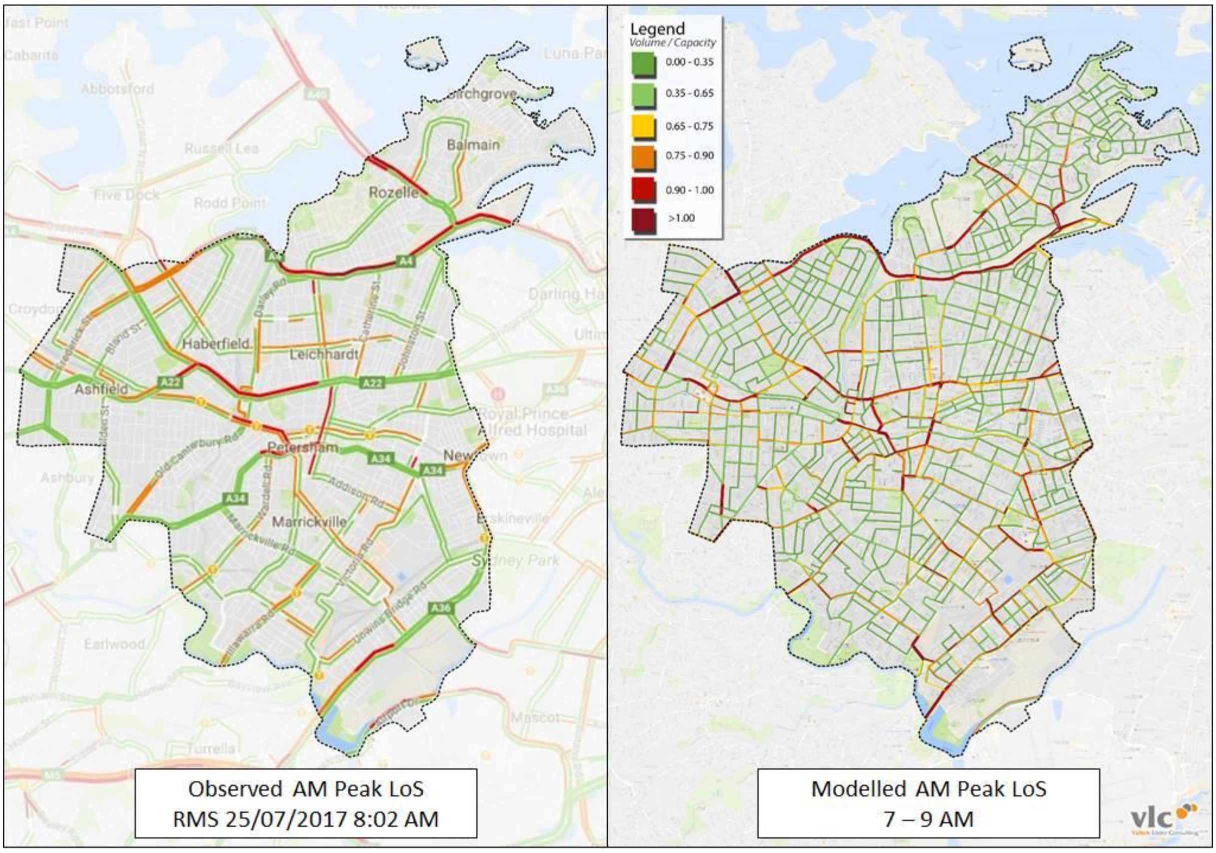


Figure C-12: Modelled vs observed AM Peak level of service

C.3 Validation Conclusion

The model validates particularly well on a model-wide basis. Within the study area, the validation is affected by comparisons between AWT and ADT volumes. The use of an average conversion factor for locations where both measures are not available does not fully compensate for having the actual comparable numbers. The local area validation is also affected by commercial vehicles.

Commercial vehicle validation is weaker than that of passenger travel. This is a common issue with strategic transport models, which are primarily aimed at passenger travel. There is a paucity of travel data for commercial vehicle trip generation and mode split.

Forecasts of commercial vehicle demands will be post-processed to provide more certainty around the impact of WestConnex on commercial vehicle volumes in the Inner West LGA.

Appendix D: Details of Impact of WestConnex on Local Roads

This section discusses the modelled differences between scenarios in order to highlight changes in travel behaviour resulting from the opening of the stages of WestConnex. Roads experiencing induced traffic will be examined areas vulnerable to increased traffic will be examined.

D.1 Impact on Delays

The delay time can be calculated for a given network by comparing the free-flow speeds with the calculated speed resulting from the speed-flow curve and link volume. The formula for calculating the delay time is given by:

$$t_{delay} = \int_0^N \frac{V_N \times L_N}{{S^c}_N} - \int_0^N \frac{V_N \times L_N}{{S^f}_N}$$

Where:

- N = the number of links
- V = the traffic volume on a given link
- L = the link length
- S^c = the calculated speed of the link
- S^f = the free-flow speed of the link

The average total delay was calculated for each scenario, by time period and by mode. Only roads in the study area were included in this calculation, with most major roads (WestConnex, Parramatta Rd, City West Link, etc) omitted. This means that the analysis reflects the status of travel delays within local roads in the study area.
The data is shown in Table 6-1. For the purpose of model outputs, the modes and time periods are:

- AM: 7 to 9 AM
- PM: 4 to 6 PM
- OP: 9 AM to 4 PM, and 6PM to 7AM.
- Car: Standard passenger car
- LCV: Light Commercial Vehicle (Austroads vehicle class 3)
- HCV: Heavy Commercial Vehicle (Austroads vehicle class 4+)

This analysis suggests the following:

- Delays will increase in the future
- In 2021 with WestConnex stages one and two, there will be slightly fewer delays during the peaks, but slightly more during off-peak times when compared to the no-WestConnex scenario. This suggests that increases in observed traffic volumes are likely due to rerouting within the study area as opposed to induced demand.
- In 2031 with WestConnex stage three, there will be significantly fewer delays during all time periods when compared to the base scenario.

Table D-7-11: Average Delay

Time	Mode	2011	2021 Base	2021 Project	2031 Base	2031 Project
AM	Car	2,542 hrs	4,103 hrs	3,888 hrs	5,789 hrs	3,954 hrs
AM	LCV	94 hrs	157 hrs	153 hrs	229 hrs	157 hrs
AM	HCV	91 hrs	152 hrs	151 hrs	219 hrs	136 hrs
AM	Total	2,727 hrs	4,411 hrs	4,192 hrs	6,237 hrs	4,247 hrs
PM	Car	2,261 hrs	3,701 hrs	3,553 hrs	5,369 hrs	3,757 hrs
PM	LCV	73 hrs	123 hrs	121 hrs	183 hrs	129 hrs
PM	HCV	72 hrs	121 hrs	122 hrs	181 hrs	113 hrs
PM	Total	2,407 hrs	3,944 hrs	3,796 hrs	5,733 hrs	3,999 hrs
OP	Car	7,444 hrs	12,423 hrs	12,756 hrs	19,970 hrs	14,291 hrs
OP	LCV	313 hrs	523 hrs	541 hrs	834 hrs	605 hrs
OP	HCV	310 hrs	518 hrs	555 hrs	836 hrs	541 hrs
OP	Total	8,066 hrs	13,464 hrs	13,852 hrs	21,640 hrs	15,437 hrs
Daily	Car	12,247 hrs	20,226 hrs	20,197 hrs	31,127 hrs	22,002 hrs
Daily	LCV	480 hrs	802 hrs	815 hrs	1,246 hrs	891 hrs
Daily	HCV	473 hrs	791 hrs	828 hrs	1,237 hrs	790 hrs
Daily	Total	13,200 hrs	21,819 hrs	21,841 hrs	33,610 hrs	23,683 hrs

D.2 Impact on Level of Service

The level of service images shown in sections 5.1 and 5.2 illustrate the state of congestion for that scenario, but impacts arising from WestConnex are not easily interpreted. To understand these effects, the change in level of service between the base and project cases were plotted. The images are shown in Figure D-13 and Figure D-14.

