AUBURN LGA TRAFFIC AND TRANSPORT STUDY

Volume 1 – Executive Summary and Report

Prepared for

AUBURN CITY COUNCIL

September 2013

Hyder Consulting Pty Ltd
ABN 76 104 485 289
Level 5, 141 Walker Street
Locked Bag 6503
North Sydney NSW 2060
Australia
Tel: +61 2 8907 9000
Fax: +61 2 8907 9001
www.hyderconsulting.com

AUBURN CITY COUNCIL

AUBURN LGA TRAFFIC AND TRANSPORT STUDY

Author	Kung Nigarnjanagool, Alen Krljic, Philip Brogan
Checker	Mukit Rahman
Approver	Mukit Rahman
Report No	AA005093_DF_Rev3
Date	September 2013

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REVISIONS

Revision	Date	Description	Prepared By	Approved By
1	Dec 12	DRAFT	KN	MR
2	May 13	DRAFT FINAL	KN	
3	Sept 13	DRAFT FINAL	MR	MR

GLOSSARY

AADT	Average Annual Daily Traffic
BTS	Bureau of Transport Statistics (Part of Transport NSW and formerly TDC)
DCP	Development Control Plan
DoP	Department of Planning (now Department of Planning & Infrastructure)
Down	Rail movement away from the Sydney CBD
EA	Environmental Assessment (formerly EIS)
ECRL	Epping to Chatswood Rail Link
EIS	Environmental Impact Statement
EPA	Environmental Planning & Assessment Act, 1979
IA	Infrastructure Australia
JTW	Journey to Work
LGA	Local Government Area
LoS	Level of Service
PAMP	Pedestrian Access and Mobility Plan
Pax	Passengers
RTA	Roads and Traffic Authority (now RMS)
SEPP	State Environmental Planning Policy
SSFL	Southern Sydney Freight Line
STM II	Strategic Travel Model (mode share model operated by BTS)
TCA	Transport Construction Authority (previously TIDC)
TIDC	Transport Infrastructure Development Corporation (now TCA)
TOD	Transit Oriented Development
Up	Rail movement towards the Sydney CBD
VKT	Vehicle Kilometres Travelled
VPD	Vehicles per day
VPH	Vehicles per hour

CONTENTS

Executive Summary

Auburn City Council ('Council') commissioned Hyder Consulting Pty Ltd ('Hyder') to undertake a Traffic and Transport Study ('the Study') for the Auburn Local Government Area (LGA) to identify existing transport and traffic issues and strategic responses. Once the Study outcomes are endorsed by Council, the result from this Study would form the basis for Council's future amendments to the Auburn LEP 2010, Development Control Plan and Section 94 Development Contributions Plan.

As per the brief, the Study has been delivered in three separate stages including:

- *Stage 1: Primary Assessment* involves reviewing relevant NSW State Government strategic documents, Council's plans, existing transport systems in order to identify key transport issues and barriers to transport system in the Auburn LGA.
- *Stage 2: Traffic Modelling* involves the development of a traffic model for the LGA using new traffic survey data. A micro-simulation model has been developed using Paramics software for existing 2012 traffic condition. The traffic model has been used to identify key network constraints, intersection capacity for both morning (AM) and afternoon (PM) peak periods. The analysis has identified capacity improvements that will be required to achieve an acceptable level of service of strategic roads and intersections across the LGA study area.
- *Stage 3: Examination of Section 94 Apportionment Methodology.* Developed three apportionment methodologies to determine attributable costs of proposed road upgrades across the LGA study area.

Hyder's Study outcome has been reported into the following three parts:

- Part A: Preliminary Assessment documents study findings from Stage 1 investigation.
- Part B: Traffic Assessment and Modelling documents study findings from Stage 2 investigation; and
- Part C: Apportionment Methodology documents study findings from Stage 3 investigation.

A consultation process engaging the Council constituted an important element of Hyder's Study. Four technical workshops were undertaken with Council's staff over the course of this Study. The technical feedback from Council has been incorporated in the Study findings at various stages of Hyder's investigation.

Part A: Preliminary Assessment

Part A Preliminary Assessment documents the findings of a preliminary assessment of transport in the Auburn LGA. Auburn LGA is home to about 69,000 residents and provides over 542 ha of employment land or approximately 45,800 jobs. In combination with the Parramatta and Bankstown this constitutes the greatest concentration of industrial jobs in Sydney's middle ring. Major residential suburbs are Auburn, Berala, Wentworth Point, Lidcombe, Newington, Regents Park and Silverwater. Major industrial lands are located along the M4 and Parramatta Road at Lidcombe and Silverwater. Journey to work data shows that approximately 24% of residents live and work within Auburn LGA. About 76% travels to work outside the LGA. Key employment locations outside Auburn are:

- Parramatta;
- Inner Sydney;
- Inner Western Sydney (Burwood, Canada Bay, Strathfield and Ashfield);

- Lower Northern Sydney (Hunter's Hill, Mosman, North Sydney, Ryde, Willoughby, and Lane Cove);
- Bankstown; and
- Fairfield and Liverpool.

Car based trip making dominates the Auburn LGA, albeit it a rate below that prevailing across Sydney. The existing Auburn JTW mode share for bus is low at about 1%. Scope exists to increase this mode share, however, care needs to be taken not to achieve such an improvement solely at the expense of rail based trips. Increased bus mode shares should be achieved at the expense of existing car based Journey to work trips. The data shows that almost one third of Auburn workers use rail to travel to and from their place of employment which is positive and forms a solid base on which to build an even stronger public transport focussed LGA. This positive current travel characteristic also warrants investment and development. Successfully boosting bus mode shares is likely to be achieved by boosting bus service frequencies and capacities to and from the rail stations. It is unlikely that increases in bus mode shares will be achieved where buses compete directly with the well-established rail markets. Rather, the buses should supplement them by linking patrons to and from the rail hubs both during and outside peak periods. About 14% of work trips within LGA are made by walk. This strongly indicates needs of pedestrian facilities.

In undertaking this preliminary review and transport system assessment, the key multi modal issues identified across the LGA are summarised in **Table E-1**.

Table E-1 Key Multi Modal Transport Issues

Rail:			
Location	**Issue**	**Possible Response**	**Responsibility**
LGA wide	Constrained peak period heavy rail capacity on the western line.	Adopt provisions of the June 2012 announced 'Sydney Rail Future'.	NSW Government.
Auburn Town Centre	Provision of more formal commuter car parking	Secure NSW Government agreement to undertake needs study.	NSW Government.
Lidcombe Town Centre	Provision of more formal commuter car parking	Secure NSW Government agreement to undertake needs study.	NSW Government.
Berala Railway Station	Berala is the only railway station in Auburn LGA that doesn't have accessible facilities for its patrons.	Council to lobby the State government to improve accessibility at Berala Station.	NSW Government.

Bus:			
Location	**Issue**	**Possible Response**	**Responsibility**
LGA wide	The existing cross regional bus services (M91 and M92) are well servicing north-south journeys linking the LGA with Parramatta and Bankstown. However there is limited cross regional service for east-west journey linking the LGA with Sydney and North Sydney CBD areas..	Retain existing north-south oriented cross regional services and no further augmentation is required in the short and medium term. There is a scope to investigate the need and likely patronage of an east-west running cross regional bus service linking the LGA with the Sydney and North Sydney CBDs.	NSW Government.
LGA wide	LGA wide local and cross regional bus service coverage is good and in the short to medium term does not warrant amendment.	Monitor over time with changes to residential and employment densities	NSW Government.
LGA wide	The current mode share for bus travel presents only 1% of journey to work for the Auburn LGA.	Improve bus journey to work mode share, especially to non CBD based destinations by improving bus infrastructure, accessibility and information dissemination.	NSW Government / Auburn Council.
LGA wide	Low peak period service frequencies for many bus services.	Initiate communication with TfNSW and bus operators to determine scope to increase peak period services.	NSW Government, Sydney Buses and Veolia Transport NSW.
Auburn Town Centre	Inadequate shelters, hard stand waiting areas and bus information at both interchanges.	Provide shelters, greater unobstructed hard stand waiting areas and real time bus information at bus stops on both sides of the rail line.	NSW Government & Auburn Council.
Lidcombe Town Centre	Inadequate shelters, hard stand waiting areas and bus information at both interchanges.	Provide shelters, greater unobstructed hard stand waiting areas and real time bus information at bus stops on both sides of the rail line.	NSW Government & Auburn Council.

Auburn and Lidcombe Town Centres, Berala and Regents Park Village	Delays to bus access at key intersections during peak periods including (Auburn) Northumberland / Rawson, Station / Rawson, (Lidcombe) John / Church, Vaughan / Joseph.	Determine scope to provide bus priority at key intersections serving the Town Centres and Villages.	NSW Government & RMS.

Taxi & Kiss and Ride:

Location	Issue	Possible Response	Responsibility
LGA wide	Some interchange areas do not have formal designated taxi zones within close proximity of the station or have illegible signage.	Provide taxi ranks at all rail station interchange areas with appropriate and clear signage.	Auburn Council.
LGA wide	Some interchange areas do not have formal designated kiss and ride zones within close proximity of the station or have illegible signage.	Provide kiss and ride spaces at all rail station interchange areas with appropriate and clear signage.	Auburn Council.

Pedestrian:

Location	Issue	Possible Response	Responsibility
LGA wide	Location of bus shelters reduces capacity of footpaths eg: Auburn Road, Auburn.	Set shelters back against property boundary where possible.	Auburn Council.
Auburn Town Centre	As identified in the Auburn Town Centre Public Domain Plan 2009.	Consider the various actions contained within the 2009 ATCPDP.	Auburn Council.
Auburn Town Centre	Civic Road and Auburn Road “wall” pedestrian crossing safety. pedestrian safety to be improved with additional advisory signage.	Add pedestrian refuge in centre of the crossing and provide advisory signage.	Auburn Council.
Auburn Town Centre	Poor paving treatment along key footpaths is both a trip hazard and a poor urban design outcome.eg: Auburn Road and the Eastern End of Kerr Parade, Auburn.	Repave extended lengths of key footpaths in consistent paving material to appropriate standards. Auburn Town Centre Upgrade is currently being undertaken by Council will address this issue.	Auburn Council.

Auburn Town Centre	Pedestrian safety is compromised when crossing the Kerr Parade / Station Road intersection and Kerr Parade itself.	Possibly signalise or provide renewed zebra markings with advisory signage. Auburn Town Centre Upgrade is currently being undertaken by Council. The potential safety issue will be addressed by Council.	Auburn Council.
Berala Village	No concrete footpath along Campbell Street. Trip hazard and poor urban design outcome.	Provide concrete footpath.	Auburn Council.

Cycling:

Location	Issue	Possible Response	Responsibility
LGA wide	*Implementation of new Lidcombe to Strathfield cycle route.* This link connects Lidcombe and Strathfield via the South of Rookwood Cemetery along the rail line. This new route was identified in NSW Bike Plan 2010	Determine scope to provide in consultation with TfNSW.	NSW Government & RMS.
LGA wide	*New Duck River cycleway*, between Silverwater Park and Duck River Reserve along the Duck River. This new route was identified in NSW Bike Plan 2010	Determine scope to provide in consultation with TfNSW.	NSW Government & RMS.
LGA wide	*New Regents Park to Chester Hill cycle route*. This provides a direct link between Regents Park and Park Reserves along the water supply pipeline. This new route was identified in the 2009 Auburn City Council Bicycle Route Map.	Determine scope to provide in consultation with TfNSW.	NSW Government & RMS.
LGA wide	Poor linemarking on shared cycle paths.	Delineate on road cycle routes with more legible and continuous linemarking.	Auburn Council.
LGA wide	Directional signage for cyclists is poor and inadequate.	Increase amount and legibility of signage in and around town centres/villages and along heavy patronised routes.	Auburn Council.

Auburn Town Centre	Provided Bicycle lockers are not being used and bikes are being chained to rails and fences instead. Free cycle storage on the opposite side of the station (Rawson street) is well utilised.	Make lockers free for access to general public. Install additional bike racks on both sides of the station.	NSW Government.
Auburn and Lidcombe Town Centres	Opportunity to reduce car based travel to and from the town centres and rail interchanges.	Identify opportunities for shared facilities – i.e. not just serving rail passengers, but also town centre users: for example, bike hub or pods conveniently located so that it can be used by town centre workers as well as rail commuters.	Auburn Council.
Lidcombe Town Centre	As above.	Make lockers free for access to general public. Install additional bike racks on both sides of the station.	NSW Government.
Berala Station	None or few bicycle parking facilities provided.	Install bike racks on both sides of the station.	NSW Government.
Regents Park Village	Amy Street is a classified 23m B-Double Route. There is conflict between heavy vehicles and cyclists using Amy street in the vicinity of the rail station.	Consider removal of some on street parking at key pinch point locations and line mark accordingly.	Auburn Council.

Parking:			
Location	**Issue**	**Possible Response**	**Responsibility**
Auburn Town Centre	Provision of formal commuter car parking	Secure NSW Government agreement to undertake needs study.	NSW Government.
Auburn Town Centre	Issues identified in the 2011 Auburn Town Centre Parking Strategy Study.	Consider the various actions contained within the 2009 ATCPDP	Auburn Council.
Lidcombe Town Centre	Provision of formal commuter car parking	Secure NSW Government agreement to undertake needs study.	NSW Government.
Berala Village	Unrestricted on-street parking along Campbell Street adversely impacts resident and visitor accessibility.	Monitor and assess feasibility of resident parking scheme or time restrictions.	Auburn Council in consultation with CityRail.

Part B: Traffic Assessment and Modelling

Part B Traffic Assessment and Modelling has been undertaken in Stage 2 of the Study. In this stage Hyder assessed the performance of existing road network capacity within the Auburn LGA Study Area. Hyder's scope was to identify capacity problems of key intersections from traffic ground. Based on modelling outcomes, the study has recommended upgrading works at key intersections required to provide acceptable level of service. There is a need that Council undertakes safety assessment to local intersections. Hyder's study does not preclude Council undertaking local improvements for safety reasons on a need basis.

In general, Hyder's modelling study area includes part of the Auburn LGA south of M4 Motorway with Chisholm Road on the western boundary, Birnie Avenue on the east and Amy Street on the south. A road based micro-simulation traffic model was developed for the study area. For the micro-simulation model, Hyder used *Paramics* software and built upon and intergraded with Hyder's own Strategic Traffic Model for Sydney using TransCAD software.

A Paramics model was developed for the 2012 existing base year traffic condition that provided an assessment tool for identifying key existing network issues. Hyder undertook extensive traffic survey and data collection in the study area. Hyder's strategic traffic model has been calibrated and validated appropriately in accordance with the industry practice acceptance criteria. A robust calibration and validation has been achieved for both morning and afternoon peak period. The Paramics model has been calibrated and validated as per Roads and Maritime Services (RMS) Paramics modelling guideline. Both AM and PM peak Paramics models have been calibrated and validated adequately and models are fit for the study purpose.

In order to quantify the current road network capacity issues within the study area, Hyder has undertaken road network capacity assessment. Intersection analysis based on the Paramics assessment indicated operational issues at 17 locations (refer to Figure E-1 overleaf). The specific operational issues at those 17 locations (comprising 19 intersections) are showed in **Table 8-31 in Section 8.2**.

Regular overflow queues are observed on key State and Regional roads in both morning and afternoon peak periods including:

- Parramatta Road;
- St Hilliers Road / Silverwater Road;
- Olympic Drive / Joseph Street;
- Station Road;
- Rawson Street; and
- Wellington Road / Vaughan Street.

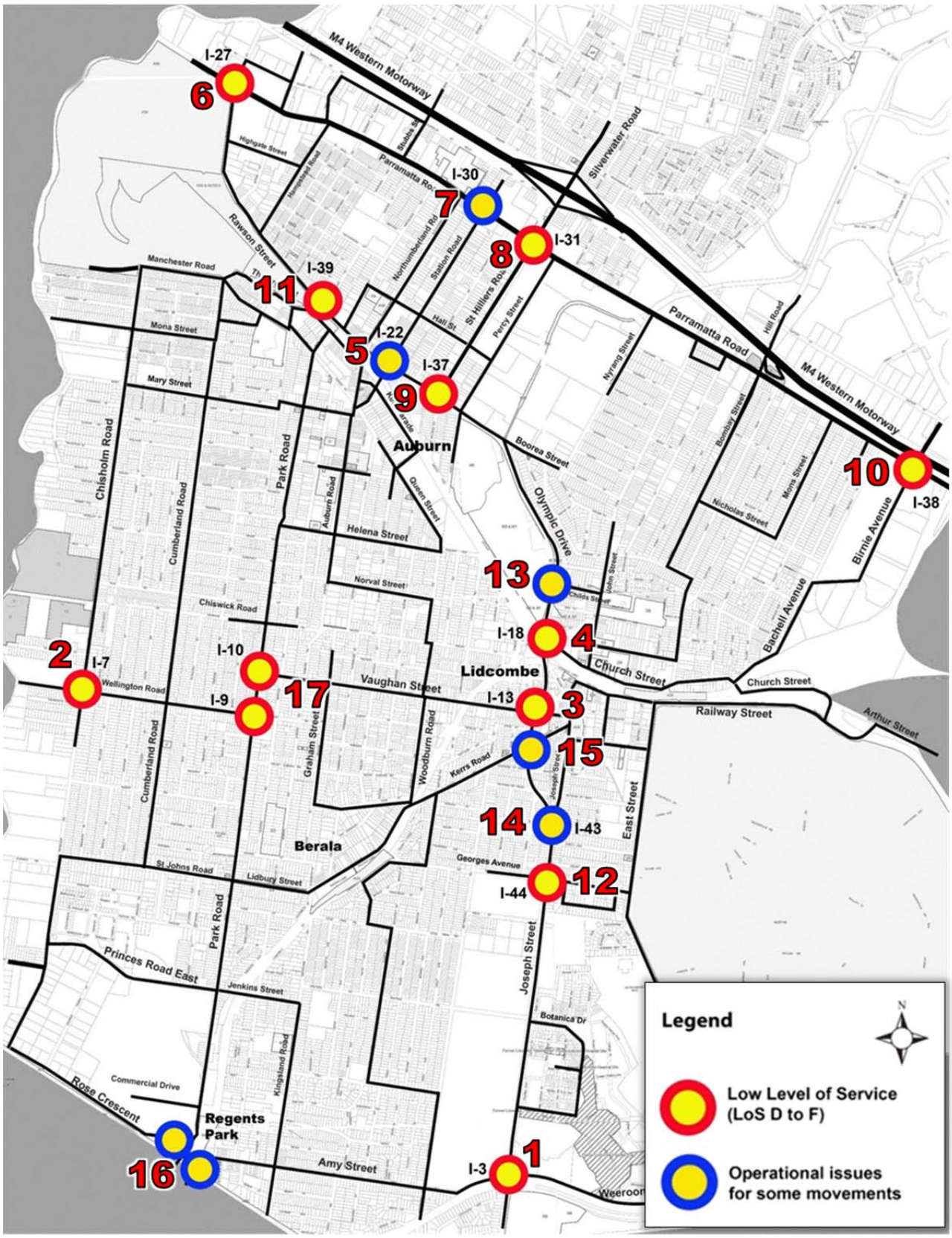


Figure E-1 Key Locations where Network Issues are identified

The existing network capacity was assessed for 46 key intersections. The analysis determined level of service (LoS) between A and F for modelled intersections. Of the 46 intersections assessed, 19 intersections were identified having capacity problems and poor level of service either for the entire intersection or specific movements. The modelling analysis showed that about 12 key intersections performed at a poor level of service. The following 12 intersections showed level of service D (operating near capacity) to F (operating above capacity) in either morning or afternoon peak including:

- Weeroona Road / Joseph Street/Amy Street (I-3);
- Wellington Road / Chisholm Road (I-7);
- Wellington Road / Park Road (I-9);
- Park Road / Vaughan Street (I-10);
- Vaughan Street / Olympic Drive (I-13);
- Church Street / Olympic Drive (I-18);
- Rawson Street / Parramatta Road (I-27);
- Parramatta Road / Silverwater Road (I-31);
- St Hilliers Road/ Rawson Street (I-37);
- Parramatta Road/Birnie Avenue (I-38);
- Rawson Street/The Crescent (I-39); and
- Georges Avenue/Joseph Street (I-44).