In these images, a positive number (ie. Orange through purple) indicates an increase in level of service. This means traffic has increased such that the volume capacity ratio jumps N bands. For example, a change in level of service of +2 means that the level of service has changed from B to D, or from C to E. In the same way, a negative number means that level of service has decreased relative to the base case.

D.2.1 2021

In general, the results indicate that WestConnex stages one and two will not have a significant increase or decrease on levels of traffic in the study area during peak periods. Rather, rerouting of traffic will occur which will see an increase in traffic in some areas and a decrease in traffic in other areas.

The congestion is expected to *increase* in the following corridors:

- The North / South corridor between the stage one interchange at Parramatta and the M5. Roads affected include:
    - Bland St
    - Brown St
    - Prospect Rd
- The corridor between the stage one interchange at Parramatta and the stage two interchange at St Peters. Roads affected include:
    - Hawthorne Parade
    - Ramsay St
    - Gower St
    - Grosvenor Cres

  - West St
  - Brighton St
  - Addison Rd
  - Edinburgh Rd
  - Edgeware Rd
  - Juliett St
  - Bedwin Rd
  - Hunter St

One explanation for the former behaviour is that some vehicles heading towards the M5 from the M4 are electing to stay on the M4 until the Parramatta Rd interchange instead of exiting at Concord Rd to take a route such as The Boulevarde.

The former could be explained by vehicles heading towards the Sydney Airport and Port Botany region from the North Western areas that choose to take the M4 and navigate the local roads instead of opting for the M5.

Meanwhile, congestion is expected to *decrease* on the following corridors:

- West of the Parramatta Rd Interchange. Roads affected include:
  - Church St
  - Croydon Rd
  - Ramsay St, West of the interchange
  - Frederick St
- The East / West corridor between the stage one interchange at Parramatta and the M5. Roads affected include:
  - Elizabeth St
  - Thomas St
  - Norton St
  - Arthur St
  - Park Ave
- The North-West / South West movement West of the St Peters Interchange
  - Illawarra Rd
  - Victoria Rd
  - Livingstone Rd

The first instance could be explained by drivers utilising the extra capacity provided by stage one to stay on the M4, thus bypassing some local streets.

Similarly, the second instance could be attributed to drivers choosing the upgraded M4 for east-west movements over the competing local streets.

The third observation is likely to be a result of the new M5 tunnel to St Peters interchange relieving traffic on the competing local routes.

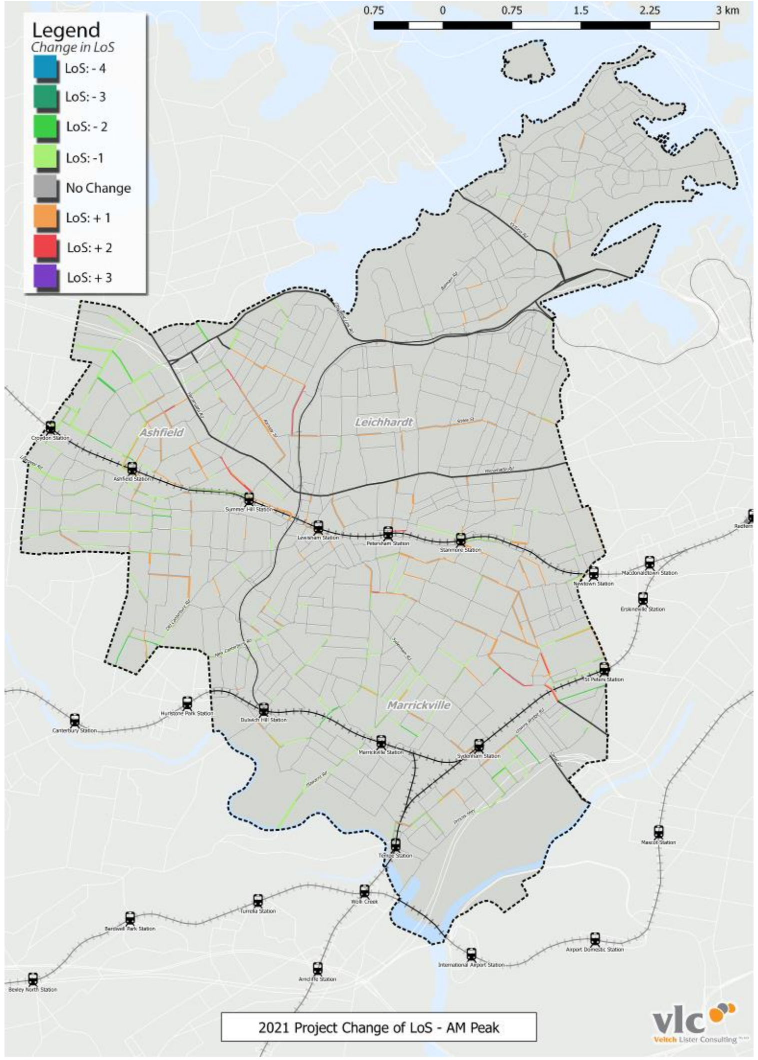


Figure D-13: 2021 Project vs Base AM, Level of Service Change

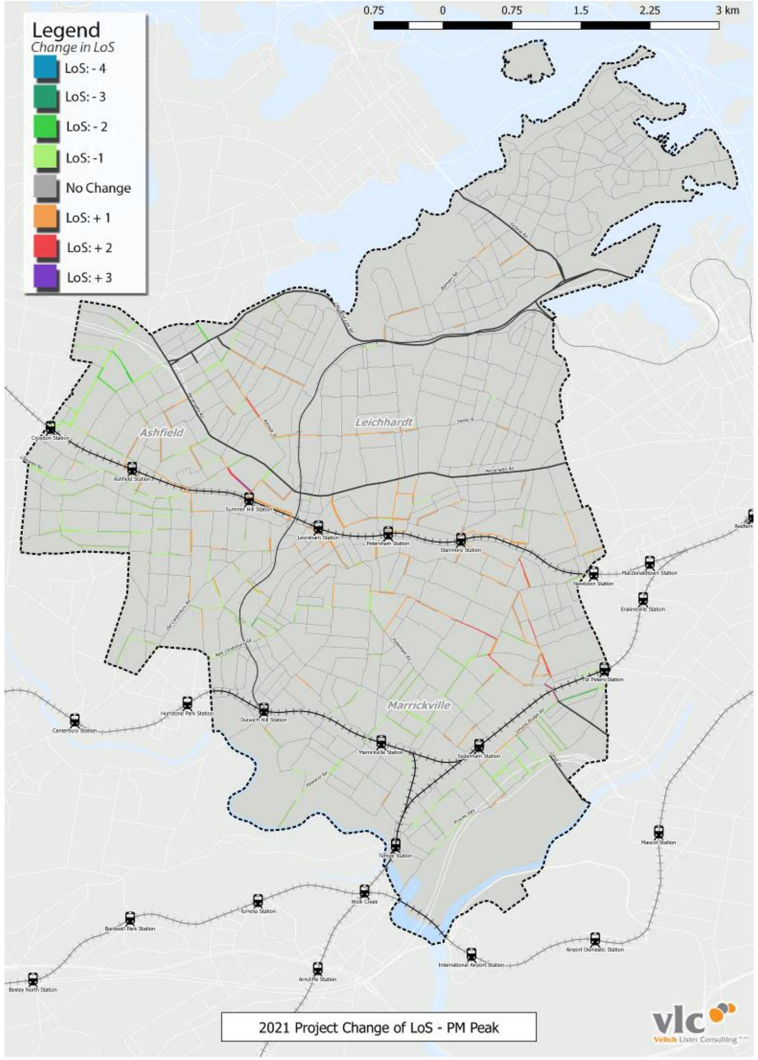


Figure D-14: 2021 Project vs Base PM, Level of Service Change

D.2.2 2031

The model results suggest that the addition of WestConnex Stage Three and the Western Harbour tunnel will generally reduce congestion in the area during peak periods. Most of the roads highlighted as having an increase in congestion as a result of stages one and two in 2021 experience a decrease in level of service with the introduction of stage three in 2031.

There are some exceptions which might experience an increase in level of service during peak periods. The areas affected are:

- The North South corridor between Parramatta Rd and The Crescent. Roads affected include:
  - Annandale St
  - Johnson St, but only southbound in the AM Peak
- West of the Parramatta Rd Interchange. Roads affected include:
  - Ramsay St, West of the interchange
  - Ash Lane
- The North / South corridor between the stage one interchange at Parramatta and Elizabeth St. Roads affected include:
  - Frederick St[1]
  - Bland St[2], Northbound in AM Peak, Southbound in PM Peak
  - Alt St[2], Northbound in AM Peak, Southbound in PM Peak

1) Frederick St is expected to experience a decrease in Level of Service as a result of stage one and two. This increase returns the level of service to where it would be with normal growth.

2) Bland St and Alt St experience a decrease in Level of Service for the reverse directions

The first observation could be attributed to vehicles accessing the Rozelle interchange from Parramatta Rd.

The second and third observations are also likely due to vehicles accessing stage three of WestConnex at the Parramatta Rd interchange from the region immediately to the West and South of the interchange respectively.

The model demonstrates that stage three of WestConnex will relieve congestion across the network. This is best demonstrated in Figure D-15 and Figure D-16.

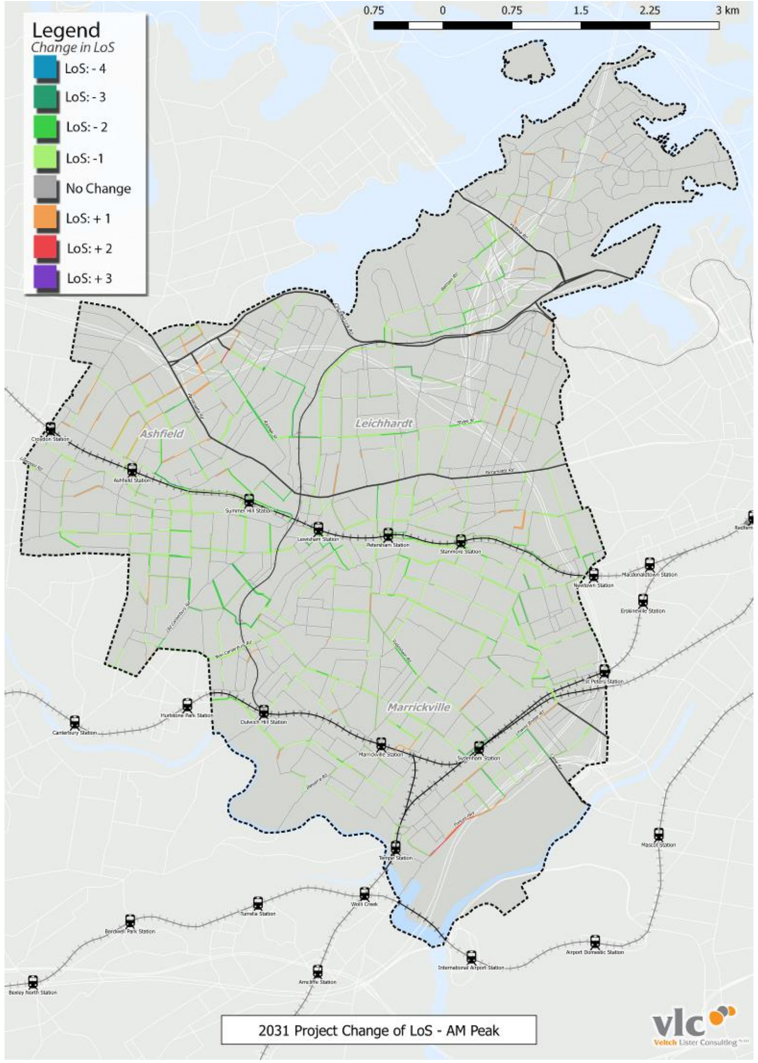


Figure D-15: 2031 Project vs Base AM, Level of Service Change

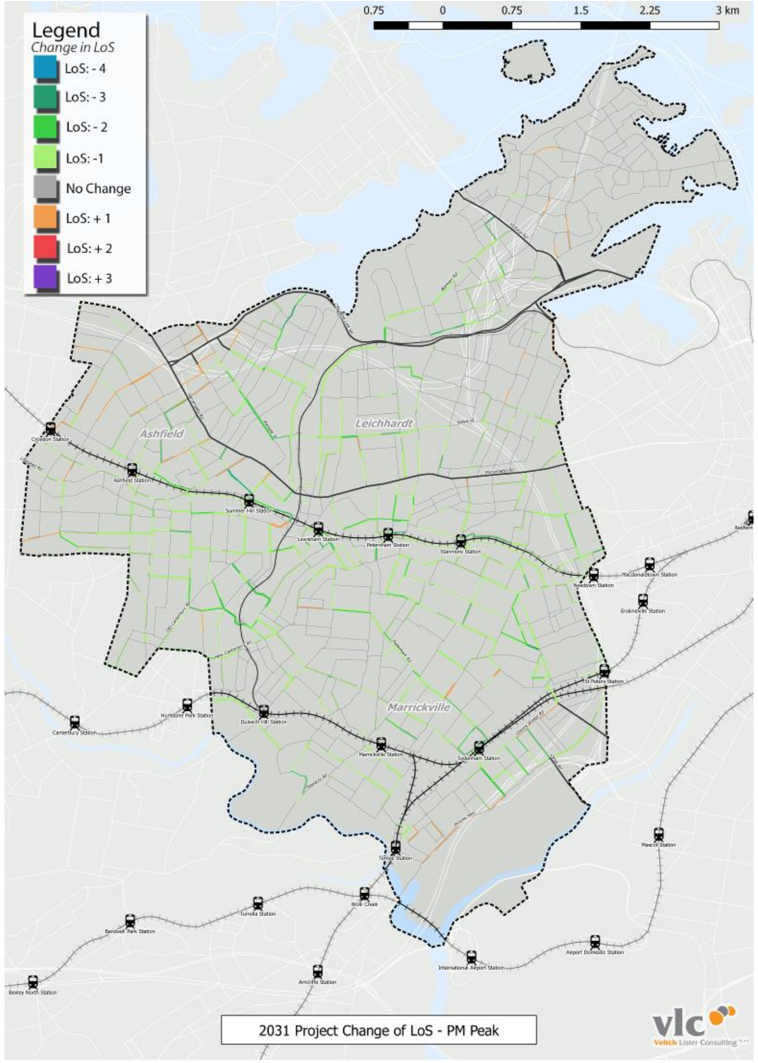


Figure D-16: 2031 Project vs Base PM, Level of Service Change

D.3 Impact on Traffic Movements

Two separate analyses were conducted to determine the effects of WestConnex on route choice. The first was a global analysis of the study area, which focussed on the change in daily total kilometres. The second analysis focused on the change in volumes on each link, which enabled the impacts to be viewed geographically.

D.3.1 Across the study area

To assess the impacts on traffic movements on the study area as a whole, the number of kilometres travelled on local roads was calculated and compared between base and project case scenarios.

The percentage increase shown in Table 6-2 is determined from the total kilometres travelled daily on local study area roads in the project case, divided by the base case.

Table D-7-12: Percentage Traffic Kilometre Increase

Time	Mode	2021 Project vs 2021 Base	2031 Project vs 2031 Base
AM	LCV	1%	-9%
AM	HCV	3%	-17%
AM	Car	-1%	-10%
AM	Total	-1%	-10%
PM	LCV	1%	-10%
PM	HCV	2%	-17%
PM	Car	-1%	-10%
PM	Total	-1%	-10%
MD	LCV	1%	-9%
MD	HCV	4%	-16%
MD	Car	-1%	-9%
MD	Total	-1%	-10%
Daily	LCV	1%	-9%
Daily	HCV	3%	-16%
Daily	Car	-1%	-9%
Daily	Total	-1%	-10%

The model results suggest that in general, the local roads will experience slightly less traffic across all time periods in 2021 with WestConnex stages one and two compared with the base scenario. However, slightly more commercial vehicle traffic will be present across all time periods.