In conjunction with that further capacity problems were identified to particular movements for 7 additional intersections as follows:

- Station Road / Rawson Street (I-22);
- Station Road / Parramatta Road (I-30);
- Joseph Street / Olympic Drive (I-43)
- Kerrs Road / Olympic Drive;
- Olympic Drive / Childs Street;
- Amy Street / Auburn Road; and
- Carlingford Street / Park Road.

These 7 intersections have not showed capacity problems for the entire intersection rather than particular movements showed poor level of service. The previous Figure E-1 also shows location of all 19 intersections identified as problematic when level of service criteria is used. The red dot points represent 12 intersection locations with capacity problem for the entre intersection. The blue dot points represent 7 intersection locations with movement specific capacity problems. Due to close proximity two intersections at Wellington Road/Park Road (1-9) and Park Road/Vaughan Street (I-10) have been reported as one location. Similarly two intersections at Amy Street / Auburn Road and Carlingford Street / Park Road have been reported as one location.

Based on the modelling investigations, Hyder has identified upgrading works required for 19 intersections with a view to improve existing traffic congestion within the LGA study area. These upgrading works include localised intersection widening, providing clearway condition in both morning and afternoon peak period.

Table 8-32 in Section 8.3 shows proposed intersection upgrade required to improve current capacity and congestion problems. The upgrading works are identified on State, Regional and

Local Roads depending on intersection locations. **Table E-2** below shows administrative responsibility of roads where upgrades are proposed. It also shows notional cost apportionment between State (RMS) and Council.

Table E-2 Administrative Road Classification where Upgrades are Proposed

Intersection Classification	Number of intersections	State Contribution	Council Contribution
State / State	1	100%	
State / Regional	7	50%	50%
State / Local	3	50%	50%
Regional / Regional	7	50%	50%
Regional / Local	1	50%	50%
Local / Local	n/a		100%
Totals	19		

With proposed upgrades in place, the modelling analysis showed substantial improvements in level of service particularly on key State and Regional roads. Traffic model showed acceptable level of service between A and C to those intersections (either morning or afternoon peak) where significant capacity problems were identified for pre-upgrade condition. The proposed upgrade would provide additional capacity to both major north-south and east-west traffic movements through the LGA. The upgrade would improve traffic conditions to both State and Local road network particularly along St Hillers Road/Silverwater Road, Olympic Drive/Joseph Street, Station Street, Park Road, Vaughan Street, Wellington Road, Amy Street, Rawson Street and Queen Street.

The pre-strategic construction only costs have been used as a basis to develop the cost estimate for intersections where upgrades are proposed. The strategic cost estimates for each of the upgrade were provided to assist Council in prioritising suitable infrastructure upgrades for this study. To improve current capacity problems and provide an acceptable level of service to key roads/intersections within the LGA, the cost of proposed upgrading works is estimated in the order of $30.1 million. Should a notional cost apportionment between State and Council were adopted (as per Table E-2), the cost contribution would be $16.1 million to State (RMS) and $14 million to Council.

It is likely that identified intersection upgrades will require property acquisition and utility adjustments. Future consultation with RMS is recommended where potential upgrades are identified at State and Regional roads/ intersections within the Auburn study area.

Part C: Apportionment Methodology

A number of methodology options have been identified and reviewed. Three options have been developed to strengthen the current Council's contribution plan across the road works program.

- Option A is based on quantitative and qualitative measures. It is based on four criteria such as current congestion (measured by level of service), future congestion (measured by level of service), proposed road upgrade linked to new development and road upgrade linked to existing background traffic.
- Option B is based on vehicle kilometres travelled (VKT) measure. It is based on current VKT (without development) and future VKT (with development). The apportionment is based on additional VKT attributable to new development.
- Option C is based on spare capacity measure. This is based on new development traffic relative to spare capacity available.

All three apportionment options have considered the traffic modelling as a potential tool. Each of the methods aims to strengthen the nexus between the identified road works program and the proposed development through the application of both qualitative and quantitative criteria. The qualitative criteria are applied via a tiered ranking system while the quantitative elements are obtained from the traffic model and are intended as a more direct indicator of current and forecast road system performance. The combination of the subjective and objective criteria types serves to strengthen the reasonableness of the apportionment process.

It is expected that Council will undertake the review of future land use as part of the Section 94 Development Contribution. Once Council's future land use strategy is finalised, it is recommended to test apportionment methodologies identified in this study.

1 Introduction

1.1 Background

Auburn is a metropolitan centre with a city lifestyle and quality that people enjoy. As it grows, residents and employers will want to maintain the advantages of the area. Efficient and easily accessible transport system is essential for the sustainable growth of the community. In its recent transport planning strategies and studies, the Auburn City Council saw advantages to commissioning a Traffic and Transport Study for the entire local government area (LGA) as a basis for its future amendments to the Auburn LEP 2010, Development Control Plan and Section 94 Development Contributions Plan.

Auburn City Council ('Council') commissioned Hyder Consulting Pty Ltd ('Hyder') to undertake the Auburn LGA Traffic & Transport Study ('the Study'). As per the brief, the Study has been delivered in three separate Stages including:

- *Stage 1: Primary Assessment* involves reviewing relevant NSW State Government strategic documents, Council's plans, existing transport systems in order to identify key transport issues and barriers to transport system in the Auburn LGA.
- *Stage 2: Traffic Modelling* involves the development of a traffic model for the LGA using new traffic survey data. A micro-simulation model has been developed using Paramics software for existing 2012 traffic condition. The traffic model has been used to identify key network constraint, intersection capacity for both morning (AM) and afternoon (PM) peak periods. The analysis has identified capacity improvements that will be required to achieve an acceptable level of service of strategic roads and intersections across the LGA study area.
- *Stage 3: Examination of Section 94 Apportionment Methodology*. Developed methodologies to equitably determine attributable costs for proposed road upgrades across the LGA study area.

Hyder's Study outcome has been reported into the following three parts:

- Part A: Preliminary Assessment that documents findings from Stage 1 investigation.
- Part B: Traffic Assessment and Modelling that documents findings from Stage 2 investigation. Further modelling was undertaken on performance of upgrade proposals. The service life of proposed upgrade and its level of service are documented separately in Addendum 1 and appended to this document; and
- Part C: Apportionment Methodology that documents findings from Stage 3 investigation.

A consultation process engaging the Council constituted an important element of Hyder's Study. Four technical workshops were undertaken with Council's staff over the course of this Study. The feedback from Council has been incorporated in the Study findings at various stages of Hyder's investigation.

1.2 About Auburn

The Auburn Local Government Area (LGA) is located approximately 20 kilometres west of Sydney CBD and covers 31 square kilometres. In general, the Auburn LGA boundaries include the Parramatta River and Duck River in the north and west, Homebush Bay and Powell's Creek to the east and the Sydney Water Supply Line to the south.

The Auburn LGA shares boundaries with Parramatta, Bankstown, Strathfield and Canada Bay LGA's.

The Auburn LGA Study Area consists of two town centres and three villages including Auburn, Lidcombe, Berala, Regents Park and Newington. **Figure 1-1** shows study area coverage.

- **Auburn Town Centre**. Auburn is the largest town centre in the Auburn LGA and is located in the vicinity of the Auburn Railway Station. The town centre already provides a wide range of retail, commercial and community services to Auburn area. It is well serviced with public transport with frequent rail services directly to the Sydney CBD. Government and private buses connect Auburn to all the centres within the Auburn LGA as well as neighbouring suburbs such as Parramatta and Blacktown.
- **Lidcombe Town Centre**. Lidcombe is the second largest town centre within the Auburn LGA. The railway line divides the centre into northern and southern parts. The centrally located Lidcombe Railway Station provides good public transport connectivity to other local centres within the LGA. The 2006 Journey to Work (JTW) data indicated majority of work trips to Lidcombe originate from neighbouring areas such as Parramatta and Blacktown and also within the Auburn LGA.
- **Berala Small Village**. Berala is serviced by the Berala Railway Station which is located in the middle of the village. The majority of work trips to Berala village originate within the Auburn LGA.
- **Regents Park Small Village**. Regents Park is serviced by the Regents Park Railway Station which is to the west of the village. There are also two bus routes that connect the village to other local centres within the LGA. The majority of work trips originate from within the LGA and neighbouring Bankstown area.
- **Newington Small Village**. Newington is located north east of the Auburn LGA and has close proximity to the Olympic Park – Rhodes Specialised Centre with relatively close proximity to the Olympic Park Railway Station. The centre is primarily serviced by bus.

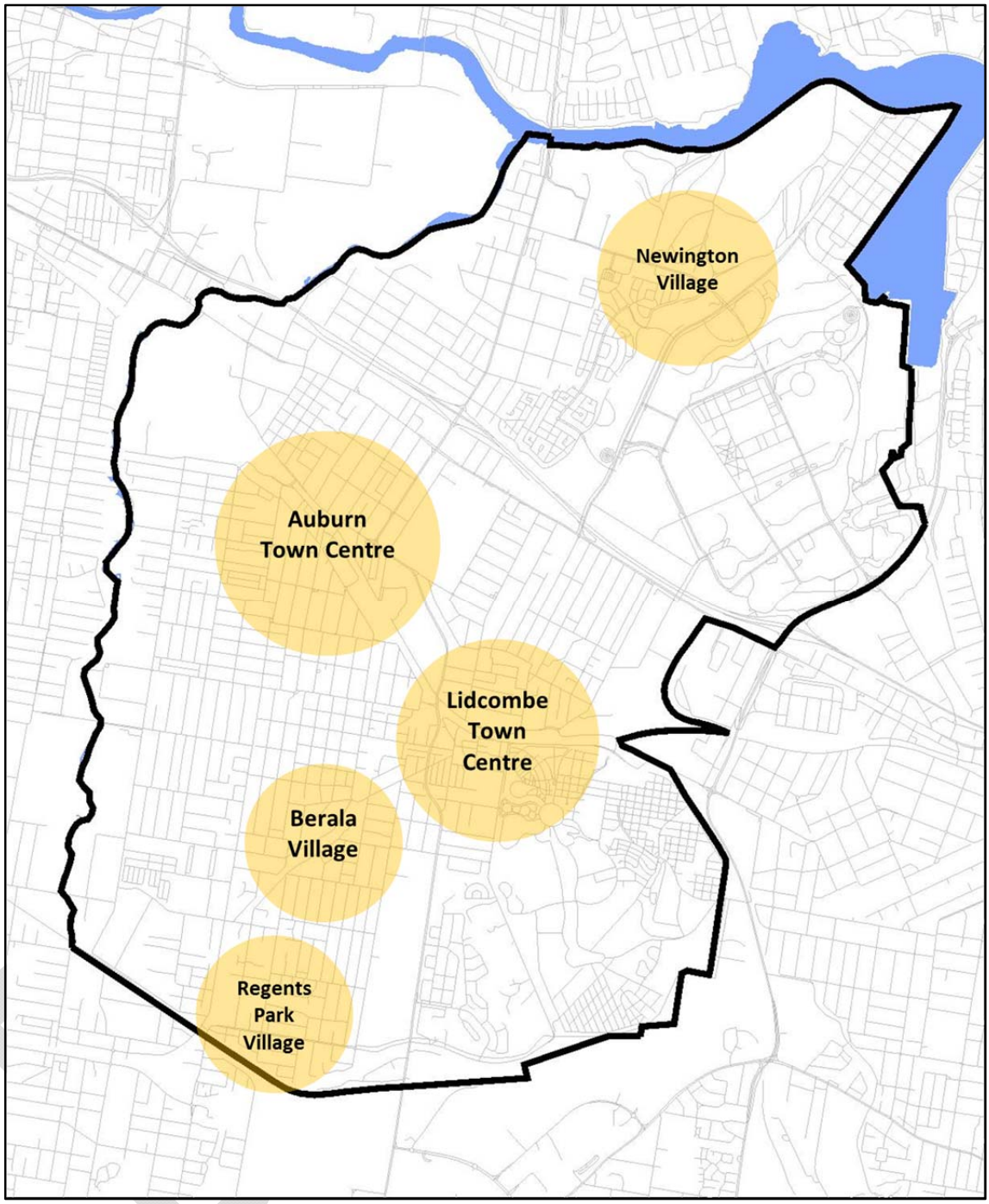


Figure 1-1 Study Area Coverage

1.3 Report Purpose and Scope

The purpose of this report is to summarise the Stages 1 to 3 study outputs across the following three areas:

- Review of strategic and local transport planning policies, assessment of the existing transport system and travel patterns, and identify strategic response to key sustainable transport issues;
- Identify existing road network performance and potential improvement strategy, and document development of a road-based Paramics micro-simulation model used for assessing road network condition;
- Reviews of a current Council's Section 94 Development Contribution Plan and develop apportionment algorithms to strengthen the current Council's contribution plan across the road works program.

The report does not address transport needs in the Sydney Olympic Park zone or the Wentworth Point area as Council has existing studies that applies to these areas.

1.4 Report Structure

This Traffic and Transport Study for Auburn LGA Report has been prepared to document Hyder's assessment results from Stages 1 to 3. The Traffic and Transport Study Report is produced in two volumes. This report forms Volume 1.

Volume 1 – Executive Summary and Report

The Traffic and Transport Study Report – Volume 1 contains the following three parts and nine chapters providing an assessment of the current traffic and transport issues within the LGA.

Chapter 1 provides an overview of the project, background information and study objective.

Part A Primary Assessment responding Stage 1 of the study involves review of the relevant NSW State Government strategic documents and Council's plans, and review of existing transport systems in order to identify key transport issues and barriers to transport system in the Auburn LGA.

Part A investigations include the following Chapters:

- *Chapter 2* provides a review of state, regional and local transport planning strategy in context of the study.
- *Chapter 3* documents the findings of observational surveys of transport issues undertaken in August 2012.
- *Chapter 4* provides key travel movement to and from the study area, and current travel model share made by Auburn's resident
- *Chapter 5* documents identified existing and likely future multi modal transport issues within the Auburn LGA and strategic response to address the identified issues.

Part B Traffic Assessment and Modelling responding Stage 2 of the study involves a review of existing road traffic network and traffic survey data, documents the development of a Paramics micro-simulation traffic model the existing situation (2012) for the study area. The traffic model has been used to identify key network capacity issues for both morning (AM) and afternoon (PM) peak periods.

Part B investigations include the following Chapters:

- *Chapter 6* provides the regional and local traffic context within which the assessment has been undertaken.
- *Chapter 7* documents the development of a Paramics micro-simulation traffic model for the study area.
- *Chapter 8* establishes the existing transport network performance in the study area around the study area. An assessment of existing network capacity has been undertaken, indicating network deficiencies at key roads and intersections.

Part C: Apportionment Methodology responding Stage 3 of the study.

Part C investigations include the Chapter 9:

- *Chapter 9* reviews the Council's Development Contribution Plan and documents the proposed methodologies to equitably determine attributable costs of road infrastructure upgrades to the proponent of future development.

Chapter 10 outlines summary of key study finding from Stages 1 to 3. It also recommends further modelling assessment be required for testing identified upgrade works.

Volume 2 – Appendices

Detailed Paramics and Strategic (TransCAD) model development, calibration and validation, detailed modelled results and traffic survey data are included in Volume 2 as appendices to Volume 1. The Addendum 1 is included as appendix in Volume 2. The appendices are as follows:

- *Addendum 1* Modelling of Proposed Intersection Upgrades;
- *Appendix A* Strategic Model Validation;
- *Appendix B* Paramics Model Development, Calibration and Validation;
- *Appendix C* Paramics Forecast Level of Service (LoS);
- *Appendix D* Traffic Survey Data; and
- *Appendix E* Schematic Design of Upgrade Proposals

Part A Preliminary Assessment

Part A Preliminary Assessment involves review of the relevant NSW State Government strategic documents and Council's plans, and review of existing transport systems in order to identify key transport issues and barriers to transport system in the Auburn LGA.

Structure

- Chapter 2: Policy Review
- Chapter 3: Assessment of Existing Transport System
- Chapter 4: Assessment of Travel Movements and Patterns
- Chapter 5: Key Transport Issues and Strategic Response

2 Policy Review

2.1 State and Regional Transport Strategies

This section provides an overview of the main aspects of each strategy and its relevance to the study area.

2.1.1 Draft West Central Sub Regional Strategy 2007

Document	Draft West Central Sub Regional Strategy 2007
Organisation	Department of Planning
Date	December, 2007
Purpose	The subregional strategies are intended to translate the objectives of the Metropolitan Strategy's "City of Cities" long-term planning blueprint to the local level.
Content	Draft West Central Sub Regional Strategy 2007 (DWCSS) targets additional 95,500 new dwellings or 42% and additional 61,000 jobs by 2031 for five LGAs within West Central sub region. The document considers that Sydney's transport system supports the economic growth of every subregion. Congestion is a major factor across the Sydney region as a whole which includes the West Central Area. Some existing road and transport networks are facing capacity constraints and there will be demand to develop new infrastructure while maintaining the existing networks, to maintain safety, reliability and service quality of both the existing road and public transport networks.
Relevance to Auburn 2012 Study	Of these, Auburn LGA has a target of17,000 dwellings and 12,000 jobs by 2031. Improvements to transport systems are proposed or currently being implemented: ▪ Extend the rail and bus networks to Connect Centres; ▪ Extend transport networks to serve growth; ▪ Improve operational management of existing transport networks; and ▪ Improve local and regional walking and cycling networks. The Plan makes reference a few specific actions within the Auburn LGA including a RTA (RMS) led road upgrade of a bridge on Parramatta Road at Auburn North and completed Easy Access project at Auburn Station.

2.1.2 Metropolitan Plan for Sydney 2036

Document	Metropolitan Plan for Sydney 2036
Organisation	Department of Planning & Infrastructure
Date	December, 2010
Purpose	In 2005, the NSW Government released Sydney's Metropolitan Strategy—City of Cities: A Plan for Sydney's Future—to support growth while balancing social and environmental impacts over 25 years. Five years on, that Strategy has now been updated and integrated with the Metropolitan Transport Plan to deliver a new 25 year Metropolitan Plan for Sydney 2036.
Content	The Metropolitan Plan integrates land use, urban and funded–transport planning together for the first time, providing a framework for sustainable growth and development across the city to 2036. It will also meet the targets in the updated NSW State Plan – notably in integrated transport and land use planning.
Relevance to Auburn 2012 Study	Auburn is a centre within the West Central Sub region. The Plan seeks to increase residential and employment densities within the centres across this region while increasing the proportion of active transport at the expense of car based travel. Objective C2 – To build on Sydney's strengths by further integrating transport and land use planning and decision making to support increased public transport to reduce congestion. For the first time the Plan also includes an active transport target to raise the mode share of bicycle trips in the greater Sydney region at a local and district level to 5% by 2016 (currently 1%). These targets require a strong focus on Transit Oriented Development (TOD) and urban renewal as well as initiatives to increase the attractiveness of public transport and to manage congestion.

2.1.3 NSW 2021 A Plan to make NSW Number One

Document	NSW 2021 A Plan to make NSW Number One
Organisation	Department of Premier and Cabinet
Date	September, 2011
Purpose	NSW 2021 is a 10 year plan to guide the state government's policy and budget decision making and in conjunction with the NSW Budget. To deliver on community priorities. The plan will drive the agenda for change in NSW to: ▪ Restore economic growth. ▪ Return quality health, transport, education, police, justice and community services putting customer service at the heart of service design. ▪ Build infrastructure that drives our economy and improves making and returning planning power to the community. ▪ Restore accountability and transparency of the government and give the community a say in decisions affecting their lives.

Document	NSW 2021 A Plan to make NSW Number One
Content	The Plan has five main strategies: rebuild the economy, return quality services, renovate infrastructure, strengthen our local government and communities and restore accountability to the government. Of these, transport significance is Goal 8 and Goal 19. Goal 8 – Grow patronage on public transport by making it a more attractive choice in order to reduce traffic congestion, improve travel times and provide significant environmental benefits. Key targets include: ▪ Increasing walking and cycling; ▪ Improving metro bike network and local council cycling networks; and ▪ Developing and implementing a NSW Walking Strategy. Goal 19 - Improve the quality of urban and rural State roads, 93% of state roads to meet national road smoothness standards by 2016: ▪ Conducting road resurfacing and reconstruction programs to improve road quality in areas not currently meeting the national standards. ▪ Introducing priority.
Relevance to Auburn 2012 Study	The Plan seeks to deliverer key infrastructure projects to relieve congestion, improve safety and to expand capacity on roads and corridors. The Plan could provide for improved heavy rail services to and from the Auburn and, Lidcombe Town Centres, and Berala and Regents Park Villages. The Plan may bring about increased investment in regional cycling facilities and infrastructure which could increase non-motorised travel within, to and from the Auburn LGA. This could also better link the 5 key centres within the Auburn LGA. Goals 7, 8, 9 and 10 are highly relevant to the Auburn LGA. Goal 7 – Reduce travel time by improving the efficiency of the road network during peak times and minimising public transport waiting times for customers; Goal 8 – Grow patronage on public transport by making it a more attractive choice; Goal 9 – Improve customer experience with transport services by improving customer satisfaction with transport services and increasing real-time travel information to customers; and Goal 10 – Improve road safety.

2.1.4 NSW Long Term Transport Master Plan

Document	NSW Long Term Transport Master Plan
Organisation	BusNSW, Transport for NSW
Date	April, 2012
Purpose	The Plan seeks to foster the efficient and sustainable growth of public transport in NSW, this document is designed to contribute to the Long Term Transport Master Plan. To support the new integrated transport authority and outline the vision, guiding principles and goals that should be aligned to ensure future consistency at all levels of government. The document will implement polices to appropriate the application and integration of transport solutions in combination with land use, planning, environmental, institutional and behaviour factors in both urban and regional areas. Based on an integrated approach to transport and land use planning from the proposed NSW Long Term Transport Master Plan (LTTMP).
Content	The priorities listed in the report focuses on achieving greater mode shares of public transport to the following values ▪ To and from Sydney CBD during peak hours to 80%; ▪ To and from Parramatta CBD during peak hours to 50%; ▪ To and from Liverpool CBD during peak hours to 20%; and ▪ To and from Penrith CBD during peak hours to 25%. The focus of the transport plan should be on moving people not traffic. The development of a priority action plan is advised for convenient and reliable transport services.
Relevance to Auburn 2012 Study	Auburn Council in its response to the Draft Plan noted as follows: ▪ The policy framework lacks guidance for LGA's like Auburn; ▪ An action plan is required to achieve convenient, reliable and effective public transport; ▪ Provision of commuter car parking at Auburn and Lidcombe stations; ▪ Provision of improved public transport services to Sydney Olympic Park, Wentworth Point, Newington and Silverwater; and ▪ Upgrade Berala station including easy access. The Plan could see better state based agency cooperation which may translate to better decision making and improvements for the Auburn LGA. *This report depicts general suggested objectives for NSW as a whole and is not specific to the Auburn LGA. However these ideas must be considered.*

2.1.5 Sydney's Rail Future

Document	Sydney's Rail Future
Organisation	Sydney's Rail Future
Date	June 2012
Purpose	The brochure outlines the planned upgrades to Sydney's rail network designed to be an addition to the overhaul of Sydney's public transport network. Sydney's Rail Future is to be integrated as part of the draft NSW Long Term Transport Master Plan.
Content	Inclusive in the City Rail Xpress is the addition of single deck high frequency transit trains. Additionally planned jobs and current tenders have been highlighted and these include the following: The current tender process for the North West Rail Link. Planning for a second heavy rail crossing to be constructed under Sydney Harbour. Pedestrian improvement - Wynyard Walk project.
Relevance to Auburn 2012 Study	This information should be taken into account as the projects mentioned will impact on future journey to work pattern. None of the actions in Sydney's Rail Future will have a specific immediate effect on the Auburn LGA.

2.2 Local Transport Context

Traffic levels are increasing, particularly on key arterial roads, leading to congestion and the associated social, environmental and economic concerns. Provision of infrastructure for pedestrians and cyclists has occurred in a disjointed fashion. This has resulted in ad-hoc provision of facilities that often fails to provide quality, direct access for cyclists and pedestrians between key destinations.

A high level of parking provision has also resulted in excessive car dependency despite recent improvements in local and regional bus services.

Bus priority measures have been introduced in recent years in a range of locations, particularly Parramatta Road. These have assisted bus movements in peak periods, although the extent of traffic congestion, particularly during peak periods, remains a problem impacting bus service reliability and travel time.

At present, the Auburn LGA does not have a current integrated transport plan in place.

2.2.1 Auburn Bikeways Plan

Document	Auburn Bikeways Plan
Organisation	Arup/Geo plan
Date	November, 1995
Purpose	The Auburn Bikeways Plan is a plan to encourage a modal transfer to cycling away from motorised transport in the Auburn Local Government Area.
Content	Five regional routes and eight local routes were identified in Auburn LGA. A master plan for the provision of the bicycle facilities (identified routes) including staging and priorities. Determine costs for the works.
Relevance to Auburn 2012 Study	Most of the routes are implemented and appeared in 2009 Council's cycle route map. The routes provide major connections to railway stations, schools, retail area recreation and sporting venues within Auburn LGA. The Plan is dated but its key concepts are relevant to the 2012 Traffic & Transport Study. It is understood that Council will be undertaking a review of the Plan in the near future. Part A of this study will help to informa that process.

2.2.2 Pedestrian Access and Mobility Plan (PAMP)

Document	Pedestrian Access and Mobility Plan (PAMP)
Organisation	Cycle Planning
Date	October, 2000
Purpose	The Plan identifies programs to improve pedestrian access through the provision of enhanced infrastructure and facilities.
Content	The Plan noted as follows: ▪ General pedestrian requirements; ▪ A review of pedestrian accident data; ▪ Surveys to gauge the community's attitudes and concerns; ▪ Fieldwork for entire network of selected pedestrian routes; and ▪ A proposed future pedestrian network for works implementation.
Relevance to Auburn 2012 Study	This plan is relevant to 2012 Traffic Study as it contains the pedestrian activities data and pedestrian route information which could have a bearing on the modelling and future traffic works. This plan is dated, yet is still relevant to the 2012 Traffic & Transport study.

2.2.3 Auburn Town Centre Retail & Economic Study

Document	Auburn Town Centre Retail & Economic Study
Organisation	Auburn City Council
Date	December, 2007
Purpose	The Auburn Town Centre Retail & Economic Study is intended to provide the basis for the Auburn Town Centre Strategic Plan.
Content	The document seeks to: ▪ Analyse business and economic trends and performance; ▪ Identify internal and external influencing factors on business; ▪ Assess the changing impacts of competing commercial centres; ▪ Project future retail, commercial and employment demand; ▪ Identify strategic development opportunities in relation to the strategic vision; ▪ Comment on the appropriate geographic definition of the town centre; and ▪ Comment on implications for strategic and statutory planning.
Relevance to Auburn 2012 Study	The document will provide future trends to the 2012 Traffic & Transport Study.

2.2.4 Auburn Employment Lands Study

Document	Auburn Employment Land Study
Organisation	Hill PDA Consulting
Date	June, 2008
Purpose	The key objectives of the Study are to: **1** Research and document existing industrial employment capacity, type and trends in the LGA. **2** Visit and review 14 existing employment precincts (as agreed with the Council) in the LGA. **3** Research and document anticipated future employment trends and industrial demand. **4** Develop a vision for employment lands and protect their significance. **5** Provide recommendations as to key strategies and principles that will enable sustainable and viable business and employment growth across the LGA up to 2031.

Document	Auburn Employment Land Study
Content	The Study highlights the following areas: ▪ Existing Employment lands; ▪ Future of Auburn's Employment Lands; ▪ Employment lands demand Assessment; and ▪ Land use principles and recommendations. Auburn's employment lands are a valuable source of employment generation, business and support services in the LGA and for the wider Sydney region. Analysis has shown that industrial land will reduce due to forecast demands to 2016. In contrast demand for commercial floor area and high tech industrial land use will increase. Therefore a zoning review of some industrial areas must be considered for the appropriateness for alternative, higher yield employment generation uses.
Relevance to Auburn 2012 Study	The land use forecasts in this document will provide an important input into the traffic analysis. The land use forecasts will influence journey to work analysis in future years as well as off peak traffic conditions. The employment lands, where growth is expected particularly in the commercial sector, will need to be considered as this growth will require improvements in transport connections throughout different locations in the LGA.

2.2.5 Sydney Olympic Park Master Plan 2030 Transport Strategy

Document	Sydney Olympic Park Master Plan 2030 Transport Strategy
Organisation	Parsons Brinkerhoff
Date	August 2008
Purpose	The Sydney Olympic Park Master Plan is a 20+year plan to 2030 for the development of the SOPA area. It establishes planning principles and controls for the future development of the Park. The Master Plan was approved by the Minister for Planning in October 2009.
Content	The document sets out transport strategies to cater for the planned development of the Park. Commercial development is anticipated to generate most of the travel demand in the peak periods, which will dictate the Park's future impact on the performance of the surrounding road network. The Plan identifies a maximum commercial development of approximately 480,000 m^2 of gross floor area (GFA). The forecast transport demands are expected to be met by implementing travel demand strategies, transport upgrades, including regional and local road intersection upgrades, Parramatta to Strathfield Strategic Bus Corridor, additional strategic bus corridor services (e.g. North/South) additional heavy rail services. The Plan seeks to increase the trip mode share of public transport during peak periods to 40%. The Plan targets a bicycle/pedestrian mode share split of 10%. The Plan has controls that require non-residential developments in the town centre to prepare and implement Work Place Travel Plans outlining how the development will meet the objectives of the Plan and mode share targets. The Plan specifies controls for vehicular access and parking.

Document	Sydney Olympic Park Master Plan 2030 Transport Strategy
Relevance to Auburn 2012 Study	The transport objectives outlined in the Plan will provide the basis of the targets required for the region. The Plan provides for significant growth in commercial development which cannot be accommodated if current levels of public transport use do not improve and road network improvements are not made.

2.2.6 Auburn Town Centre Strategy 2031

Document	Auburn Town Centre Strategy 2031
Organisation	Auburn City Council
Date	February, 2009
Purpose	Develops a suite of planning controls, policies and guidelines that will guide the sustainable development of the Auburn Town Centre in keeping with the vision. Aligns Auburn with state, regional and sub-regional planning strategies
Content	This document proposes a vision for the 2031 Auburn town centre combining a number of strategic themes including , urban structure, built form and character, Revitalisation through consolidation of targeted sites, circulation, transport and parking, public domain and culture, sustainable economic development and employment. The Strategy includes an Auburn upgrade scheme which provides for: ▪ Social cultural and heritage; ▪ Pedestrian amenity and the public domain (the creation of place); ▪ Transport and movement; and ▪ Economic, retail and commercial activity.
Relevance to Auburn 2012 Study	The major pedestrian connectors outlined in the Strategy (Figure 18 of the report) must be assessed in the traffic study inclusive of the proposed additions to the Auburn pedestrian network. The Strategy outlines strategic action to be taken for transport circulation and parking management. The study will list upgrades/ actions to be taken into account by Auburn Council. Recommendations for future revisions of the Strategy document shall assess the planned actions against the regulations included in the DCP and LEP.

2.2.7 Dwelling Target Analysis

Document	Dwelling Target Analysis
Organisation	Auburn City Council
Date	March, 2009
Purpose	The DoP established dwelling targets for 2031 for all LGA's in metropolitan Sydney. Auburn was allocated a 17,000 dwelling target, and therefore Auburn's LEP must take this into account.
Content	The analysis suggests that Auburn will experience most of its growth in the next 5 – 10 years as infill development. Local areas are able to appropriately cater for additional dwelling growth. There is no up-zoning required in local centres or infill areas because of recent growth and future growth within brownfield sites.
Relevance to Auburn 2012 Study	The Auburn LGA growth of 17,000 dwellings to 2031 will be factored into the traffic analysis. Travel and trip making to and from these additional dwellings will see increased congestion at key hot spots across the lower and higher order road network. The Study must consider the impact of higher dwelling density in locations throughout the LGA that do not have sufficient public transport or road network capacity.

2.2.8 Homebush Bay Area Traffic Study

Document	Home bush Bay Area Traffic Study
Organisation	Sinclair Knight Merz
Date	August, 2009
Purpose	Auburn City Council commissioned a Paramics micro-simulation traffic model of the Homebush Bay area to assess the current traffic conditions at the time (2009).
Content	The study outlined model development, roads, transport, demand zones, matrices and profile, Model parameters and identified infrastructure and road network requirements, costs and apportionments. Modelling years: to 2019 and 2029 forecast years.
Relevance to Auburn 2012 Study	The Study identifies upgrades required as a consequence of planned growth in the Homebush Bay Area. The outcomes will be relevant to the 2012 Traffic & Transport Study.

2.2.9 Auburn Town Centre Public Domain Plan

Document	Auburn Town Centre Public Domain Plan
Organisation	Auburn City Council
Date	November, 2009
Purpose	The Plan: ▪ Sets out a public domain concept design for the Auburn town centre, together with a detailed implementation plan; ▪ Summarises the people, place, vision and issues identified in previous studies; ▪ Outlines what actions are to be taken based upon design principles and long term strategic directions; ▪ Identifies the issues and planned development of the Auburn LGA; ▪ Identifies the implementation plan; and ▪ Provides a basic cost outline.
Content	The Plan outlines the attributes of the town centre and the issues which have arisen that must be dealt with. Domain design concepts are outlined for the town centre, “town centre outer” and the “town centre whole”. These detail actions, street by street, for all aspects including traffic and parking laneways and public transport. The Plan details concept designs for each nominated street within the town centre and then moves to an implementation plan outlining the process and strategies detailing how these concepts are to be achieved for each specific street within the town centre. Related projects are also identified as they are relevant to the town centre including the Station /road bridge and the council car park both of which are now complete. The Plan identifies general street issues such as poor overall appearance, lack of greenery , lack of open space, lack a play spaces, lack of places to sit, safety and accessibility – poor pedestrian walkways and lighting (at night).
Relevance to Auburn 2012 Study	Concept plans mentioned will assist the Traffic & Transport Study team and will be an input into the traffic forecasting. Identified issues and changes to the structure of the main streets in the town centre need to be taken into account. As proposed road/pedestrian changes are covered in the Public domain plan this will be of use in the traffic model and can be conducted based on the Council's preferred traffic network for the Auburn LGA.

2.2.10 Auburn Development Control Plan 2010

Document	Auburn Development Control Plan 2010
Organisation	Auburn City Council
Date	2010
Purpose	The DCP seeks to: ▪ Identify the regulations regarding development of new and existing infrastructure in the Auburn LGA; ▪ Outline performance criteria against which development is assessed; ▪ Manage and control the enhancement of the environment of the Auburn LGA and to provide for the long term needs of the Auburn LGA; ▪ Provide for enhancement of the environmental qualities of sites while simultaneously considering the long term needs of the Auburn LGA by managing the development of infrastructure through performance criteria and developmental controls; and ▪ Provide for an environmentally sustainable residential community that is benefitted by the integration of development and infrastructure.
Content	This DCP supplements the Auburn Local Environment Plan 2010. The DCP provides more detail in relation to: ▪ Commercial development controls; ▪ Industrial development controls; ▪ Other development controls; and ▪ Requirements for applications for development.
Relevance to Auburn 2012 Study	Once the findings of the 2012 Traffic & Transport Study are known, relevant changes to the DCP can be made to ensure that development across the LGA and in key centres takes place having regard to the objectives and findings of the analysis.

2.2.11 Auburn Community Strategic Plan 2011-2021

Document	Auburn Community Strategic Plan 2011-2021
Organisation	Auburn City Council
Date	January 2011
Purpose	The Plan seeks to: ▪ Deliver a 10 year strategic plan to for Auburn City. The planning for Auburn City community's future, the plan is to outline the aspirations and priorities of the community and ▪ Outline the outcomes that are to be achieved over the next decade, identify stakeholders internal and external to Auburn City and the integrated planning framework strategy.

Document	Auburn Community Strategic Plan 2011-2021
Content	The Plan includes an integrated planning framework for sustainable growth of the community that identifies issues across four themes. These include Our Community, Our Places, Our Environment, Our Leadership. Some of the major strategic outcomes under each theme include: ▪ Our community: a community that feels safe; ▪ Our places: high quality urban development and Good transport and traffic management; ▪ Our Environment: a sustainable natural environment; ▪ Minimise our Ecological footprint and compliance with public and environmental health standard; ▪ Our Leadership: attract and retain quality workforce; and ▪ Continuous Improvements and innovations.
Relevance to Auburn 2012 Study	The plan makes reference to better transport specifically the need for better transport services and the movement of people that is safe accessible and efficient. Existing conditions and planned actions are referenced which are directly relevant to stage 1 of this Study. Guiding principles are outlined including principles for sustainable cities and social justice.

2.2.12 Auburn Local Environment Plan 2010

Document	Auburn Local Environment Plan 2010
Organisation	Auburn City Council
Date	Nov 2011
Purpose	This planning instrument facilitates the effective management and use of land across the LGA. The LEP implements a framework of provisions and standards to allow creation of opportunity for specific types of development control/action plans.
Content	The Plan notes: ▪ Written statement and maps with objectives for various zones relating to permissible land use, development standards and provisions guiding development across the LGA; ▪ Land use zones, subdivision, demolition, temporary use of land; ▪ Principal development standards: Rural subdivision, height of buildings, floor space ratio, exceptions from standards; and ▪ Various other regulations.
Relevance to Auburn 2012 Study	The 2012 Traffic & Transport Study needs to consider the provisions of the LEP in terms of the location and types of land uses and development that will inevitably occur. There may be scope to amend the provisions of the LEP and supporting DCPs to achieve the sustainable outcomes envisaged by the 2012 Traffic & Transport Study. These will be defined through the Study process.