The addition of WestConnex stage three and Western Harbour tunnel will cause a significant decrease in traffic, including commercial vehicle traffic, across all time periods in 2031 compared with the base scenario.

D.3.2 Individual links

The daily change in traffic volume was calculated for each link for both all traffic and commercial vehicles, and the percentage difference was plotted in Figure D-17 and Figure

D-18. Only roads with a sufficient volume in 2011 were considered for this analysis in order to prevent minor changes on roads with little volume from dominating the output.

It is important to consider, with this analysis, that the model's route choice is not always accurate in the route choice of the commercial vehicles because of non-technical deterrents mentioned in the validation chapter of this report.

Increases and decreases were generally consistent between combined traffic and commercial vehicle traffic.

D.3.2.1 2021

The areas where an increase in traffic and commercial vehicle volumes are expected to increase in 2021 as a result of WestConnex stages one and two are:

- The corridor between the stage one interchange at Parramatta and the stage two interchange at St Peters. The roads that the model suggests might be affected include:
    - Hawthorne Parade
    - Ramsay St
    - Gower St
    - Grosvenor Cres
    - Railway Terrance
    - Hunter St
    - Stanmore Rd
    - Enmore Rd
    - Edinburgh Rd
    - Bedwin Rd

- The corridor between Bayview Ave and the stage two interchange at St Peters
    - Unwins Bridge Rd
    - Edith St (SE Bound)

Regions with a projected decrease in traffic volumes include:

- The area surrounding the Parramatta Rd stage one interchange
    - Mortley Ave
    - Boomerang St
    - Dalhousie St
    - O'Connor St
    - Frederick St, North of John St
    - Alt St, North of John St
    - Church St
    - John St
- The East / West corridor between the stage one interchange at Parramatta and the M5. Roads affected include:
    - Elizabeth St
    - Thomas St
    - Norton St
    - Park Ave

D.3.2.2 2031

In 2031, it is expected that the introduction of WestConnex Stage 3 will increase traffic volumes in the following corridors:

- The North / South corridor between the stage one interchange at Parramatta and Elizabeth St. Roads affected include:
  - Alt St
  - Bland St
  - Frederick St (commercial vehicles only)
- The North South corridor between Parramatta Rd and The Crescent. Roads affected include:
  - Johnson St
  - Young St (commercial vehicles only)

Meanwhile, significant decreases are observed in mixed traffic and commercial vehicle volumes across the network. Most increases in traffic mentioned that results from stage one and two in 2021 undergo a decrease in commercial vehicle traffic as a result of stage three in 2031. Figure D-19 and Figure D-20 best highlight all of the areas that experience a decrease in traffic and commercial vehicle traffic respectively.

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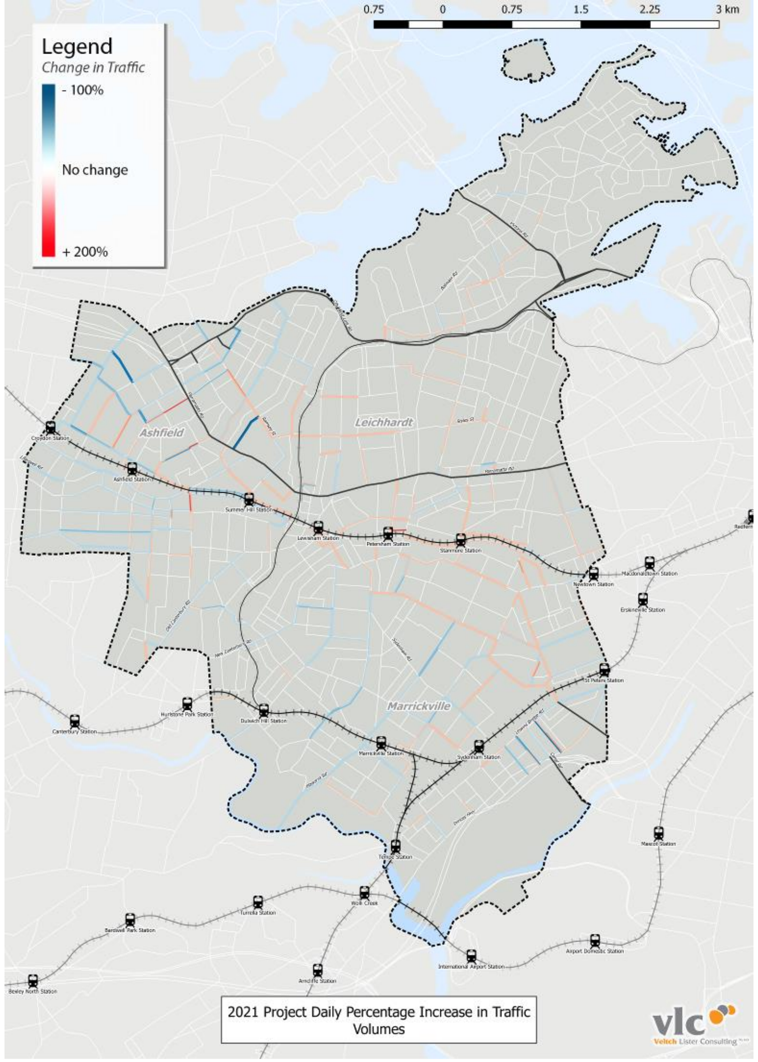