2.2.13 Draft Berala Village Centre Study

Document	Draft Berala Village Centre Study
Organisation	Auburn City Council
Date	February, 2012
Purpose	A Study of the Berala Village centre with the purpose of : ▪ Identifying the opportunities to revitalise Berala; ▪ Inform Council's strategic planning, particularly Council's delivery program and inter agency initiatives; ▪ Bring together information which will inform the future of Berala's main street area; and ▪ Consider which building types and heights are suitable for Berala in the future.
Content	The study addressed the key outcomes identified in the Council's Auburn City Community Strategic Plan, high quality urban development, attractive public spaces and town centres and promotion of community pride. The study outlined the existing facilities in the Berala area as of March 2012. Community engagement workshops have been analysed in the context of outcomes from previous studies along with consultations, studies and a site analysis. These documents are an important step in identifying objectives for improvement and future change. Priority actions/recommendations have been outlined in alignment with the Community Strategic Plan Outcomes along with the implications of these actions.
Relevance to Auburn 2012 Study	Issues with the current facilities in the Berala area have been outlined in the Analysis and Recommendations Section. The outcomes will be relevant to the 2012 Traffic & Transport Study. The document was released in March 2012 and has not been finalised. Consequently action has not taken place on the majority of these issues.

2.2.14 Draft Delivery Program 2011/2015, Operational Plan 2012/2013

Document	Draft Delivery Program 2011/2015, Operational Plan 2012/2013
Organisation	Auburn City Council
Date	Version 2
Purpose	To use this Plan to deliver the shared Auburn City vision over a 4 year period with the overall long term goal of achieving the qualities of a sustainable city. This vision is being approached using the strategic directions categorised under four strategic themes, these being our community, our places, our environment and our leadership.
Content	This delivery program specifies the methods through which a number of services will be provided to the community. The delivery program is supported and informed by the community strategic plan (10 year plan vision outcomes), delivery program (4 years) and Operational Plan (1 year action Plan). The Operation Plan is designed with the outcome of implementing a range of programs to promote a healthy lifestyle amongst residents. Developing and coordinating a range of lifelong learning programs at our community centres across the Auburn LGA, including a regular school holiday program. Key Issues: Carbon tax, current service levels, budget changes.
Relevance to Auburn 2012 Study	The plan identified the need for the delivery of upgrades to local roads and pedestrian infrastructure. It allocated $63,000 for construction of facilities is planned to improve access and provide safe and convenient pedestrian and cyclist crossing opportunities on major roads, reducing injuries to pedestrians, mobility impaired groups and older persons. The Council's proposed outcomes will affect the scope of the Study as plans will be proposed for infrastructure upgrades for traffic and transport.

2.3 Key Outcomes from Policy Review

The literature review highlights the broad range of investigations that have and are still being undertaken by Council to better define the land use and transport issues and needs of its residents and workers. A number of key themes repeat themselves across almost all of the documents reviewed. These have been reaffirmed recently by Council in its response to the 2012 NSW Long Term Transport Masterplan:

- Council would expect that a wide diversity of people and organisations throughout western Sydney would be given consideration of issues regarding accessibility, service quality, feasibility, convenience and cost, and how travel options integrate into personal life priorities.
- **Climate**: The impact of climate and potential climate change on public transport service, including the need for air-conditioning of vehicles and better infrastructure suitable to the climate including bus shelters and good pedestrian and cycle paths.
- **Convenience**: Issues relating to the convenience of the public transport system including the need for more direct and faster services (including express services) the need for more frequent services and the need for better connections. Circuitous routes were a particular concern.
- **Quality of service**: In relation to public transport service provision including the need for respect for passengers by operators and the need for better communication regarding services, fares and concessions.
- **Reliability**: In relation to the need for realistic timetables and dependable services that people can have confidence in.
- **Safety**: Onboard safety on buses and appropriate lighting of streets and public transport shelters and stops are important issues relating to the safety of the public transport system, as well as separation wherever possible of bicycles and pedestrians on pathways.
- **Socially responsive design** where the quality and experience of the station environment is important, and in particular, a strong connection to the outdoors with the inclusion of outdoor and indoor gardens, structural openness, climate responsive design and greater access to natural light in subterranean stations. Other considerations relating to the station environment would include addition of public art and a range of seating designs to promote social interaction
- **Environmental issues**: The need to seek positive environmental and health outcomes from reducing car use, and the need to have benchmarks of current performance as the basis for implementation and monitoring.

In addition to the above, the policy and document review has reaffirmed that achieving a sustainable outcome rests heavily upon Council's promotion of active transport. Active transport is generally accepted as a term that includes walking, cycling, and other non-motorised modes for transportation and does not include walking and cycling for recreational purposes. The above themes are linked to success in the promotion of active transport, the benefits of which include:

- **Liveability** – the quality of the local environment and the improvements that stem from reducing vehicle traffic and speeds.
- **Economic development** – the commercial benefits that stem from shifts in consumer expenditures towards more local businesses and locally produced goods.

- **Social equity** – the degree to which walking and cycling helps to increase the mobility and accessibility of disadvantaged people.

All these benefits can be applied throughout the Auburn LGA, the challenge being to identify how best to achieve them in each of the distinct centres.

3 Assessment of Existing Transport System

It is important to understand the existing transport conditions in the Auburn LGA as the basis for assessment and recommendation for upgrade works.

The existing conditions have been determined using a wide range of data sources including:

- A review of existing literature and reports;
- Existing traffic data and a 2012 traffic survey undertaken by Hyder;
- A review of existing sources of travel behaviour data;
- Examination of aerial photographs, site plan, and development proposals; and
- Observational surveys through site visits.

The following sections summarise an assessment of existing transport systems by mode.

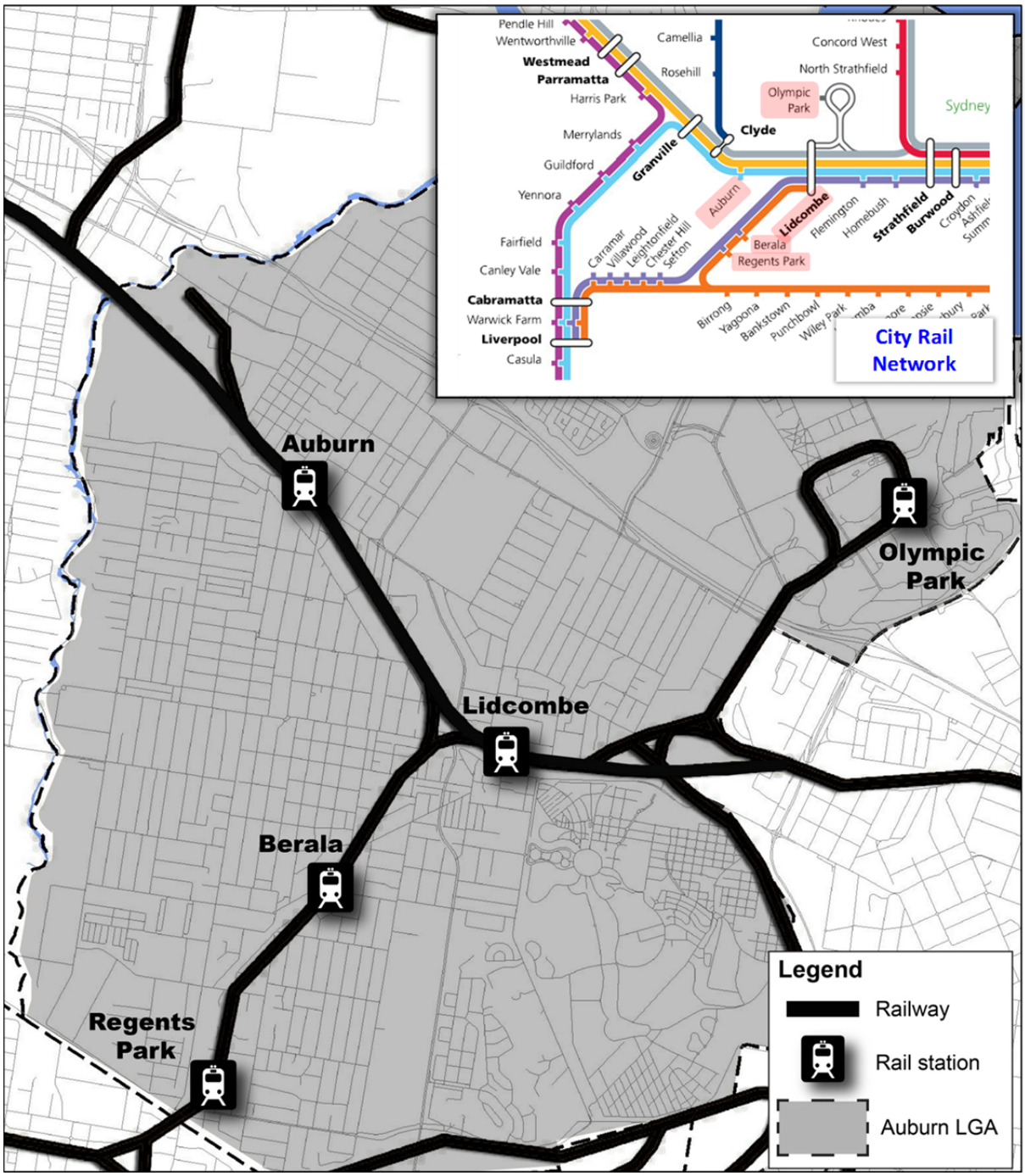
3.1 Rail Services

The Auburn LGA is served by a number of transport systems of which rail is a significant component covering a mode share 29% of the journey to work trips from Auburn LGA. The Auburn LGA rail stations are connected to the CityRail network providing connections to the Sydney CBD, Macquarie Park, Parramatta, the Airport Link and also the southern region. However some of these destinations require commuters to change trains during their trip.

The Auburn LGA includes the following railway stations:

- Auburn Station;
- Lidcombe Station;
- Olympic Park Station;
- Berala Station; and
- Regents Park Station.

Figure 3-2 highlights the stations within the Auburn LGA.



Source: NSW Transport, July 2012

Figure 3-2 Existing Rail Services in Auburn LGA

3.1.1 Existing Rail Services

Regular rail services operate on the Inner West Line providing access between Lidcombe – Berala and Regents Park and ending at Liverpool. The South Line, Inner West Line and North Shore/Western Line provide access to Auburn and areas outside of the LGA including the Sydney CBD. The Olympic Park sprint and special event services line is a standalone line providing access to Olympic Park facilities from Lidcombe Station.

Lidcombe station is the busiest station within the Auburn LGA particularly during AM and PM peak hours. A weekday peak frequency at Lidcombe Station is approximately three minutes. The other stations including Auburn, Berala, Regents Park and Olympic Park station operate at weekday peak frequency of between 5 to 10 minutes. These service frequencies drop during the weekend to about 10 to 15 minutes.

The rail frequency for key commuter peaks and weekend periods are outlined below in **Table 3-2.**

Table 3-2 Current Peak Hour Rail Service Frequency, July 2012

Service	Weekday		Weekend	
	AM Peak 7:30 to 8:30	PM Peak 17:00 to 18:00	AM Peak 10:00 to 11:00	PM Peak 18:00 to 19:00
Auburn Station				
To Central	11	7	6	5
From Central	8	10	6	6
Berala Station				
To Central	7	7	4	4
From Central	7	7	4	4
Lidcombe Station				
To Central	21	22	16	14
From Central	22	19	16	16
Regents Park Station				
To Central	8	8	4	4
From Central	8	8	4	4
Olympic Park Station				
To Lidcombe	6	6	6	6
From Lidcombe	7	7	6	6

Source: CityRail website, July 2011. Note: Services are at variable time intervals

Rail services through the Auburn LGA in the peak commuter direction originate in the growing West and South Western areas. Train passenger capacity at stations close to the CBD is an issue across the network. **Table 3-3** shows that trains from Bankstown and Western Sydney travelling in the peak direction to the Sydney CBD are operating over their seated capacity before they reach Auburn Station.

Table 3-3 overleaf shows the average load factors (passengers as a percentage of seating capacity) observed at cordons on a weekday in 2009.

Table 3-3 Average Peak Line Loads, 2009

Line (Measured at)	Service	Period	No. of Trains	Passengers	Average Load Factor
AM Peak One Hour					
Bankstown (Redfern)	Bankstown Total	08:00-08:59	6	6,630	120%
South (Redfern)	South via Granville	07:50-08:49	6	7,065	135%
	South via Regents Park	07:50-08:49	2	1,895	105%
Inner West (Redfern)	All stations	07:50-08:49	4	3,860	105%
Western (Redfern)	Western Suburban Total	07:55-08:54	15	15,825	120%
PM Peak One Hour					
Bankstown (Redfern)	Bankstown Total	17:14-17:13	6	4,810	90%
South (Redfern)	South via Granville	17:00-17:59	6	5,435	100%
	South via Regents Park	17:00-17:59	1	575	65%
Inner West (Redfern)	All stations	17:18-18:17	4	4,245	120%
Western (Redfern)	Western Suburban Total	17:05-18:04	14	14,310	115%

Source: A Compendium of CityRail Travel Statistics, CityRail (June 2010)

Table 3-4 shows passenger entries and exits in the morning peak (06:00-09:00AM) and evening peak (15:00-18:30PM) on a typical weekday in 2009 at stations in the Auburn LGA. During peak periods, Auburn and Lidcombe stations had over 6,000 passengers entering and exiting the stations. Approximately 60% to 70% of rail trips were made during the peak periods.

Table 3-5 shows the station access modes to Auburn and Lidcombe stations in 2009. Most rail passengers, up to 67%, accessed the station by foot. At Auburn station, up to 27% of passengers accessed by car lift or kiss and ride. Access to Auburn station for commuter car parkers is low with only a few rail patrons parking on-street near the station. At Lidcombe station, about 25% of entries in 2009 were commuter car parkers, and about 14% by car lift. Both Auburn and Lidcombe stations exhibited high walk up mode shares due in part to commuter car parking supply being below demand. The stations both have strong walk up catchments which reaffirms the need for any package of measures to have a strong pedestrian dimension, at least in the immediate vicinity of the main rail stations.

Table 3-4 Weekday Station Entries and Exits, 2009

Station	06:00 to 09:30		15:00 to 18:30		24 Hours	
	In	Out	In	Out	In	Out
Auburn	4,310	1,800	1,950	4,430	10,100	10,100
Berala	1,140	150	310	1,060	1,840	1,840
Lidcombe	4,530	1,610	1,930	4,070	9,780	9,780
Regents Park	1,070	960	930	900	2,690	2,690
Olympic Park	40	1,180	1,250	220	1,940	1,940

Source: A Compendium of City Rail Travel Statistic, seventh edition, June 2010

Table 3-5 Station Access Modes, 2009

Station	Year	Sample	Walk	Bus	Car Park	Car Lift	Other	Source
Auburn	2008/09	25	67%	5%	0%	23%	5%	RC
Lidcombe	2008	57	56%	4%	25%	14%	2%	RC

Source: A Compendium of City Rail Travel Statistic, seventh edition, June 2010. RC – Rail Crop

3.1.2 Existing Rail Facilities

Auburn station has limited park and ride or commuter car parking facilities and evidence suggests high demand for these facilities. Taxi, bus and disabled parking facilities are available on both sides of Auburn station. There is no commuter car parking within close proximity to the station. There are no formal kiss and ride designated areas on either side of the station, the result being that pick up and drop off (see **Figure 3-3**) occurs in an ad hoc manner sometimes in no parking/no stopping areas and in taxi zones to the detriment of traffic flow efficiency and accessibility.

Similarly, at Regents Park and Olympic Park there are no formal kiss and ride zones. However, accessible car parking is provided at these stations.

Multi modal facilities are provided at the Lidcombe interchange. A kiss and ride designated area is provided at this station (see **Figure 3-4**). It appears that Berala is the only railway station in Auburn LGA that doesn't have accessible facilities for its patrons. The station also has no formal kiss and ride kerbside allocations nor formal off street car parking. This is understandable as in 2009, Berala had only about 1,840 station entries and exits per day compared with more that 10,000 at Auburn and at Lidcombe stations. **Table 3-6** summarises existing facilities at key stations in the LGA.

Table 3-6 Existing Station Facilities

Station	Existing Facilities					
	Bus Stop / Interchange	Taxi Rank	Car Park Close By	Kiss and Ride	Disabled Facilities (i.e. lift and ramp)	Bike Racks or Bike Lockers
Auburn	✓	✓	✗	✗	✓	✓
Berala	✓	✓	✗	✗	✗	✓
Lidcombe	✓	✓	✓	✓	✓	✓
Regents Park	✓	✓	✓	✗	✓	✓
Olympic Park	✓	✓	✓	✗	✓	✗

Note ✓ = facilities are provided, ✗ = facilities are not available

Source: CityRail website (August 2012)

Photo taken in August 2012

Figure 3-3 Drop off and pick up at Auburn Station, South Parade

Photo taken in August 2012

Figure 3-4 Formal Kiss and Ride at Lidcombe Station, Railway Street and Tooheys Lane

3.1.3 Recent Project Completions

The Rail Clearways project (now superseded by Sydney's Rail Future Plan) is an initiative which has been implemented by NSW Transport to simplify the rail network, improve the operating efficiency and allow for future growth of the network.

Lidcombe turn back and platform – Completed in 2010

The now completed Lidcombe turn back and platform project has the effect of reducing the congestion between Lidcombe and Strathfield by starting Bankstown Line trains from their own separate turn back and platform at Lidcombe. It improves the reliability of the service and provides connections between the Bankstown line and western line or to the city via Lidcombe and Strathfield

Homebush turn back and platform – Completed 2011

The Inner West now has services between the City and Ashfield starting from Homebush Station ready to commence after south line trains have passed through. A dedicated turn back was created allowing terminations at Homebush Station without having impacts on the South Line Services.

3.1.4 Rail Strategies

Sydney's Rail Future

In June 2012 the NSW Government announced plans to introduce new, single deck, high frequency trains and an eventual second harbour crossing as part of a major overhaul of Sydney's rail network. This aims to provide more frequent services and increased train capacity with new rapid transit trains to run alongside existing suburban and intercity double deck trains. This will result in more than a 60% increase in the number of trains that can run to the CBD, increasing capacity from areas including Western and South West Sydney and catering for up to 100,000 additional passengers per hour. Key issues for this Study include:

- More services across the rail network as part of the new timetable;
- Planning for a second harbour crossing and new CBD stations; and
- The conversion of the exiting Bankstown Line to allow for the fast, single deck train services.

Auburn Stabling Project

Due to the expected increase in train services in Sydney's inner west and south west the construction of a new train stabling facility to the north-west of Auburn station is proposed.

The stabling facility will allow for increased trains, improve reliability by reducing empty trains and provided further facilities for maintenance to be performed on existing trains. The project is currently under construction and will be completed in 2013.

Additionally the Southwest Rail Link project will have a limited impact upon the Auburn LGA, however it will increase the volume of passengers on rail services and potentially increasing congestion of platforms and trains which is scheduled to commence in 2016.

3.2 Bus Services

Journey to work data shows public transport has a low to moderate share of travel within the Auburn LGA and exterior to the LGA. The current mode share for bus travel presents only 1% of journey to work for the Auburn LGA compared to 14% for Inner Sydney SSD.

Auburn LGA is currently relatively well served by a network of bus routes that link the area with surrounding suburbs and commercial centres as well as major regional centres such as Sydney CBD and Parramatta. The focus of bus routes in this review is the bus services operating across Auburn LGA. Bus services within the LGA are operated by Sydney Buses and Veolia Transport NSW.

3.2.1 Existing Bus Services

A summary of existing services is provided in **Table 3-7** below. The table show all bus services that run through the study area including route number, route description, operating hours and frequency during the AM and PM peak hour.

The routes that are well served by high frequency (between 10 and 20 minutes) services particularly during pear hour are:

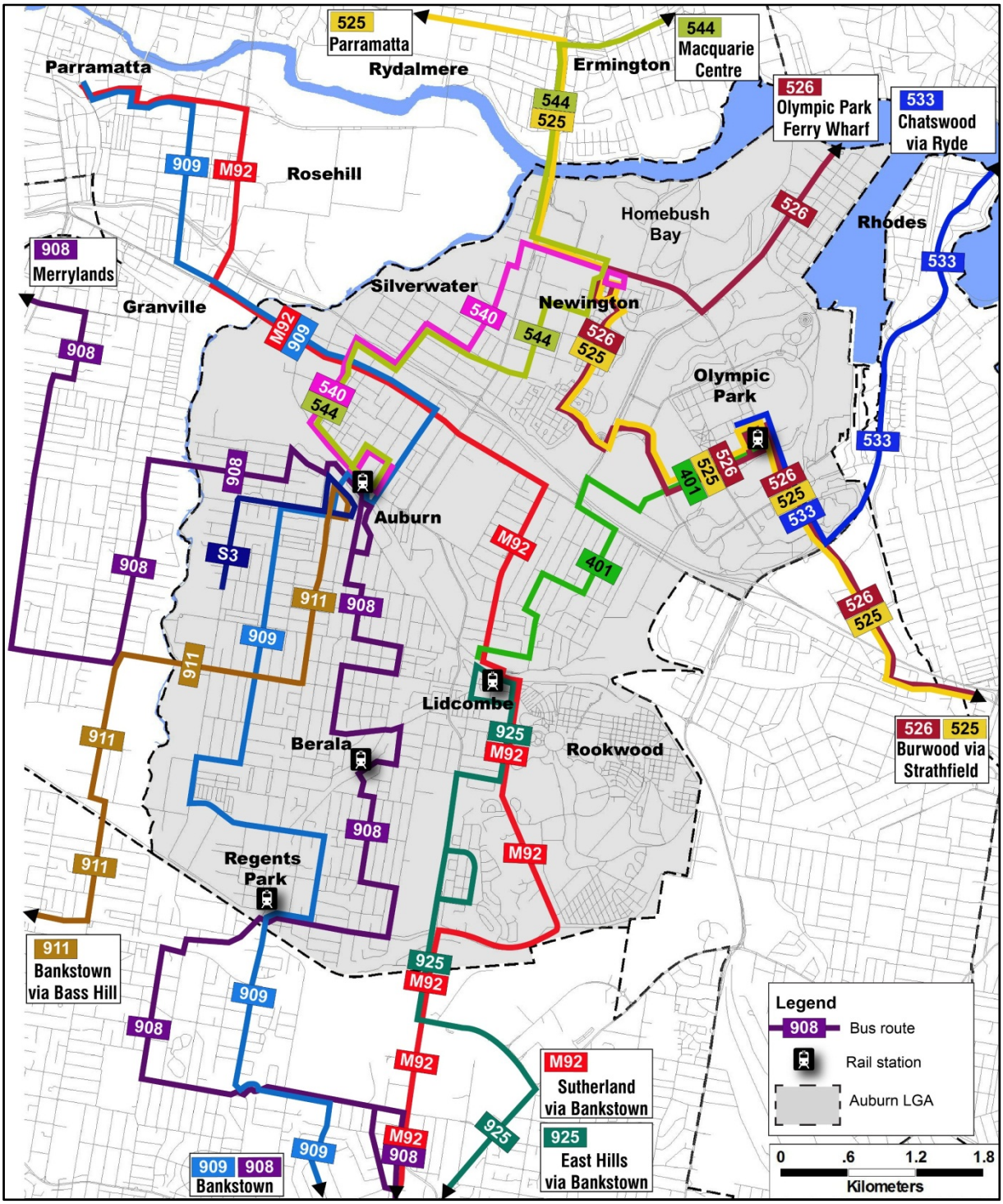
- Route M91 (Metrobus) – Parramatta to Hurstville via Padstow, Bankstown and Lidcombe;
- Route M92 (Metrobus) – Parramatta to Sutherland via Lidcombe and Auburn;
- Route 525 (Sydney Buses) – Parramatta to Burwood via Newington; and
- Route 401 (Sydney Buses) – Sydney Olympic Park Wharf to Burwood via Newington.

Key destinations to the south are Bankstown, East Hills and Sutherland (via Route M92), to the north are Parramatta, Macquarie Square and Chatswood, to the east are Strathfield and Burwood, and to the west is Marylands. **Figure 3-5** shows the regular bus network serving Auburn LGA.

Table 3-7 Current Peak Hour Bus Service Frequency, July 2012

Route	Route Description	Operating	Service Frequency During Peak Hour (no of services)			
			To Weekdays AM Peak (7:30 – 8:30)	To Weekday PM Peak (17:00 - 18:00)	From Weekday AM Peak (7:30 - 8.:30)	From Weekday PM Peak (17:00 - 18:00)
401	Sydney Olympic park Station to Lidcombe	7 days	3	1	3	2
525	Parramatta to Burwood via Newington	Monday to Saturday	3	3	7	6
526	Sydney Olympic Park Wharf to Burwood via Newington	7 days	3	3	7	6
540	Auburn to Newington	7 days	3	2	No service	No service
544	Auburn to Macquarie Centre	7 days	3	2	No service	2
908	Bankstown - Sefton - Regents Park - Berala - Auburn - South Granville - Merrylands	7 days	1	1	1	4
909	Bankstown to Parramatta via Auburn	7 days	2	2	2	2
911	Bankstown to Auburn via Chester Hill	7 days	2	2	2	2
925	East Hills to Lidcombe	7 days	2	2	2	2
M91	Parramatta to Hurstville via Padstow, Bankstown and Lidcombe	7 days	6	6	6	6
M92	Parramatta to Sutherland via Lidcombe and Auburn	7 days	6	6	6	6

Source: Transport Info, July 2012



Source: Transport Information, Consultant analysis

Figure 3-5 Bus Network Servicing Auburn LGA

3.2.2 Existing Bus Infrastructure

The Auburn bus network provides services to and from surrounding suburbs and commercial centres, and also provides accessibility to the rail system for intercity and regional travel.

Facilities for waiting passengers are limited and generally comprise covered waiting areas with seating and some basic bus timetable information. **Figure 3-6 and Figure 3-7** examine typical bus shelter and timetable information observed in Auburn and Lidcombe Town Centres. In busy areas, the bus waiting facilities provided by Council are not adequate to meet demand in peak periods. For example, in Lidcombe, the lack of facilities in peak hours results in passenger queuing along the pedestrian walkway. **Figure 3-8** shows busy bus stop on Church Street at Lidcombe Station. This is an inconvenience to passengers, particularly the elderly or those with mobility difficulties.

The potential exists to improve the facilities available to passengers to include more comprehensive bus timetable and routing information and further seating.

Photo taken in August 2012

Figure 3-6 Bus Stop on South Parade, Auburn Station

Photo taken in August 2012

Figure 3-7 Bus Stop Information, Lidcombe Interchange

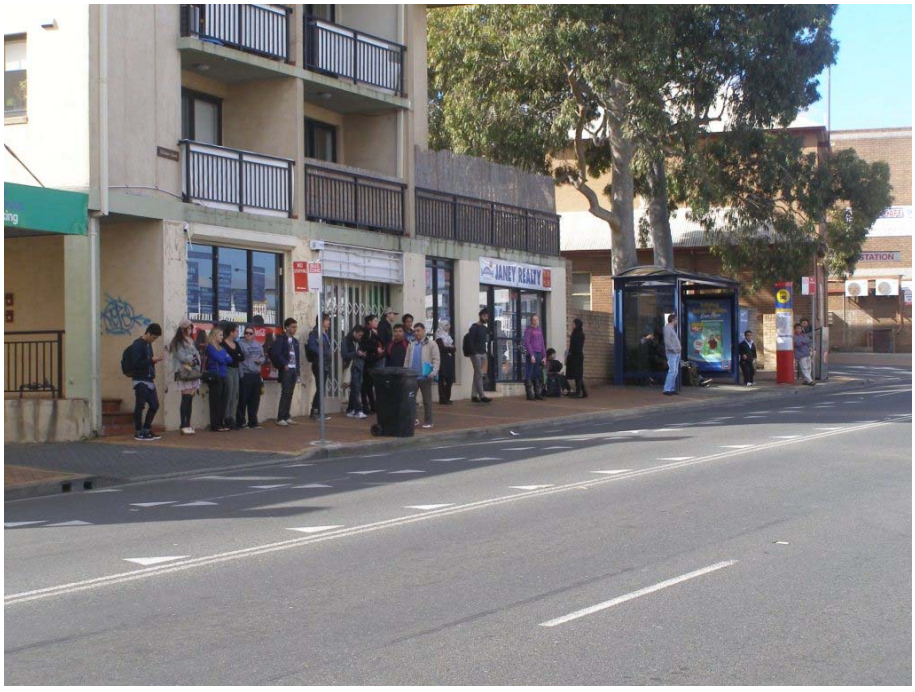


Photo taken in August 2012

Figure 3-8 Over-crowded Bus Stop on Church Street, Lacombe Station

3.2.3 Recent Project Completions

Bus priority on strategic bus corridors

The NSW Government committed $235 million between 2006 and 2008 to improving bus priority on Strategic Bus Corridors. Both infrastructure and technological solutions are being used to improve average bus speeds on strategic corridors.

Technology options include the Sydney-wide implementation of the NSW Road and Maritime Services Public Transport Information and Priority System (PTIPS). PTIPS uses satellite technology to identify late running buses and communicates with the traffic management system to direct traffic signal priority to late running buses, where possible.

PTIPS is currently being rolled out across the Sydney bus fleet. The State Transit bus fleet is PTIPS enabled and the private bus fleet is being PTIPS enabled.

Key congestion or choke points for traffic are being targeted using:

- Dedicated red bus lanes on approaches to congested intersections;
- Dedicated bus bypass lanes (such as Left Turn Only, Buses Excepted lanes);
- Bus pre-emption signals;
- Conversion of unrestricted lanes to transit and no stopping lanes; and
- New bus lanes through tidal flow schemes.

Over $135 million in bus priority infrastructure has been implemented on Strategic Bus Corridors between 2006 and 2008 with a further $25 million a year being dedicated over the next four years.

Strategic bus corridors that travel through Auburn LGA are:

- Strategic Bus Corridor 12 – Parramatta to Bankstown and
- Strategic Bus Corridor 13 – Parramatta to Burwood.

3.2.4 Planned Bus Strategies

Community bus

Auburn City Council has a 24 seater wheelchair accessible community bus which can be hired out by any group. The provisions being that groups have a LR light rigid license. The driver is required to undergo a road and safety assessment with Auburn City Council. A booking cannot be made until the nominated driver is authorised by Council.

Pre pay ticketing

Currently the Sydney CBD, Chatswood Station, Epping Station and the Parramatta Interchange use the Pre-Pay Ticket system. Valid tickets must be used prior to joining buses at these locations between 7am and 7pm and at normal travel times according to the Pre-Pay System already in place in the locations mentioned above. A phased implementation of the Pre-Pay System could facilitate morning and afternoon peak traffic on major routes.

Passengers should still be able to make cash purchases on bus services for an intermittent period to allow an easy transition into this new system. Additionally Pre-Pay tickets shall be readily available to public transport users, including at a close location to bus interchanges.

Improved accessibility to rail stations

An objective of the NSW government is to increase the mode share of public transport from Parramatta to the Sydney CBD during peak hours to 50%. Transport interchange upgrades are planned for the Auburn LGA area as several public transport routes through Parramatta run through the Auburn LGA, these including Auburn and Lidcombe.

Olympic park bus links for major events

Transport for NSW has proposed additional special bus services during major events at Sydney Olympic Park (including Acer Arena and ANZ Stadium). This aims:

- to provide a reliable and continual base level of public transport for all forecast crowds;
- to provide public transport access to areas not well serviced by rail for medium and large events;
- to provide flexibility in increasing service delivery at relatively short notice; and
- to move up to 28,000 people per hour at peak times;

Auburn transport interchange upgrade

Transport for NSW plan to improve the transport interchange facilities at Auburn Station. The upgrade works which are proposed to commence in mid-2012 include:

- Installing a new bus shelter at the Northumberland Road bus stop with lighting and signage to improve legibility and security;
- Upgrading the Northumberland Road ‘kiss and ride’ facility to incorporate seating and signage;
- Relocating the existing bicycle rack located at the northern end of Railway Park. This would also include adequate lighting for improved security; and
- Removing the existing stairs that lead to the ramp at the Railway Station entrance and exit at South Parade.

3.3 Cycling

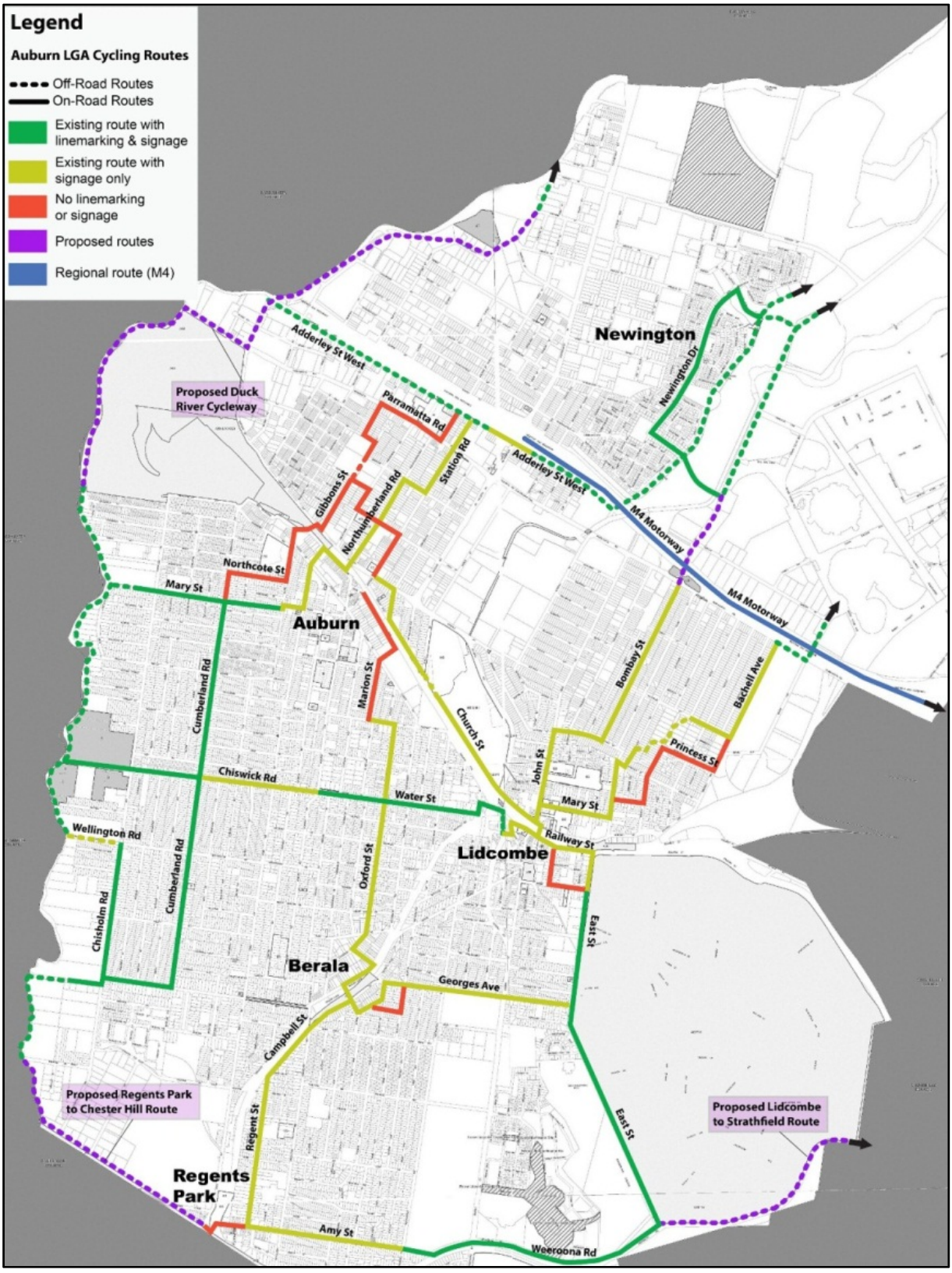
3.3.1 Existing Cycling Routes

A Bikeways Plan was prepared for Auburn City Council in November 1995. The Plan identified seven local bicycle routes to provide connections to railway stations, schools, retail area, recreation and sporting venues within Auburn LGA. These routes utilise the collector and local road network. The existing bicycle routes as identified in the 2009 Auburn LGA Cycling Route and the RMS Sydney and Parramatta Cycleway Map are shown in **Figure 3-9**. The figure also highlights exiting cycling facilities including linemarking and signage condition observed on the existing routes.

As per 2009 Council Cycling Routes, there are nine key local routes and one regional bicycle route in the study area as follows:

	Route Description	Streets
Local routes as per Council's Cycling Routes (2009)		
1	Lidcombe Station to Olympic site to Newington	John Street, Maud Street, Bombay Street, Hill Road, Wing Parade, Newington Boulevard
2	Lidcombe to TAFE and Cumberland College	Railway Street, East Street
3	Cumberland College to Regents Park Station	Weeroona Road, Amy Street.
4	Lidcombe Station to Newington via Auburn Station	Church Street, Wyatt Park, North Parade, Station Road, Hall Street, Macquarie Road, Hutchinson Street, Auburn Park, Hunter Street, Braemar Avenue, Parramatta Road, Melton Street, Adderley Street, Haslams Creek Flats.
5	Peter Hislop Park to Auburn Park	St Johns Road, Cumberland Road, Mary Street, Park Road, South Parade, Gibbons Street
6	Auburn Botanic Gardens to Lidcombe	Chiswick Road, Water Street. Samuel Street, Bridge Street, Tooheys Lane
7	Auburn Centre to Regents Park Station via Berala Station	Marion Street, Elsham Road, Oxford Street, Woodburn Road, Campbell Street
8	Berala Station to East Street to TAFE	Campbell Street, London Road, Georges Avenue
9	Lidcombe to Sydney Olympic Park	John Street, Mary Street, Swetes Street, Philips Park, Bachell Avenue, Parramatta Road, Birnie Avenue.
Regional route as per RMS's RMS Sydney and Parramatta Cycleway Map		
1	M4 between St Hilliers Road and Concord Road, Homebush	M4 between St Hilliers Road and Concord Road, Homebush

Source: Auburn City Council Bike Plan



Source: Auburn City Council, NSW Bike Plan, Consultant analysis

Figure 3-9 Existing and Planned Regional and Local Cycleways

3.3.2 Existing Cycling Facilities

The majority of cycleways in the Auburn LGA are on-road facilities. There are some off-road cycleways in the Olympic Park and Homebush Bay areas. The bicycle routes are rated as low or moderate difficulty riding environments by RMS. Photos below show on road bicycle facilities at Newington and Lidcombe.