Figure D-17: 2021 Increase in Traffic

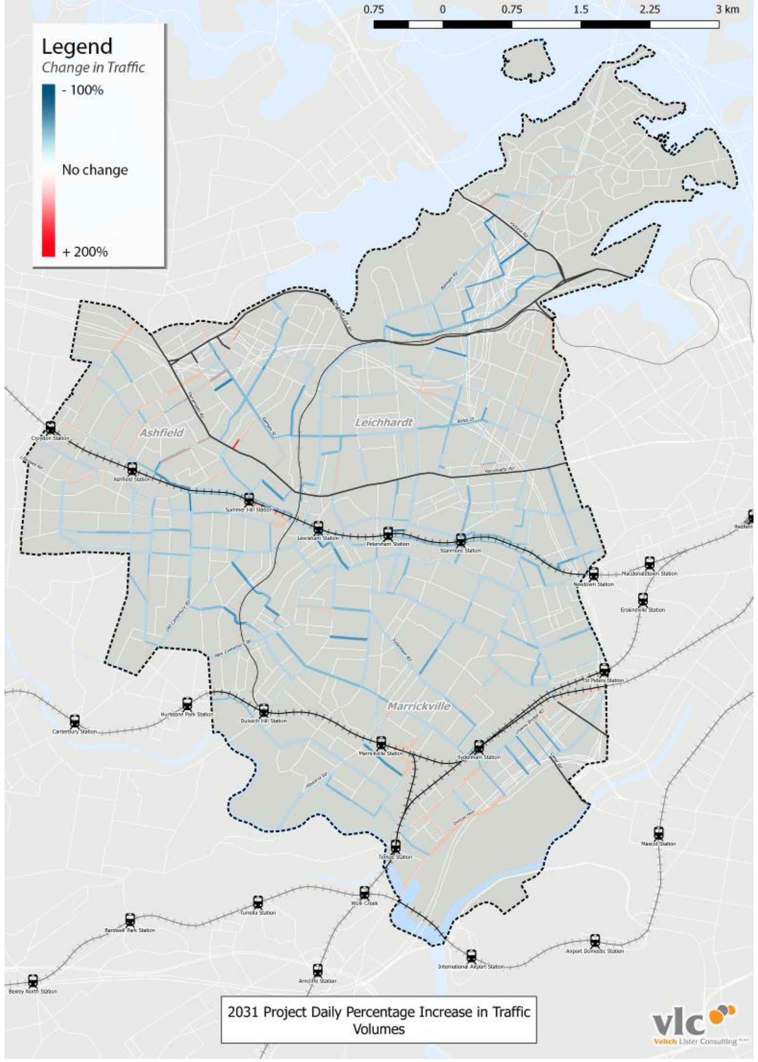

Figure D-18: 2031 Increase in Traffic

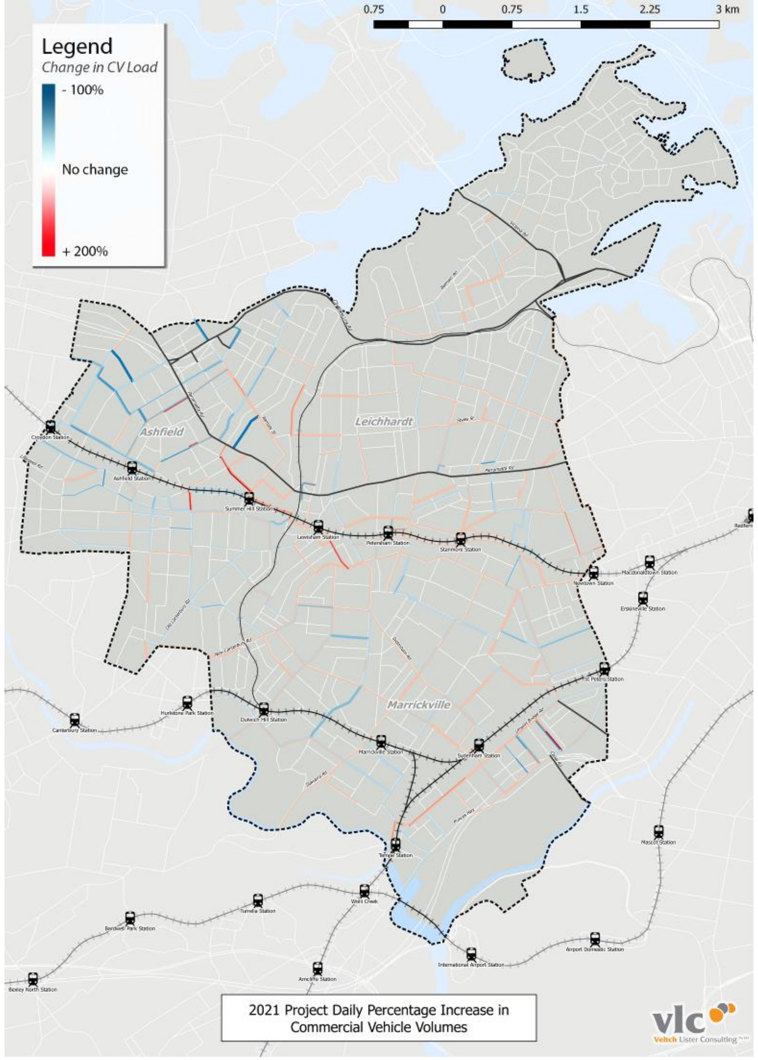

Figure D-19: 2021 Increase in CV Load

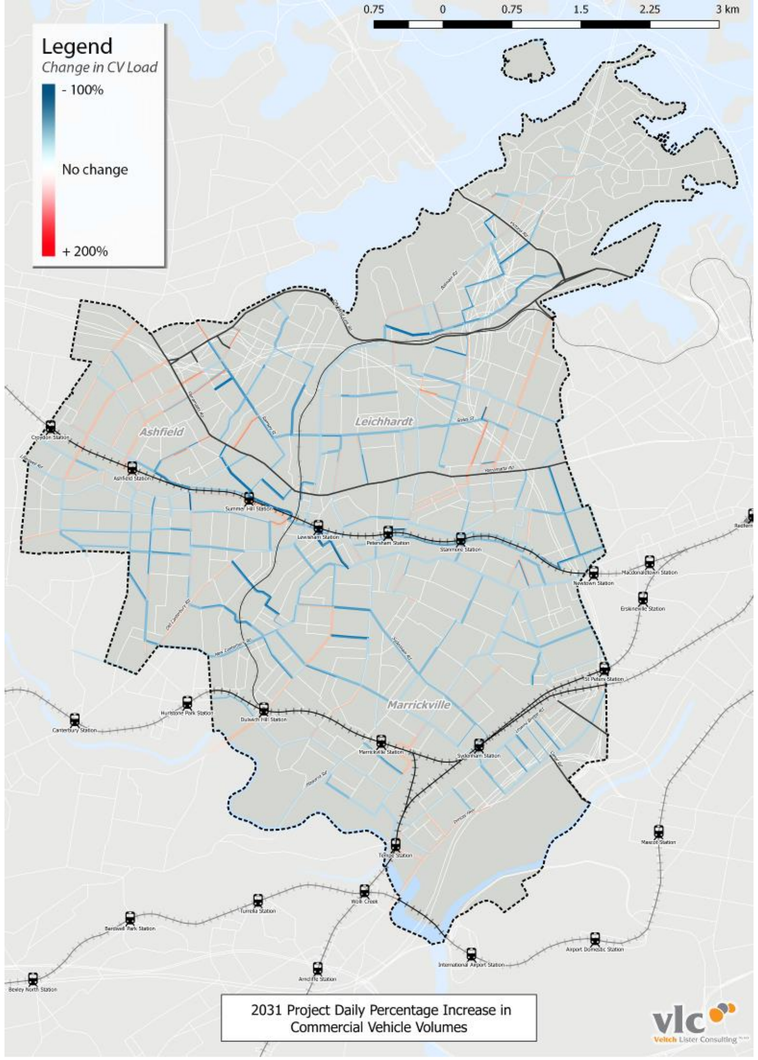

Figure D-20: 2031 Increase in CV Load

D.4 Short term Impacts

The analysis above indicates that the impacts of WestConnex are expected to be either short term, or long term. The short-term effects result from changes in travel patterns from the inclusion of stages one and two that are addressed by the completion of stage three due in 2023. These short term effects are discussed in this section.

The short term effects require a different approach to long term impacts as permanent traffic calming techniques will be largely redundant after stage three opens. Instead, temporary traffic calming techniques such as temporary signage might be better suited. In some cases, doing nothing is viable as the excess traffic is expected to dissipate on its own accord.

The following corridors can expect an increase in traffic after stages one and two are constructed, but prior to stage three:

- The North / South corridor between the stage one interchange at Parramatta and the M5. Roads affected include:
  - Brown St
  - Prospect Rd
- The corridor between the stage one interchange at Parramatta and the stage two interchange at St Peters. Roads affected include:
  - Hawthorne Parade
  - Ramsay St
  - **Gower St**
  - **Grosvenor Cres**
  - West St
  - Brighton St
  - Addison Rd
  - Edinburgh Rd
  - **Edgeware Rd**
  - **Juliett St**
  - **Bedwin Rd**
  - Hunter St

Those in **bold** are expected to encounter the greatest temporary increase in traffic. The changes in volumes on these roads are available in Appendix E.

It is important to note that the model did not include Kensington Rd between Sloan St and Liverpool Rd, and as Gower St runs directly parallel with this road, it is reasonable to assume that Kensington St will share the increase in volume with Gower St.

D.5 Long term Impacts

There are some effects of WestConnex that are expected to remain long term after the construction of stage three. These impacts are discussed in this section of the report.

The effects fall into one of two categories:

- Impacts caused by stages one and two that are not addressed by the construction of stage three
- Impacts caused by the construction of stage three, that are not a correction of a traffic reduction observed as a result of stages one and two

Unlike short term impacts, the long term impacts might require permanent traffic calming techniques. Techniques such as slower speed limits, additional parking, speed bumps, and curb extensions could be utilised to reduce traffic through these sections.