Photo taken in August 2012

Figure 3-10 On-road Bicycle Facilities, Newington Boulevard

Photo taken in August 2012

Figure 3-11 On-road Bicycle and Crossing Facilities, East Street near Lidcombe College

Bike racks or bike lockers are currently available at all the railway stations in the Auburn LGA, except the Olympic Park Station. Bike racks are also found in Newington Village Shopping Centre and Auburn Central. Photos below show some of the trip end facilities (i.e. racks and lockers) for cycling in Auburn.

Photo taken in August 2012

Figure 3-12 Bicycle Racks and Lockers at Regents Park station

Photo taken in August 2012

Figure 3-13 Bicycle Racks at Auburn Central

Photo taken in August 2012

Figure 3-14 Bike Locker Facility at Auburn Station

3.3.3 Planned Cycling Facilities

The following three new cycling routes were proposed:

- *Regents Park to Chester Hill.* This provides a direct link between Regents Park and Park Reserves along the water supply pipeline. This new route was identified in the 2009 Auburn LGA Cycling Routes.
- *Lidcombe to Strathfield.* This link connects Lidcombe and Strathfield via the South of Rookwood Cemetery along the rail line. This new route was identified in the 2009 Auburn LGA Cycling Routes.
- *Duck River cycleway*. This provides a connection between Silverwater Park and Duck River Reserve along the Duck River. This new route was identified in NSW Bike Plan 2010.

These proposed routes are shown in **Figure 3-9**.

3.4 Pedestrians

Pedestrian facilities are particularly important because all public transport users are pedestrians at some point in their journeys.

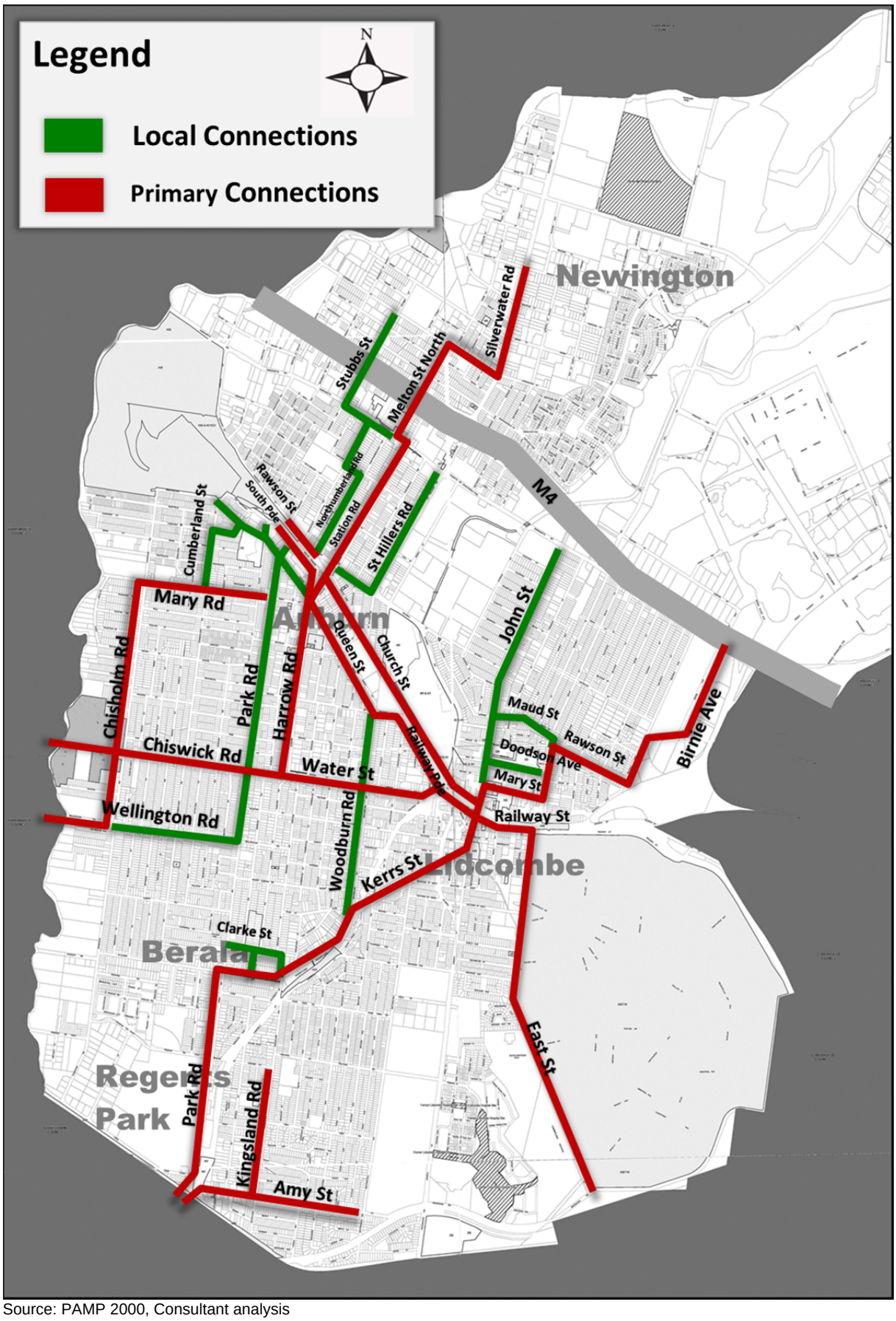
Pedestrian activities are present throughout the Auburn LGA particularly in town centres and villages which are in close proximity to rail stations. The rail movement in these town centres and villages is often essential to the retail areas and the economic viability of the area. Currently pedestrian activity accounts 14% of travel mode share throughout the Auburn LGA. The town centres and their major pedestrian routes include the following:

- Auburn Town Centre – Kerr Parade, South Parade, Queen Street, Civic Road, Auburn Road, Rawson Street, Station Road and Railway Park.
- Lidcombe – Church Street, John Street.
- Berala – Campbell Street and Burke Avenue, Woodburn Road and Crawford Street.
- Park Road/ Carling Ford Road and Amy Street.

Figure 3-15 shows key pedestrian routes.

A Pedestrian Access Mobility Plan (PAMP) been prepared previously in October 2000 for the Auburn Council area (excluding Newington and Homebush Bay). The PAMP along with the Auburn Town Centre Strategy (2009) and the Auburn Public Domain Plan (2009) provides a strategic context for this review of the pedestrian accessibility for the study area. Inclusive of this review of the pedestrian routes, issues and measures identified in these documents have been considered including the identification of additional measures where appropriate.

In order to provide safe access to, from and within the major centres across the Auburn LGA, the continued provision of safe pedestrian only footpaths is encouraged. Where possible, cyclists should be encouraged to use on road cycle paths especially in congested town centre areas, depending of the circumstances of each case.



Source: PAMP 2000, Consultant analysis

Figure 3-15 Existing Pedestrian Routes

3.4.1 Existing Pedestrian Facilities

Footpaths across the local road network are a combination of single sided and double sided footpaths.

Major railway stations have good quality pedestrian and traffic controlling facilities. Lighting is available in most cases to assist pedestrian access and safety. Pedestrian underpasses/overpasses are provided at Lidcombe, Berala, Auburn and Regents Park Stations and have signalised crossings or marked pedestrian crossings allowing safe entry/exit to the stations. Photo below show examples of pedestrian facilities in provided in the Auburn LGA.

The overall state and quality of pedestrian infrastructure which includes footpaths, pavement, signalised and marked “zebra” crossings, signage, footpath continuity and lighting is generally acceptable.

Section 5.1.4 summarises key pedestrian facility issues observed in the Auburn LGA

Photo taken in August 2012

Figure 3-16 Pedestrian Bridge Facilities, Auburn

Photo taken in August 2012

Figure 3-17 Typical Zebra Crossing, Berala

Photo taken in August 2012

Figure 3-18 Pedestrian Underpass Facilities at Berala Station

3.4.2 Planned Pedestrian Facilities

The PAMP proposed four routes for high priority implementation as follows:

Pedestrian Route / Road	PAMP's Works Program
1 Auburn Railway Station access, Auburn	Provide increased access to Auburn Railway Station and adjacent crossing area (south side)
2 Civic Road, Auburn	Improve pedestrian crossing movement at Civic Road at Auburn Road "wall" area
3 Kerr Parade, Auburn	Provide a pedestrian crossing at Kerr Parade at Auburn Road and linkages into Auburn Road
4 Tooheys Lane and Joseph Street, Lidcombe	Provide a pedestrian crossing at the intersection of Tooheys Lane and Joseph Street Lidcombe and restrict pedestrian access to ensure pedestrians use the signalised crossing on Olympic Drive immediately west of New Street

Additional to the PAMP, the Auburn Town Centre Strategy (2009) and the Auburn Public Domain Plan (2009) identified following Works Program below:

Pedestrian Route / Road	Auburn Town Centre Strategy / Auburn Public Domain Plan Works Program
5 Kerr Parade, Auburn	▪ Introduction of signalised intersections at both ends ▪ Repave road surface at both ends of Kerr Parade and plant trees ▪ Install Improved Street lighting at entrance
6 South Parade, Auburn	▪ Removal of both existing raised pedestrian crossing and install one signalised connection ▪ Due to pedestrian crossing changes parking will be relocated to maintain efficient pedestrian flow ▪ Upgrade Street and Pedestrian lighting
7 Queen Street, Auburn	▪ Paving of Five Ways intersection to slow car speeds, and emphasise pedestrian crossings around the intersection ▪ Footpath resurfacing ▪ Partial opening of Five Ways intersection (of Queen Street, and Civic and Auburn Roads) and the reconfiguration of traffic movements

Pedestrian Route / Road	Auburn Town Centre Strategy / Auburn Public Domain Plan Works Program
8 Auburn Road, Auburn	▪ Roadway alignment upgrade ▪ Footpath widening between Kerr parade and Mary Street ▪ Install pedestrian crossing at Auburn Road and Kerr Parade and Mary Street ▪ Pedestrian crossing at Auburn Road and Kerr Parade intersection (signalised scramble crossing) ▪ Removal of existing temporary outdoor dining “bays” to allow room for footpath widening
9 Rawson Street and Station Road, Auburn	▪ New pedestrian Bridge and vehicle bridge across the railway line, replacing the existing bridge on Station Road ▪ Continue footpath paving and street lighting used in the town centre is to be continued to Rawson Street and Station Road ▪ Upgrade existing lighting on both streets
10 Macquarie Road, Hall Street, Dartbrook and Holiday Lane	▪ Install pram ramps at the intersection of Hall Street and Macquarie Road ▪ Install lighting in Holiday Lane ▪ Create adjoining lanes, investigate controls
11 Northumberland Road: connections northern residential areas to Auburn Station	▪ Pending upgrade of RSL car park ▪ Upgrade lane between Northumberland and Station/ Macquarie roads
12 Olympic Park	▪ Homebush bay Bridge, allows residents to be within walking distance to Rhodes Station ▪ Grade separated link between Figtree Precinct and Bicentennial Park ▪ Link between Sydney Olympic Park to North Lidcombe ▪ Reduce walking distances by reducing Kerb radii on new streets to desirable required minimum ▪ Minimise right turn bays to reduce pedestrian crossing distances

3.4.3 Recent Completions

Some of planned facility improvements have been implemented. They are:

- Pedestrian crossing at Kerr Parade at Auburn Road and pedestrian linkage into Auburn Road were provided;
- Raised pedestrian crossing on South Parade was removed and signalised connection was installed;
- Pedestrian crossing was installed at Auburn Road/ Kerr Parade/ Marry Steet;
- New pedestrian rail bridge was install on Rawson Street replacing old bridge on Station Road;
- Pram ramps were installed at Hall Street / Macquarie Road;
- Grade separate link was provided between Figtree Precinct and Bicentennial Park; and
- Pedestrian link was provided between Sydney Olympic Park and North Lidcombe.

3.5 Taxi Services

3.5.1 Existing Taxi Services

Preliminary consultation with the NSW Taxi Council suggests that there are no major operational taxi issues at any of the centres across the LGA. Each centre, especially Auburn and Lidcombe which have average daily station entry/exit volumes of around 10,000 people, exhibits some level of peak period congestion. At Auburn, some customers have requested the provision of shelters, however, it is not common practice for taxi shelter facilities to be provided except in the very busiest of locations. At Auburn and Lidcombe stations the quantum of taxi spaces is generally appropriate for the level of demand across an average weekday. Only during inclement weather and at change over times do customers need to wait for extended periods of time.

Some residents have called for the establishment of a taxi rank in Northumberland Road near the Soccer Club. The closure of the overbridge has impacted on elderly passengers who rely on taxis to travel from Dartbrook Road to the Auburn City Centre and the rank could assist these residents[1].

Taxis are currently one of the major point to point modes of travel in Sydney and are a major contributor to the travel for the mobility impaired. Taxis additionally perform the service in bridging the gap between user destination and the termination of a particular mode of public transport, especially when the distance from a final stop exceeds reasonable walking distances.

The following points are noted from site observations:

- Taxi ranks are currently available at all the railway stations in Auburn LGA: Auburn, Lidcombe, Berela, Regents Park and Olympic Park.
- There is no dedicated taxi bay at St Joseph's Hospital. This may not be required due to its close proximity to the Auburn Railway Station.
- A taxi rank is located outside Auburn Hospital on Hargrave Road.
- In general, taxi ranks are provided in all the major centres and villages.

Figures 3-19 to 3-22 show locations of existing taxi rank provided within Auburn and Lidcombe Town Centres and Berala and Regents Parks Villages.

The photos below show some of the existing taxi facilities at Auburn and Lidcombe stations.