The following areas can expect to experience an increase in traffic that will remain long term:

- Some sections of the North / South corridor between the stage one interchange at Parramatta and the M5:
    - Bland St
    - Alt St
    - Frederick St
    - Queen St
- The North South corridor between Parramatta Rd and The Crescent. Roads affected include:
    - Annandale St
    - Johnson St
- West of the Parramatta Rd Interchange:
    - Ash Lane

The changes in traffic volumes on these roads can be found in Appendix F.

D.6 Vulnerable Areas

Some of these streets are highlighted below as being particularly vulnerable due to nearby landuse.

- De La Salle College, Bethlehem College, and St Vincent's Catholic Primary School on Bland St, between Elizabeth St and Charlotte St
    - +14% (+900) daily traffic after stages one and two, followed by +3% (+300) daily traffic after stage three
- De La Salle College access on Alt St between John and Elizabeth St
    - +26% (+1,500) daily traffic after stages one and two, followed by +3% (+200) daily traffic after stage three

Permanent traffic calming would be best utilised in these areas as they are most susceptible to an ongoing increase in traffic.

D.7 Reclaiming Public Space

The addition of WestConnex also benefits some areas by reducing the amount of traffic carried by some routes. This provides an opportunity to reclaim some public space and reduce the road hierarchy, thus improving the serenity for local residents.

Roads with a significant decrease in traffic include:

- Church St
- John St
- O'Connor St
- Edith St (St. Peters)
- Frederick St (St. Peters)
- Grove St

Some of these roads will experience an increase in traffic due to some elements of WestConnex; however such roads also undergo a significant decrease in traffic due to other elements of the project. The changes in volume predicted for these roads are shown in Appendix G.

Appendix E: Roads Identified with Short Term Impacts

Street	Time	2011	2021 Base	2021 Project	Change (%)	2031 Base	2031 Project	Change (%)
Brown St, Between Elizabeth St and Liverpool Rd, Southbound	AM Peak	900	1,030	1,160	13%	1,270	1,080	-15%
	Off Peak	5,360	6,260	6,890	10%	7,370	7,120	-3%
	PM Peak	1,150	1,300	1,370	5%	1,480	1,360	-8%
	Daily	7,410	8,590	9,420	10%	10,120	9,560	-6%
Brown St, Between Elizabeth St and Liverpool Rd, Northbound	AM Peak	1,110	1,250	1,230	-2%	1,350	1,330	-1%
	Off Peak	4,030	5,380	5,660	5%	6,440	6,290	-2%
	PM Peak	760	950	1,000	5%	1,120	1,070	-4%
	Daily	5,900	7,580	7,890	4%	8,910	8,690	-2%
Prospect Rd, Between Old Canterbury Rd and Seaview St, Southbound	AM Peak	720	930	960	3%	1,170	840	-28%
	Off Peak	2,870	3,610	3,560	-1%	4,700	3,660	-22%
	PM Peak	690	850	970	14%	1,160	870	-25%
	Daily	4,280	5,390	5,490	2%	7,030	5,370	-24%
Prospect Rd, Between Old Canterbury Rd and Seaview St, Northbound	AM Peak	590	730	860	18%	1,040	710	-32%
	Off Peak	2,330	3,090	3,090	0%	4,530	2,980	-34%
	PM Peak	600	800	830	4%	990	740	-25%
	Daily	3,520	4,620	4,780	3%	6,560	4,430	-32%
Hawthorne Parade, Between Barton Ave and Marion St, Southbound	AM Peak	720	800	1,010	26%	1,130	780	-31%
	Off Peak	2,260	2,540	2,730	7%	3,940	2,500	-37%
	PM Peak	390	420	580	38%	810	420	-48%
	Daily	3,370	3,760	4,320	15%	5,880	3,700	-37%
Hawthorne Parade, Between Barton Ave and Marion St, Northbound	AM Peak	180	210	340	62%	430	210	-51%
	Off Peak	1,720	2,050	2,230	9%	3,150	1,820	-42%
	PM Peak	460	530	700	32%	840	520	-38%
	Daily	2,360	2,790	3,270	17%	4,420	2,550	-42%
Ramsay St, Between O'Connor St and Marion St, South-East Bound	AM Peak	1,120	1,280	1,360	6%	1,500	1,120	-25%
	Off Peak	4,130	5,020	5,650	13%	6,480	4,410	-32%
	PM Peak	810	930	1,100	18%	1,240	830	-33%
	Daily	6,060	7,230	8,110	12%	9,220	6,360	-31%
Ramsay St, Between O'Connor St and Marion St, North-West Bound	AM Peak	690	840	1,000	19%	1,120	750	-33%
	Off Peak	3,610	4,890	5,680	16%	6,580	4,490	-32%
	PM Peak	1,010	1,170	1,270	9%	1,410	1,040	-26%
	Daily	5,310	6,900	7,950	15%	9,110	6,280	-31%
Gower St, Between Hume Hwy and Sloane St, Eastbound	AM Peak	530	600	720	20%	780	570	-27%
	Off Peak	1,720	2,660	3,480	31%	3,930	2,510	-36%
	PM Peak	420	490	700	43%	790	470	-41%
	Daily	2,670	3,750	4,900	31%	5,500	3,550	-35%
Gower St, Between Hume Hwy and Sloane St, Westbound	AM Peak	360	410	570	39%	560	470	-16%
	Off Peak	1,890	2,430	3,020	24%	3,230	2,700	-16%
	PM Peak	440	480	620	29%	660	500	-24%
	Daily	2,690	3,320	4,210	27%	4,450	3,670	-18%
Grosvenor Cres, Between Sloane St and Dover St, Eastbound	AM Peak	690	870	960	10%	1,130	790	-30%
	Off Peak	2,090	3,320	4,100	23%	5,270	3,420	-35%
	PM Peak	620	840	990	18%	1,190	800	-33%
	Daily	3,400	5,030	6,050	20%	7,590	5,010	-34%
Grosvenor Cres, Between Sloane St and Dover St, Westbound	AM Peak	730	960	1,060	10%	1,240	970	-22%
	Off Peak	3,390	4,500	5,100	13%	6,050	4,550	-25%
	PM Peak	820	970	1,030	6%	1,190	910	-24%
	Daily	4,940	6,430	7,190	12%	8,480	6,430	-24%
	AM Peak	1,160	1,210	1,300	7%	1,360	1,220	-10%

Street	Time	2011	2021 Base	2021 Project	Change (%)	2031 Base	2031 Project	Change (%)
West St, Between Station St and Brighton St, Southbound	Off Peak	6,520	6,850	7,120	4%	7,730	6,850	-11%
	PM Peak	1,270	1,340	1,430	7%	1,490	1,350	-9%
	Daily	8,950	9,400	9,850	5%	10,580	9,420	-11%
West St, Between Station St and Brighton St, Northbound	AM Peak	1,190	1,320	1,370	4%	1,510	1,310	-13%
	Off Peak	6,520	7,070	7,360	4%	7,790	7,140	-8%
	PM Peak	1,240	1,310	1,360	4%	1,440	1,290	-10%
	Daily	8,950	9,700	10,090	4%	10,740	9,740	-9%
Brighton St, Between West St and Station St, Eastbound	AM Peak	630	710	710	0%	770	700	-9%
	Off Peak	2,250	2,850	3,040	7%	3,620	2,930	-19%
	PM Peak	400	500	530	6%	620	500	-19%
	Daily	3,280	4,060	4,280	5%	5,010	4,130	-18%
Brighton St, Between West St and Station St, Westbound	AM Peak	350	420	450	7%	540	460	-15%
	Off Peak	2,060	2,760	2,840	3%	3,450	2,950	-14%
	PM Peak	530	660	660	0%	740	660	-11%
	Daily	2,940	3,840	3,950	3%	4,730	4,070	-14%
Addison Rd, Between Livingstone Rd and Audley St, Eastbound	AM Peak	1,550	1,660	1,770	7%	1,860	1,660	-11%
	Off Peak	7,970	8,340	9,100	9%	9,660	8,700	-10%
	PM Peak	1,380	1,520	1,670	10%	1,780	1,550	-13%
	Daily	10,900	11,520	12,540	9%	13,300	11,910	-10%
Addison Rd, Between Livingstone Rd and Audley St, Westbound	AM Peak	1,220	1,290	1,480	15%	1,530	1,390	-9%
	Off Peak	7,800	8,140	8,990	10%	9,220	8,430	-9%
	PM Peak	1,520	1,660	1,780	7%	1,880	1,680	-11%
	Daily	10,540	11,090	12,250	10%	12,630	11,500	-9%
Addison Rd, Between Cook Rd and Wemyss St, Eastbound	AM Peak	1,090	1,180	1,210	3%	1,290	1,180	-9%
	Off Peak	5,010	5,550	6,270	13%	6,510	5,890	-10%
	PM Peak	770	910	1,220	34%	1,280	1,090	-15%
	Daily	6,870	7,640	8,700	14%	9,080	8,160	-10%
Addison Rd, Between Cook Rd and Wemyss St, Westbound	AM Peak	830	1,040	1,210	16%	1,270	1,060	-17%
	Off Peak	5,420	6,300	6,900	10%	7,040	6,380	-9%
	PM Peak	1,230	1,300	1,320	2%	1,400	1,290	-8%
	Daily	7,480	8,640	9,430	9%	9,710	8,730	-10%
Edinburgh Rd, Between Fitzroy St and Bedwin Rd, Eastbound	AM Peak	1,100	1,230	1,280	4%	1,350	1,260	-7%
	Off Peak	5,360	5,900	6,530	11%	7,160	6,550	-9%
	PM Peak	970	1,090	1,290	18%	1,380	1,230	-11%
	Daily	7,430	8,220	9,100	11%	9,890	9,040	-9%
Edinburgh Rd, Between Fitzroy St and Bedwin Rd, Westbound	AM Peak	830	970	1,150	19%	1,250	1,060	-15%
	Off Peak	4,960	5,660	6,470	14%	7,020	6,230	-11%
	PM Peak	1,070	1,210	1,220	1%	1,320	1,180	-11%
	Daily	6,860	7,840	8,840	13%	9,590	8,470	-12%
Edgeware Rd, Between Enmore Rd and Lynch Ave, Southbound	AM Peak	1,400	1,530	1,560	2%	1,720	1,500	-13%
	Off Peak	6,660	7,480	8,450	13%	8,860	7,900	-11%
	PM Peak	1,220	1,400	1,590	14%	1,720	1,480	-14%
	Daily	9,280	10,410	11,600	11%	12,300	10,880	-12%
Edgeware Rd, Between Enmore Rd and Lynch Ave, Northbound	AM Peak	1,070	1,210	1,360	12%	1,480	1,300	-12%
	Off Peak	6,450	7,210	7,830	9%	8,280	7,350	-11%
	PM Peak	1,320	1,410	1,450	3%	1,530	1,400	-8%
	Daily	8,840	9,830	10,640	8%	11,290	10,050	-11%
Edgeware Rd, Between Victoria Rd and Smidmore St, Southbound	AM Peak	1,210	1,420	1,600	13%	1,660	1,530	-8%
	Off Peak	5,570	6,830	8,520	25%	9,310	7,870	-15%
	PM Peak	990	1,250	1,680	34%	1,740	1,510	-13%
	Daily	7,770	9,500	11,800	24%	12,710	10,910	-14%

Street	Time	2011	2021 Base	2021 Project	Change (%)	2031 Base	2031 Project	Change (%)
Edgeware Rd, Between Victoria Rd and Smidmore St, Northbound	AM Peak	1,010	1,290	1,570	22%	1,670	1,440	-14%
	Off Peak	5,650	7,070	8,720	23%	9,430	7,760	-18%
	PM Peak	1,270	1,440	1,620	13%	1,710	1,480	-13%
	Daily	7,930	9,800	11,910	22%	12,810	10,680	-17%
Juliett St, Between Lynch Ave and Llewellyn St, Southbound	AM Peak	140	280	330	18%	440	230	-48%
	Off Peak	260	390	860	121%	1,450	910	-37%
	PM Peak	40	70	170	143%	330	140	-58%
	Daily	440	740	1,360	84%	2,220	1,280	-42%
Juliett St, Between Lynch Ave and Llewellyn St, Northbound	AM Peak	50	60	340	467%	410	110	-73%
	Off Peak	460	650	1,580	143%	2,340	800	-66%
	PM Peak	120	200	390	95%	500	200	-60%
	Daily	630	910	2,310	154%	3,250	1,110	-66%
Bedwin Rd, Between Edinburgh Rd and Unwins Bridge Rd, Southbound	AM Peak	2,080	2,340	2,880	23%	3,130	2,720	-13%
	Off Peak	10,590	12,200	15,490	27%	17,110	15,150	-11%
	PM Peak	1,910	2,260	3,160	40%	3,540	2,860	-19%
	Daily	14,580	16,800	21,530	28%	23,780	20,730	-13%
Bedwin Rd, Between Edinburgh Rd and Unwins Bridge Rd, Northbound	AM Peak	1,930	2,290	3,060	34%	3,380	2,730	-19%
	Off Peak	11,070	13,020	16,420	26%	18,070	15,570	-14%
	PM Peak	2,310	2,600	3,000	15%	3,230	2,780	-14%
	Daily	15,310	17,910	22,480	26%	24,680	21,080	-15%
Hunter St, Between The Boulevarde and New Canterbury Rd, South-East Bound	AM Peak	340	420	460	10%	570	370	-35%
	Off Peak	780	1,730	2,130	23%	2,520	1,320	-48%
	PM Peak	330	470	510	9%	530	400	-25%
	Daily	1,450	2,620	3,100	18%	3,620	2,090	-42%
Hunter St, Between The Boulevarde and New Canterbury Rd, North-West Bound	AM Peak	180	280	410	46%	510	270	-47%
	Off Peak	600	1,170	1,550	32%	2,020	920	-54%
	PM Peak	220	310	370	19%	440	230	-48%
	Daily	1,000	1,760	2,330	32%	2,970	1,420	-52%