[1] NSW Taxi Council Website, August 2012

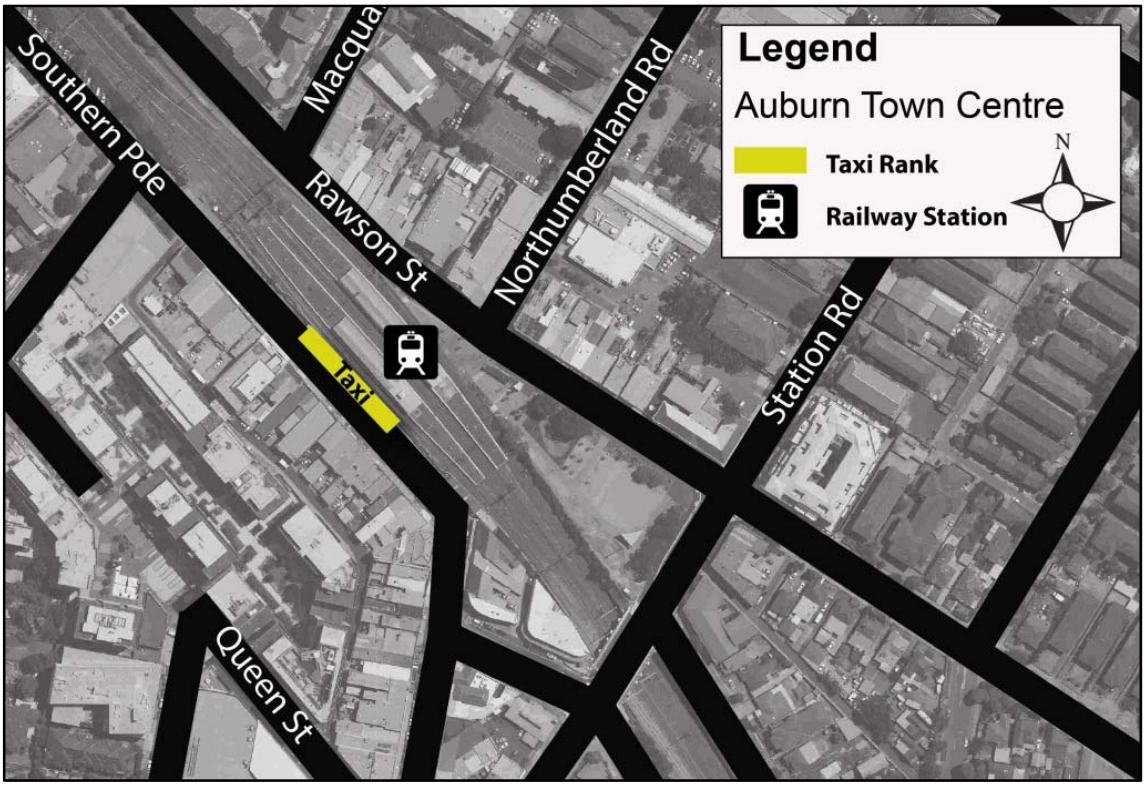


Figure 3-19 Locations of Existing Taxi Rank Auburn Town Centre

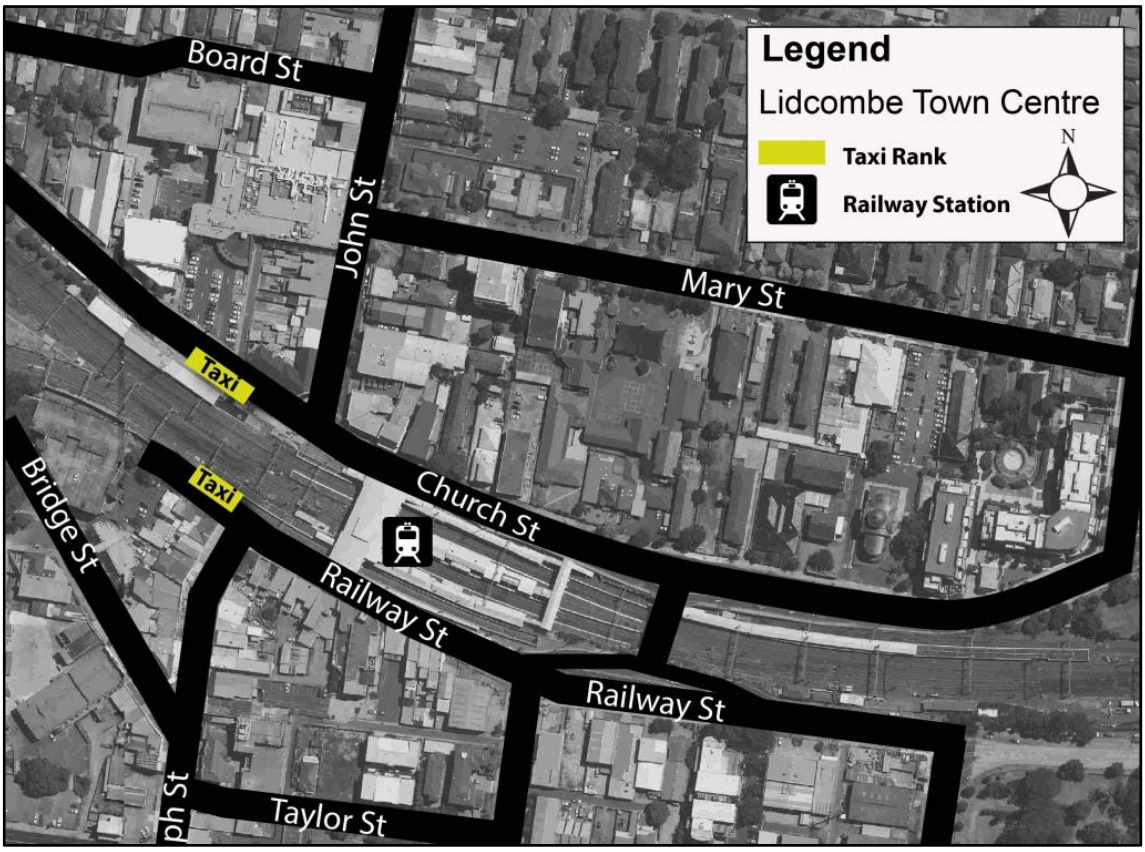


Figure 3-20 Locations of Existing Taxi Rank in Lidcombe Town Centre

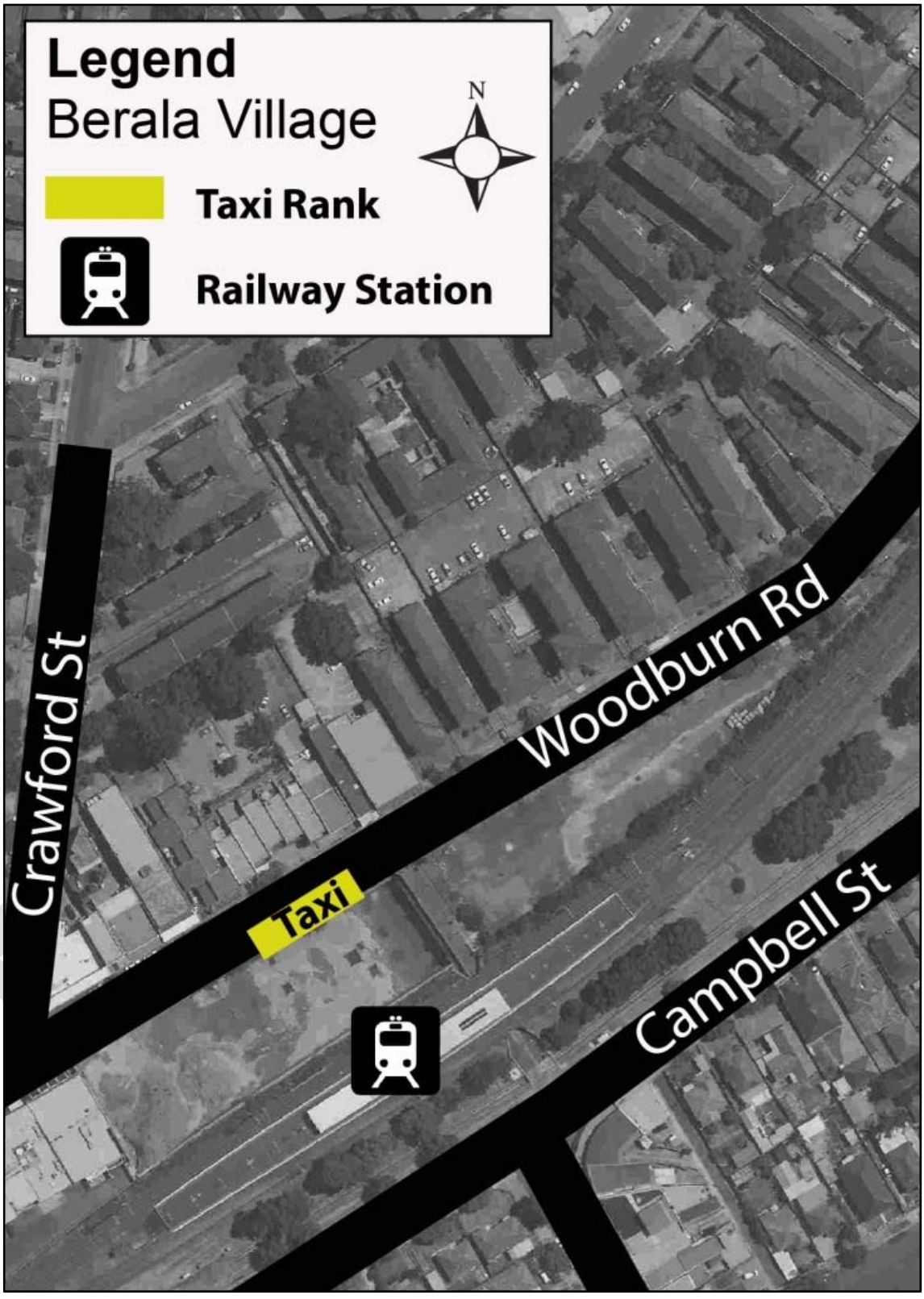


Figure 3-21 Locations of Existing Taxi Rank in Berala Village

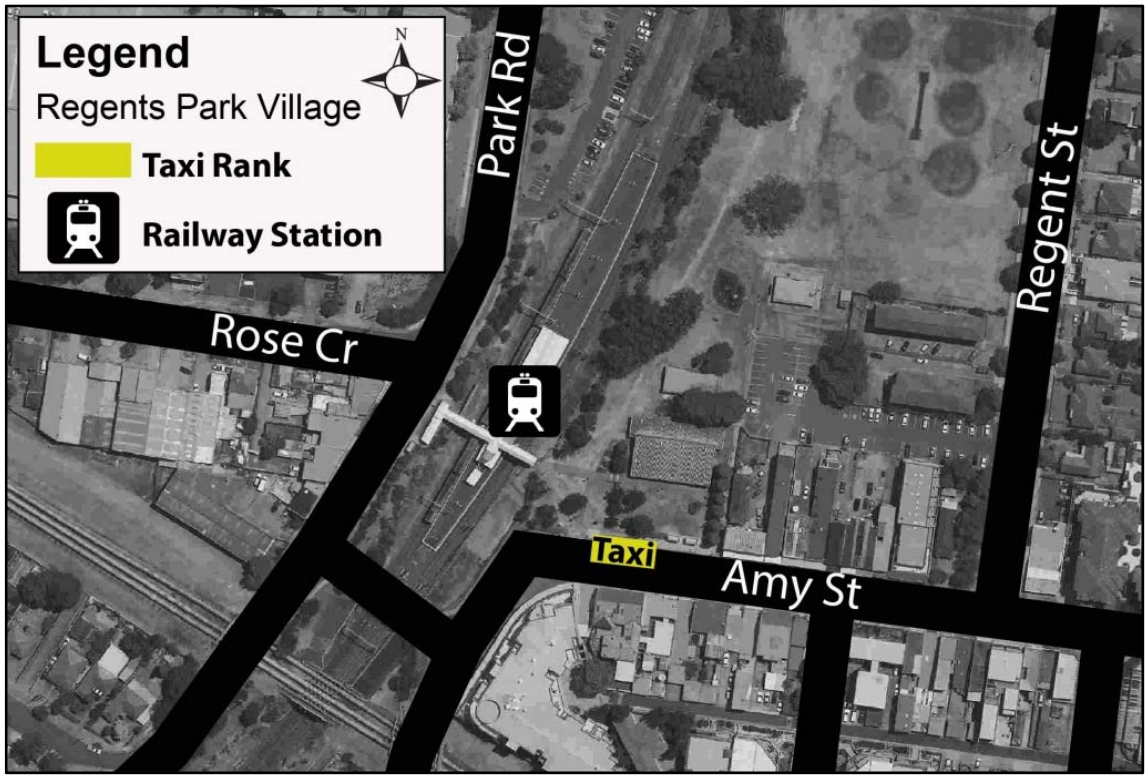


Figure 3-22 Locations of Existing Taxi Rank in Regents Park Village

Photo taken in August 2012

Figure 3-23 Taxi Rank at Auburn Station, South Parade

Photo taken in August 2012

Figure 3-24 Taxi Rank at Lidcombe Station, Church Street

3.6 Parking

The Auburn Town Centre Parking Strategy Study (Luxmoore, 2011) reported that there are approximately 220 on-street car spaces at the northern side of the Auburn Railway Station with additional 300 off-street parking spaces associated with licensed clubs. On the southern side of the railway line, there are over 1,300 off-street spaces provided in the Council car park, Coles car park and Auburn Central car.

Hyder has undertaken parking inventory and accumulation survey during AM peak (7-9am) and PM peak (4-6pm) periods in 15 minute intervals on Thursday 2nd August 2012 at two town centres and two villages:

- Auburn Town Centre;
- Lidcombe Town Centre;
- Berala Village; and
- Regents Park Village.

Figures 3-25 to 3-28 shows the parking survey locations.

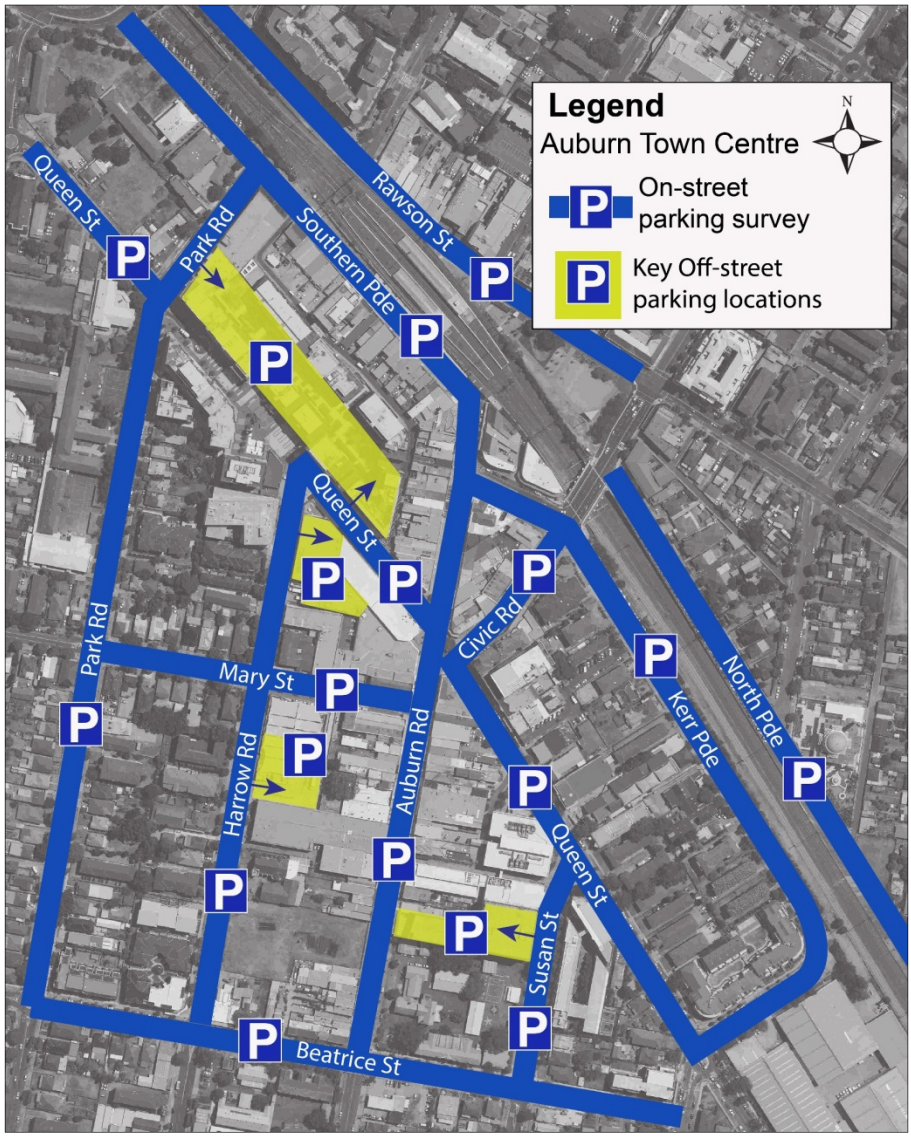


Figure 3-25 Parking Inventory and Accumulation Survey – Auburn Town Centre

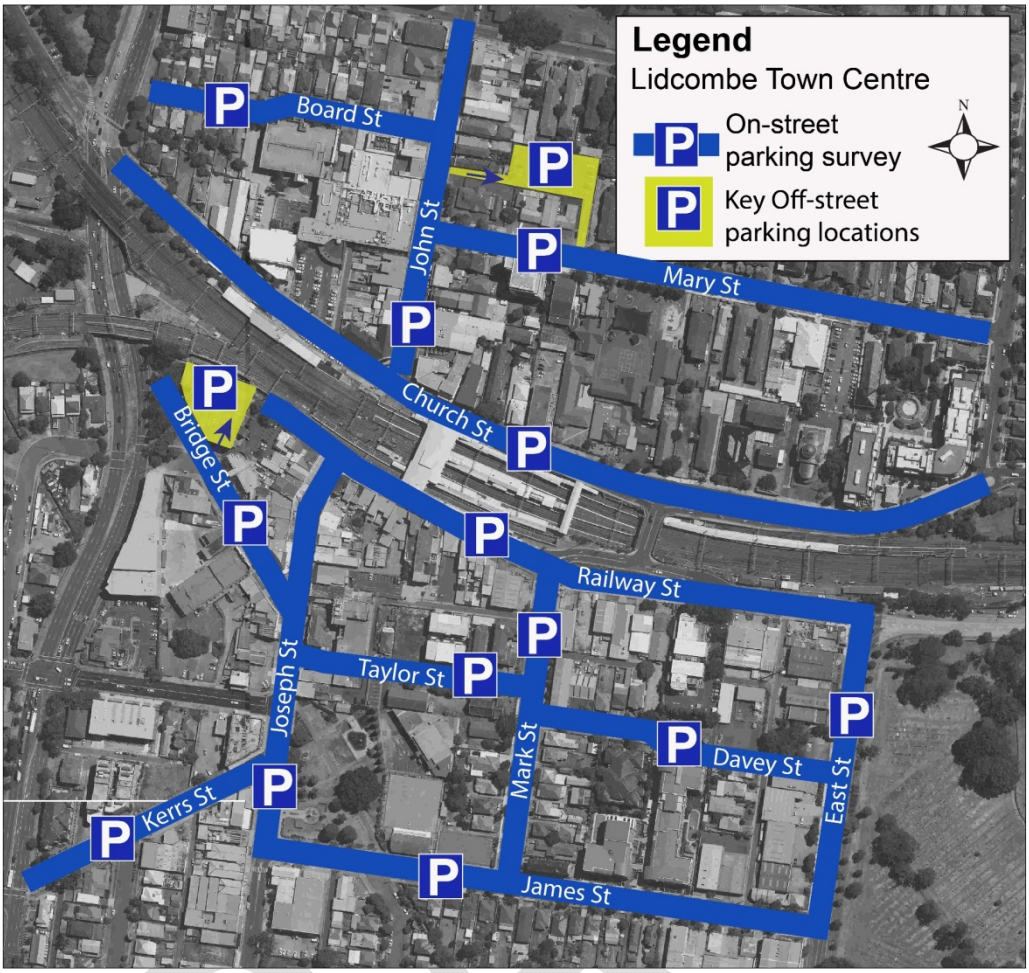


Figure 3-26 Parking Inventory and Accumulation Survey – Lidcombe Town Centre

Figure 3-27 Parking Inventory and Accumulation Survey – Berala Village

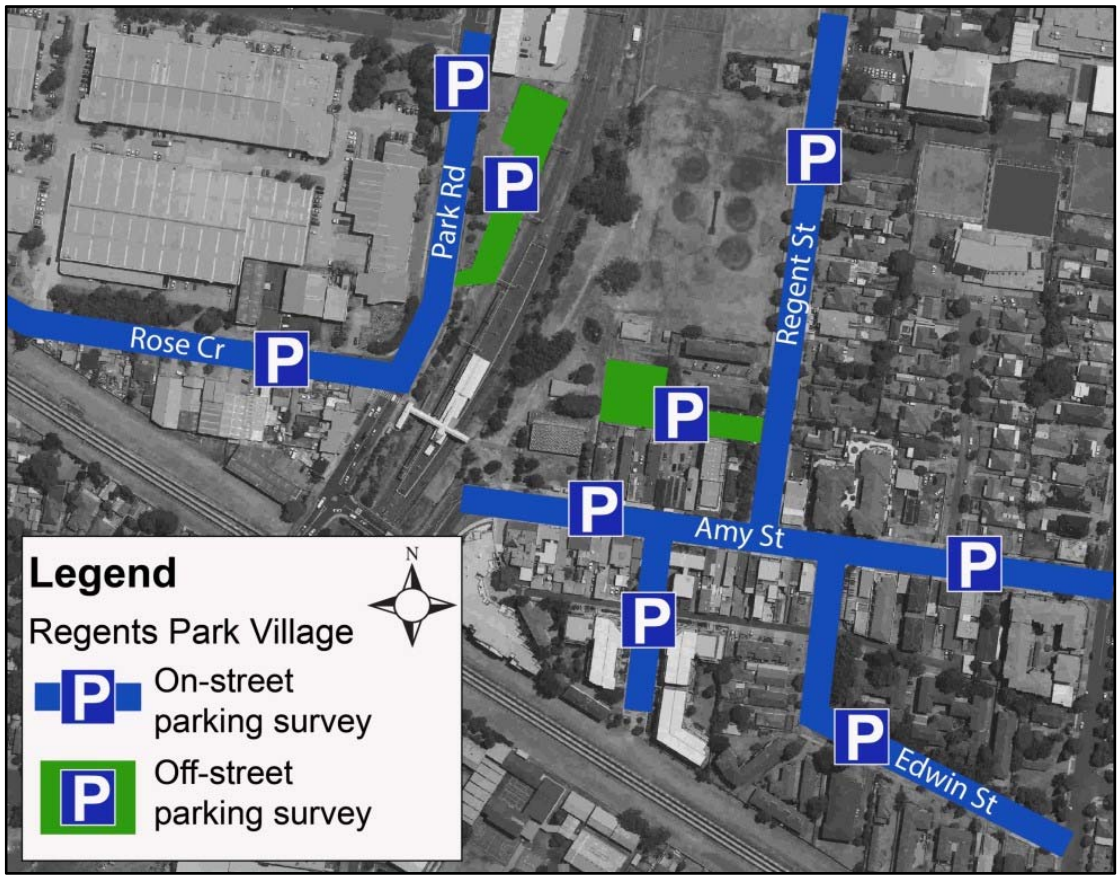


Figure 3-28 Parking Inventory and Accumulation Survey – Regents Park Village

3.6.1 Existing Parking Supply

On-street and off-street public parking spaces has been categorised as short stay and long stay paces. On-street parking includes:

- Short stay spaces where vehicles are allowed to park only for the signposted time limit; and
- Long stay spaces where parking is allowed without a limit time including disabled parking spaces.

This includes on-street parking space at town centres and villages as well as major off-street parking facilities railway stations.

Off-street parking includes:

- Short stay spaces within the various council's car parking; and
- Long stay spaces where parking is available for all members of public.

Key observations are:

- The on-street parking survey results show there are about 770 spaces provided within Auburn Town Centre. Of these approximately 220 spaces are located on the northern site of the rail line, supplemented by a further 300 off-street spaces associated with licensed club (on Station Road and Northumberland Road).
- Some 490 on-street parking spaces on the southern site of the rail line are supplemented by further 1,300 off-street parking spaces at Auburn Central, Civic, Auburn Shopping Village and Aldi.
- Approximately 500 on-street parking spaces are provided within Lidcombe Town Centre.
- Lidcombe Town Centre provides approximately 270 off-street parking spaces. Of these, about 180 are unrestricted (150 spaces at Bridge Street and 29 at John Street).
- There are about 397 total parking spaces provided within Berala Village which include about 295 on-street parking spaces (75%).
- There are about 349 total parking spaces provided within Regents Park Village. Of these about 60% are on-street parking.

Table 3-8 summarises parking inventory for the two town centres and two villages.