Appendix F: Roads Identified with Long Term Impacts

Street	Time	2011	2021 Base	2021 Project	Change (%)	2031 Base	2031 Project	Change (%)
Bland St, Between Parramatta Rd and Julia St, Southbound	AM Peak	350	460	940	104%	1,090	780	-28%
	Off Peak	1,360	1,870	3,950	111%	5,220	3,900	-25%
	PM Peak	340	560	980	75%	1,150	870	-24%
	Daily	2,050	2,890	5,870	103%	7,460	5,550	-26%
Bland St, Between Parramatta Rd and Julia St, Northbound	AM Peak	580	750	730	-3%	880	940	7%
	Off Peak	2,310	3,090	3,170	3%	4,010	4,290	7%
	PM Peak	530	640	660	3%	830	880	6%
	Daily	3,420	4,480	4,560	2%	5,720	6,110	7%
Bland St, Between Charlotte and Elizabeth St, Southbound	AM Peak	380	440	520	18%	580	540	-7%
	Off Peak	1,430	1,820	2,480	36%	2,850	2,870	1%
	PM Peak	320	460	520	13%	590	580	-2%
	Daily	2,130	2,720	3,520	29%	4,020	3,990	-1%
Bland St, Between Charlotte and Elizabeth St, Northbound	AM Peak	400	500	450	-10%	510	560	10%
	Off Peak	1,650	2,230	2,340	5%	2,680	2,870	7%
	PM Peak	400	490	490	0%	540	580	7%
	Daily	2,450	3,220	3,280	2%	3,730	4,010	8%
Alt St, Between Parramatta Rd and Henry St, Southbound	AM Peak	450	510	580	14%	700	670	-4%
	Off Peak	2,140	2,740	2,680	-2%	3,460	3,820	10%
	PM Peak	530	730	670	-8%	810	840	4%
	Daily	3,120	3,980	3,930	-1%	4,970	5,330	7%
Alt St, Between Parramatta Rd and Henry St, Northbound	AM Peak	530	670	580	-13%	690	810	17%
	Off Peak	1,850	2,600	2,500	-4%	3,180	3,690	16%
	PM Peak	440	540	520	-4%	610	740	21%
	Daily	2,820	3,810	3,600	-6%	4,480	5,240	17%
Alt St, Between John St and Elizabeth St, Southbound	AM Peak	380	450	630	40%	730	650	-11%
	Off Peak	1,310	1,790	2,640	47%	3,380	3,300	-2%
	PM Peak	310	470	620	32%	760	690	-9%
	Daily	2,000	2,710	3,890	44%	4,870	4,640	-5%
Alt St, Between John St and Elizabeth St, Northbound	AM Peak	390	530	520	-2%	630	710	13%
	Off Peak	1,320	2,020	2,290	13%	2,990	3,310	11%
	PM Peak	360	470	530	13%	630	700	11%
	Daily	2,070	3,020	3,340	11%	4,250	4,720	11%
Frederick St, Between John St and Elizabeth St, Southbound	AM Peak	1,100	1,140	1,180	4%	1,220	1,210	-1%
	Off Peak	6,280	6,480	6,990	8%	7,150	7,350	3%
	PM Peak	1,240	1,280	1,300	2%	1,360	1,390	2%
	Daily	8,620	8,900	9,470	6%	9,730	9,950	2%
Frederick St, Between John St and Elizabeth St, Northbound	AM Peak	1,230	1,270	1,280	1%	1,300	1,380	6%
	Off Peak	6,460	6,590	7,160	9%	7,400	7,670	4%
	PM Peak	1,180	1,240	1,300	5%	1,340	1,360	1%
	Daily	8,870	9,100	9,740	7%	10,040	10,410	4%
Queen St, Between Armstrong St and Seaview St, Southbound	AM Peak	210	200	320	60%	300	400	33%
	Off Peak	2,380	2,360	2,900	23%	2,870	2,970	3%
	PM Peak	520	500	600	20%	560	660	18%
	Daily	3,110	3,060	3,820	25%	3,730	4,030	8%
Queen St, Between Armstrong St and Seaview St, Northbound	AM Peak	490	500	490	-2%	450	540	20%
	Off Peak	1,080	1,590	1,770	11%	1,770	1,490	-16%
	PM Peak	180	180	200	11%	200	230	15%
	Daily	1,750	2,270	2,460	8%	2,420	2,260	-7%
	AM Peak	130	160	190	19%	300	430	43%

Street	Time	2011	2021 Base	2021 Project	Change (%)	2031 Base	2031 Project	Change (%)
Annandale St, Between Collins St and Booth St, Southbound	Off Peak	500	740	750	1%	1,350	1,210	-10%
	PM Peak	110	190	200	5%	330	390	18%
	Daily	740	1,090	1,140	5%	1,980	2,030	3%
Annandale St, Between Collins St and Booth St, Northbound	AM Peak	220	290	330	14%	410	430	5%
	Off Peak	580	1,190	1,330	12%	2,280	1,760	-23%
	PM Peak	160	280	290	4%	430	430	0%
	Daily	960	1,760	1,950	11%	3,120	2,620	-16%
Johnson St, Between Collins St and Booth St, Southbound	AM Peak	940	1,190	1,220	3%	1,490	1,690	13%
	Off Peak	5,160	7,080	7,020	-1%	8,650	8,560	-1%
	PM Peak	1,250	1,500	1,440	-4%	1,680	1,720	2%
	Daily	7,350	9,770	9,680	-1%	11,820	11,970	1%
Johnson St, Between Collins St and Booth St, Northbound	AM Peak	1,460	1,640	1,650	1%	1,800	1,770	-2%
	Off Peak	6,910	8,320	8,550	3%	9,760	9,070	-7%
	PM Peak	1,330	1,550	1,580	2%	1,750	1,750	0%
	Daily	9,700	11,510	11,780	2%	13,310	12,590	-5%
Ash Lane, Between Wolseley St and Northcote St, South-East Bound	AM Peak	60	80	80	0%	90	420	367%
	Off Peak	300	350	410	17%	450	1,710	280%
	PM Peak	70	120	90	-25%	100	340	240%
	Daily	430	550	580	5%	640	2,470	286%

Appendix G: Roads Identified with Ameliorated Impacts

Street	Time	2011	2021 Base	2021 Project	Increase (%)	2031 Base	2031 Project	Increase (%)
Church St, Between Croydon Rd and Frederick St, South-East Bound	AM Peak	370	510	220	-57%	350	330	-6%
	Off Peak	1,340	2,110	560	-73%	1,120	920	-18%
	PM Peak	400	520	260	-50%	400	350	-13%
	Daily	2,110	3,140	1,040	-67%	1,870	1,600	-14%
Church St, Between Croydon Rd and Frederick St, North-West Bound	AM Peak	410	530	280	-47%	440	380	-14%
	Off Peak	1,220	2,030	460	-77%	1,070	820	-23%
	PM Peak	310	480	170	-65%	340	250	-26%
	Daily	1,940	3,040	910	-70%	1,850	1,450	-22%
John St, Between Croydon Rd and Frederick St, Eastbound	AM Peak	510	590	410	-31%	480	440	-8%
	Off Peak	2,620	3,000	1,960	-35%	2,480	2,140	-14%
	PM Peak	550	590	460	-22%	530	490	-8%
	Daily	3,680	4,180	2,830	-32%	3,490	3,070	-12%
John St, Between Croydon Rd and Frederick St, Westbound	AM Peak	520	550	450	-18%	510	510	0%
	Off Peak	2,560	2,840	2,010	-29%	2,390	2,200	-8%
	PM Peak	480	560	420	-25%	470	420	-11%
	Daily	3,560	3,950	2,880	-27%	3,370	3,130	-7%
Edith St (St. Peters), Between Unwins Bridge Rd and Princes Hwy, South-East Bound	AM Peak	60	70	60	-14%	90	70	-22%
	Off Peak	100	140	270	93%	310	290	-6%
	PM Peak	-	10	20	100%	30	30	0%
	Daily	160	220	350	59%	430	390	-9%
Edith St (St. Peters), Between Unwins Bridge Rd and Princes Hwy, North-West Bound	AM Peak	50	120	40	-67%	130	30	-77%
	Off Peak	550	1,350	270	-80%	490	220	-55%
	PM Peak	320	410	90	-78%	160	70	-56%
	Daily	920	1,880	400	-79%	780	320	-59%
Frederick St (St Peters), Between Unwins Bridge Rd and Henry St, Southbound	AM Peak	620	670	570	-15%	630	510	-19%
	Off Peak	3,060	3,270	2,820	-14%	3,160	2,430	-23%
	PM Peak	590	640	550	-14%	640	430	-33%
	Daily	4,270	4,580	3,940	-14%	4,430	3,370	-24%
Frederick St (St Peters), Between Unwins Bridge Rd and Henry St, Northbound	AM Peak	400	440	320	-27%	350	290	-17%
	Off Peak	1,400	1,840	1,300	-29%	1,390	820	-41%
	PM Peak	230	220	180	-18%	220	160	-27%
	Daily	2,030	2,500	1,800	-28%	1,960	1,270	-35%
Grove St, Between Unwins Bridge Rd and Henry St, Southbound	AM Peak	480	550	340	-38%	420	220	-48%
	Off Peak	1,530	2,580	1,340	-48%	2,140	1,090	-49%
	PM Peak	420	580	360	-38%	600	360	-40%
	Daily	2,430	3,710	2,040	-45%	3,160	1,670	-47%
Grove St, Between Unwins Bridge Rd and Henry St, Northbound	AM Peak	60	110	60	-45%	80	90	13%
	Off Peak	180	130	100	-23%	160	130	-19%
	PM Peak	20	20	20	0%	30	30	0%
	Daily	260	260	180	-31%	270	250	-7%

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