Table 3-8 Existing Parking Supply at Town Centre

Type of Parking Restrictions	Auburn Town Centre[(1)]	Lidcombe Town Centre[(2)]	Berala Village	Regents Park Village
On-Street Parking				
Short Stay	467	298	77	79
Long Stay	301	209	218	140
Sub Total On-Street	**768**	**507**	**295**	**219**
Off-Street Parking				
Short Stay	1370[(1)]	94[(2)]	n/a	44
Long Stay	375[(1)]	179[(2)]	102	86
Sub Total Off-Street	**1745**	**273**	**102**	**130**
Total	**2513**	**708**	**397**	**349**
Special Restrictions	34	16	5	9
Grand Total	802	523	402	358

Note: In this Study, off-street parking survey is not undertaken at Auburn and Lidcombe town centre.
(1) Off-street parking data for Auburn town centre was obtained from Auburn Town Centre Parking Strategy Study, March 2011
(2) Off-street parking data for Lidcombe town centre was obtained from Auburn Town Centre Parking Study, January 2010

3.6.2 Existing Parking Occupancy

The average and peak weekday parking occupancy of each parking facility are summarised below. Tables below summarise average and peak parking occupancy at two town centres and two villages.

Key observations are:

- The peak parking occupancy within Auburn Town Centre was observed during AM peak between 8:00 to 9:00. Parking occupancy of at least 85% was observed for on-street parking during busy hour. On average, peaking occupancy for on-street parking at Auburn Town Centre is between 63% and 75%.
- The Auburn Town Centre Parking Strategy Study (March 2011) indicated that the off-street car parks in town centre (i.e. Auburn Central, Civic) have sufficient turnover level.
- Within Lidcombe Town Centre, on-street parking was observed most busy during PM peak. The peak occupancy of at least 90% was observed during between 17:00 to 18:00. On average about 80% of on-street parking spaces within Lidcombe Town Centre was occupied. All disabled parking spaces were occupied during peak period.
- The Lidcombe Town Centre Parking Study (February, 2010) indicated that unrestricted off-street car parks are fully occupied between 11am and 1pm. However, the shot stay off-street car parks were found between 60% and 67% occupied.
- Similarly, within Berala Village, parking was observed most busy during PM peak between 17:00 to 18:00. The peak occupancy of at least 80% was observed for on-street parking and at least 96% was observed for off-street parking. On average about 50% to 60% of parking spaces within Berala Village was occupied

- Within Regents Park Village, parking was observed most busy during PM peak between 17:00 to 18:00. The peak occupancy of at least 80% was observed for both on-street and off-street parking. On average about 50% to 60% of parking spaces within Regents Park Village was occupied
- In general, about 85% of all spaces were occupied during the peak period. The uses of short stay and long stay spaces were fairy equal throughout the study area at 85% during peak period. On-street parking spaces were used at a higher rate than off-street counterparts.

The result shows that in general the parking supply in the town centres and villages are close to the optimal 15% vacancy level to prevent or limit cars circulating. Lidcombe town centre shows slightly low vacancy level during peak period. This indicates that parking demand would be catered for by an adequate supply for both now and some years to come. However, this also indicates a need for further investigation for parking demand for new development.

Table 3-9 Peak Parking Occupancy at Auburn Town Centre

Type of Parking Restrictions	Capacity	Parking Occupancy at					Avg.	Peak
		7am	8am	4pm	5pm	Peak		
On-Street Parking								
Short Stay	467	176	283	339	312	386	63%	83%
Long Stay	301	240	268	210	192	268	75%	89%
Sub Total On-Street	**768**	**416**	**551**	**549**	**504**	**654**	**68%**	**85%**
Special Restrictions	34	10	4	19	19	19		
Grand Total	**802**	**426**	**555**	**568**	**523**	**673**	**67%**	**84%**

Note: In this study, off-street parking survey is not undertaken at Auburn and Lidcombe town centre. Off-street parking data for Auburn town centre was obtained from Auburn Town Centre Parking Strategy Study, March 2011

Table 3-10 Peak Parking Occupancy at Lidcombe Town Centre

Type of Parking Restrictions	Capacity	Parking Occupancy at					Avg.	Peak
		7am	8am	4pm	5pm	Peak		
On-Street Parking								
Short Stay	298	201	201	263	275	275	78%	92%
Long Stay	209	171	181	157	169	182	82%	87%
Sub Total On-Street	**507**	**372**	**382**	**420**	**444**	**457**	**79%**	**90%**
Special Restrictions	16	7	8	15	15	15		
Grand Total	523	379	390	435	459	472	79%	90%

Note: In this Study, off-street parking survey is not undertaken at Auburn and Lidcombe town centre. Off-street parking data for Lidcombe town centre was obtained from Auburn Town Centre Parking Study, January 2010

Table 3-11 Peak Parking Occupancy at Berala Village

Type of Parking Restrictions	Capacity	Parking Occupancy at					Avg.	Peak
		7am	8am	4pm	5pm	Peak		
On-Street Parking								
Short Stay	77	33	42	42	47	48	54%	62%
Long Stay	218	126	157	140	154	184	70%	84%
Sub Total On-Street	295	159	199	182	201	232	66%	79%
Off-Street Parking								
Short Term	n/a							
Long Term	102	63	96	75	53	98	71%	96%
Sub Total Off-Street	**102**	**63**	**96**	**75**	**53**	**98**	**71%**	**96%**
Total	**397**	**222**	**295**	**257**	**254**	**330**	**67%**	**83%**
Special Restrictions	5	2	0	0	0	2		
Grand Total	402	224	295	257	254	332	66%	83%

Table 3-12 Peak Parking Occupancy at Regents Park Village

Type of Parking Restrictions	Capacity	Parking Occupancy at					Avg.	Peak
		7am	8am	4pm	5pm	Peak		
On-Street Parking								
Short Stay	79	28	44	55	58	68	62%	86%
Long Stay	140	83	85	71	69	113	56%	81%
Sub-Total On-Street	219	111	129	126	127	181	58%	83%
Off-Street Parking								
Short Stay	44	8	18	33	16	33	41%	75%
Long Stay	86	25	39	61	36	61	44%	71%
Sub-Total Off-Street	**130**	**33**	**57**	**94**	**52**	**94**	**43%**	72%
Total	**349**	**144**	**186**	**220**	**179**	**275**	**52%**	79%
Special Restrictions	9	0	0	0	0	3		
Grand Total	358	144	186	220	179	278	51%	78%

3.6.3 Existing Parking Conditions

Table below depicts the existing parking conditions in major centres and locations across the study area. Site visit observation was conducted on Wednesday 1 August 2012 during morning peak period.

Table 3-13 Exiting Parking Condition, August 2012

Site Observation	Photo
Newington Village Shopping Centre The car park has over 200 parking spaces with the first two hours free. It had adequate parking availability during observation period.	
Lidcombe Station On-street car parking is often fully occupied during observation period.	
Lidcombe Station Park and Ride multi-deck car park is located at Tooheys Lane/Bridge Street. This car park is busy during observation period.	

Site Observation	Photo
Regents Park Station A community car park is located at Regents Street. It has a four hour parking restriction.	
Amy Street, Regents Park Station On-street car parking is often fully occupied.	
Woodburn Road, Berala Station On-street car parking has high occupancy during observation period.	

Site Observation	Photo
Campbell Street, Berala Station Unrestricted on-street parking at the west of Berala Station is used by rail commuters. It is fully occupied during observation period.	
Auburn Road, Auburn Town Centre The half-hour on-street parking is fully occupied during observation period.	
South Parade, Auburn Town Centre The on-street parking is fully occupied. Some double parking was observed.	

Site Observation	Photo
Susan Street Multi-deck Council Car Park, Auburn The car park was observed to be approximately 30% full during the weekday afternoon.	

4 Assessment of Travel Movements and Patterns

This section summarises the existing travel movements across the Auburn LGA using data from the Bureau of Transport Statistic (BTS) 2006 Journey to Work (JTW) and Household Travel Survey (HTS).

4.1 Auburn Travel Movements

Auburn LGA is home to about 69,000 residents and provides over 542 ha of employment land or approximately 45,800 jobs as of 2006. In combination with the Parramatta and Bankstown this constitutes the greatest concentration of industrial jobs in Sydney's middle ring. Draft West Central Sub-Regional Strategy 2007 (DWCSS) targets Auburn will provide additional 17,000 dwelling and generate addition 12,000 jobs by year 2031.

Auburn LGA is predominantly a residential and industrial area. **Figure 4-29** shows the existing land uses across the Auburn LGA. Major residential suburbs are Auburn, Berala, Wentworth Point, Lidcombe, Newington, Regents Park and Silverwater. Major industrial lands are located along the M4 and Parramatta Road at Lidcombe and Silverwater.

The Auburn Employment Land Study (2008) indicated that of the 45,800 jobs generated within the Auburn LGA as of 2006, the majority of Auburn's labour force travelled outside the LGA to and from a variety of locations including the City of Sydney, Parramatta, Bankstown and Strathfield. The following section summarise key employment and residential locations of Auburn's residents and works determined from JTW data.

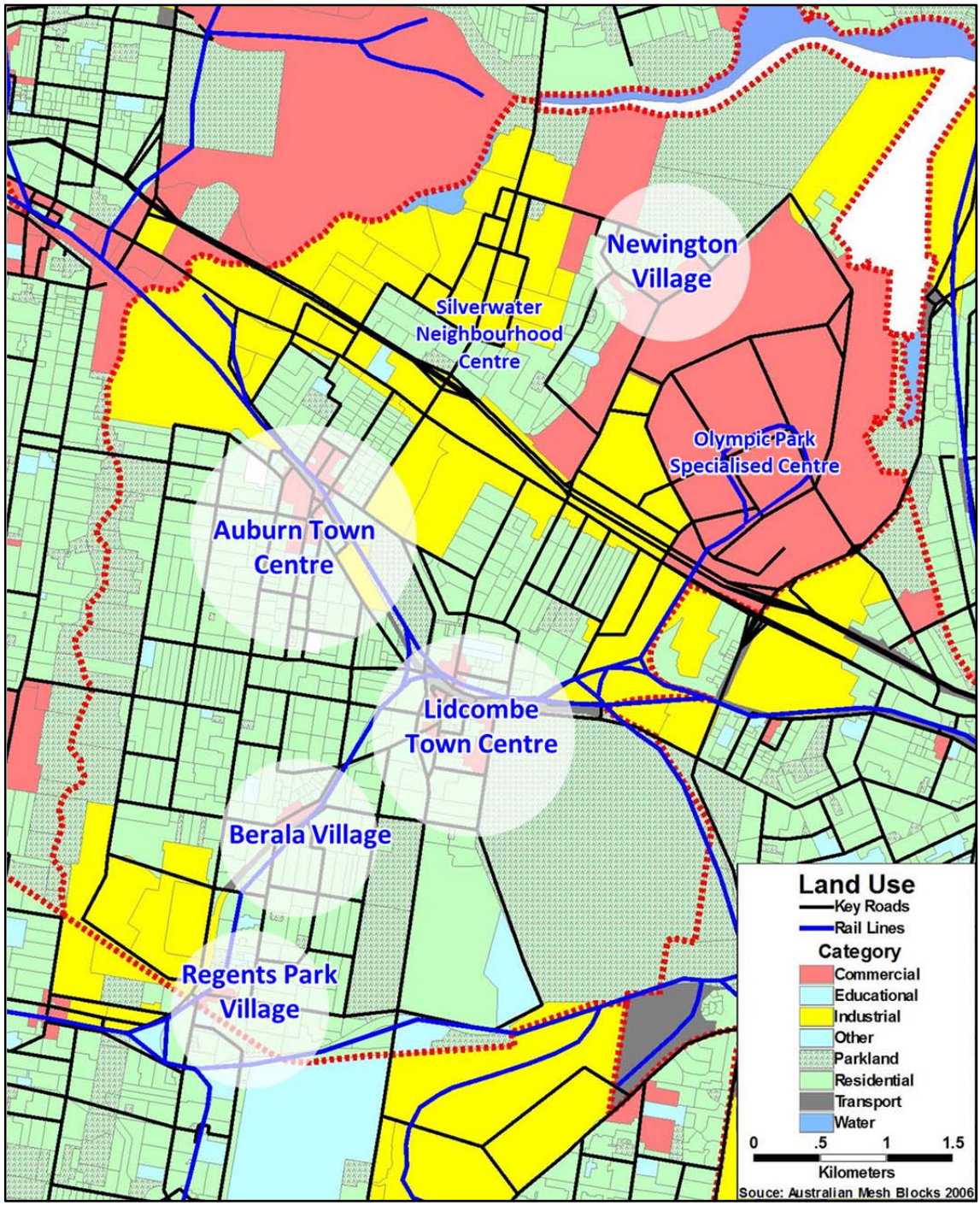


Figure 4-29 Existing Land Use of Auburn LGA

4.1.1 Key Employment Locations of Residents

Journey to work trips of Auburn's residents are summarised in **Table 4-14. Figure 4-30** shows key employment locations of Auburn's residents. The JTW data shows approximately 24% of residents live and work within Auburn LGA. About 76% travels to work outside the LGA. Those key employment locations outside Auburn with more than 1,000 daily work trips area are:

- Parramatta;
- Inner Sydney;
- Inner Western Sydney (Burwood, Canada Bay, Strathfield and Ashfield);
- Lower Northern Sydney (Hunter's Hill, Mosman, North Sydney, Ryde, Willoughby, and Lane Cove);
- Bankstown; and
- Fairfield and Liverpool.

Table 4-14 Journey to Work Trips from Auburn to Key Destinations (SSD's)

To Destination - SSD	Daily Work Trips from Auburn LGA (Outbound)	
Central Western Sydney	6,700	34%
Auburn LGA	*4,620*	*24%*
Holroyd LGA	*491*	*2%*
Parramatta LGA	*1,589*	*8%*
Inner Sydney	4,420	22%
Inner Western Sydney	1,899	10%
Lower Northern Sydney	1,785	9%
Canterbury-Bankstown	1,641	8%
Fairfield-Liverpool	885	5%
Blacktown	587	3%
Central Northern Sydney	515	3%
St George-Sutherland	422	2%
Eastern Suburbs	356	2%
Outer Western Sydney	140	1%
Outer South Western Sydney	116	1%
Northern Beaches	105	1%
Others	81	Less than 1%
Total GMA	**19,652**	**100%**

Source: JTW 2006, SSD – Statistical Sub Division, GMA – Greater Metropolitan Area

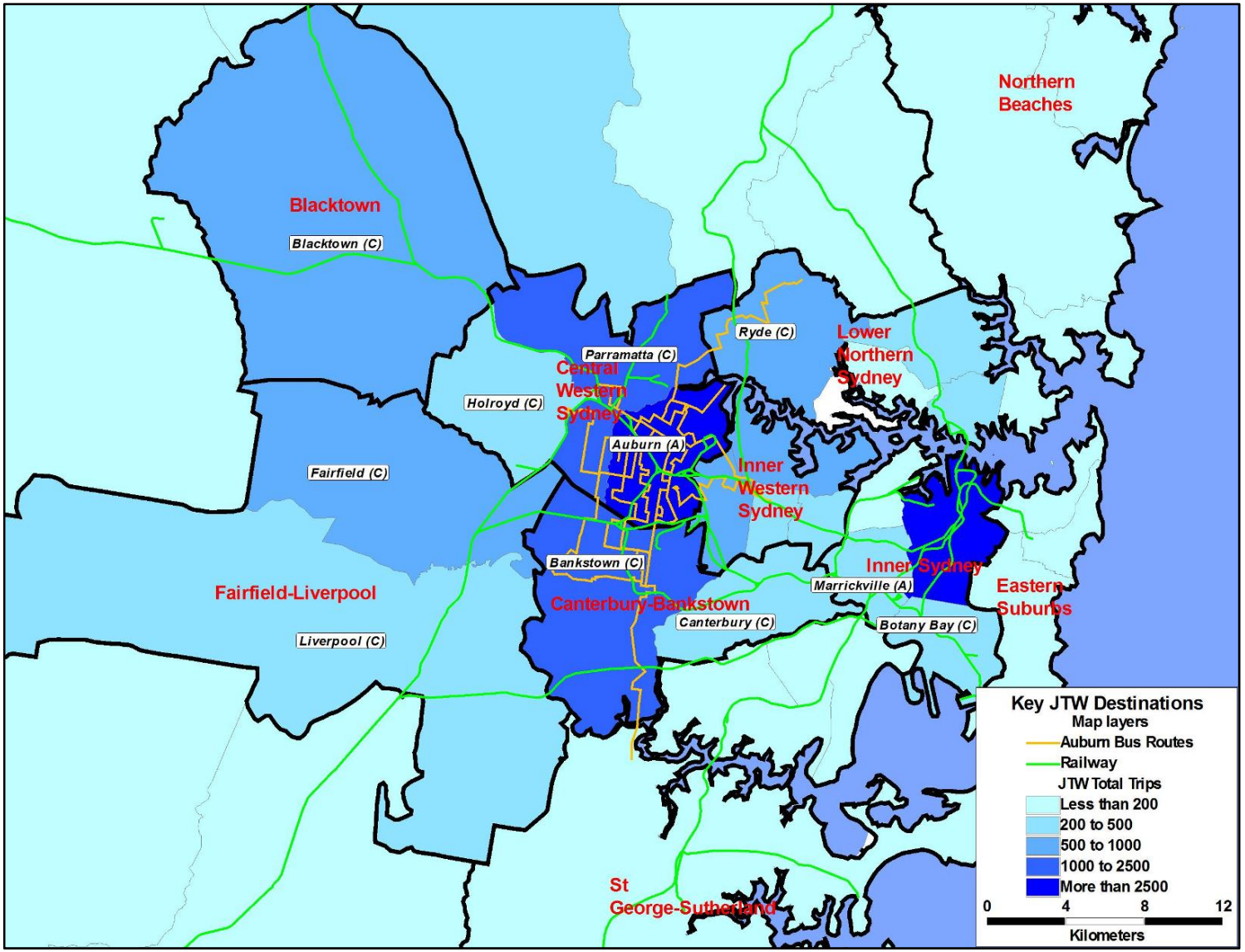


Figure 4-30 Key Journey to Work Destination of Auburn LGA (SSD's)

4.1.2 Key Residential Locations of Worker

Journey to work trips of Auburn's workers are summarised in **Table 4-15**. **Figure 4-31** shows key residential locations of Auburn's workers. The JTW data shows only 11% Auburn's works live and work within the LGA. About 89% travels from variety of locations outside the LGA. Those key residential locations outside Auburn with more than 3,000 daily work trips area are:

- Parramatta;
- Central North Sydney (Ku-ring-gai, Baulkham Hills and Hornsby);
- Fairfield and Liverpool;
- Blacktown;
- Canterbury and Bankstown and
- Outer Western Sydney (Blue Mountains, Hawkesbury and Penrith).

Table 4-15 Journey to Work Trips to Auburn from Key Origin (SSD's)

From Origin – SSD	Daily Work Trips to Auburn LGA (Inbound)	
Central Western Sydney	9,807	24%
Auburn LGA	*4,620*	*11%*
Holroyd LGA	*1,874*	*5%*
Parramatta LGA	*3,313*	*8%*
Central Northern Sydney	3,974	10%
Fairfield-Liverpool	3,926	10%
Blacktown	3,885	10%
Canterbury-Bankstown	3,521	9%
Outer Western Sydney	3,060	7%
St George-Sutherland	2,575	6%
Inner Western Sydney	2,461	6%
Lower Northern Sydney	1,969	5%
Outer South Western Sydney	1,823	4%
Inner Sydney	1,530	4%
Northern Beaches	653	2%
Eastern Suburbs	607	1%
Others	1,095	3%
Total GMA	**40,886**	**100%**

Source: JTW 2006, SSD – Statistical Sub Division, GMA – Greater Metropolitan Area

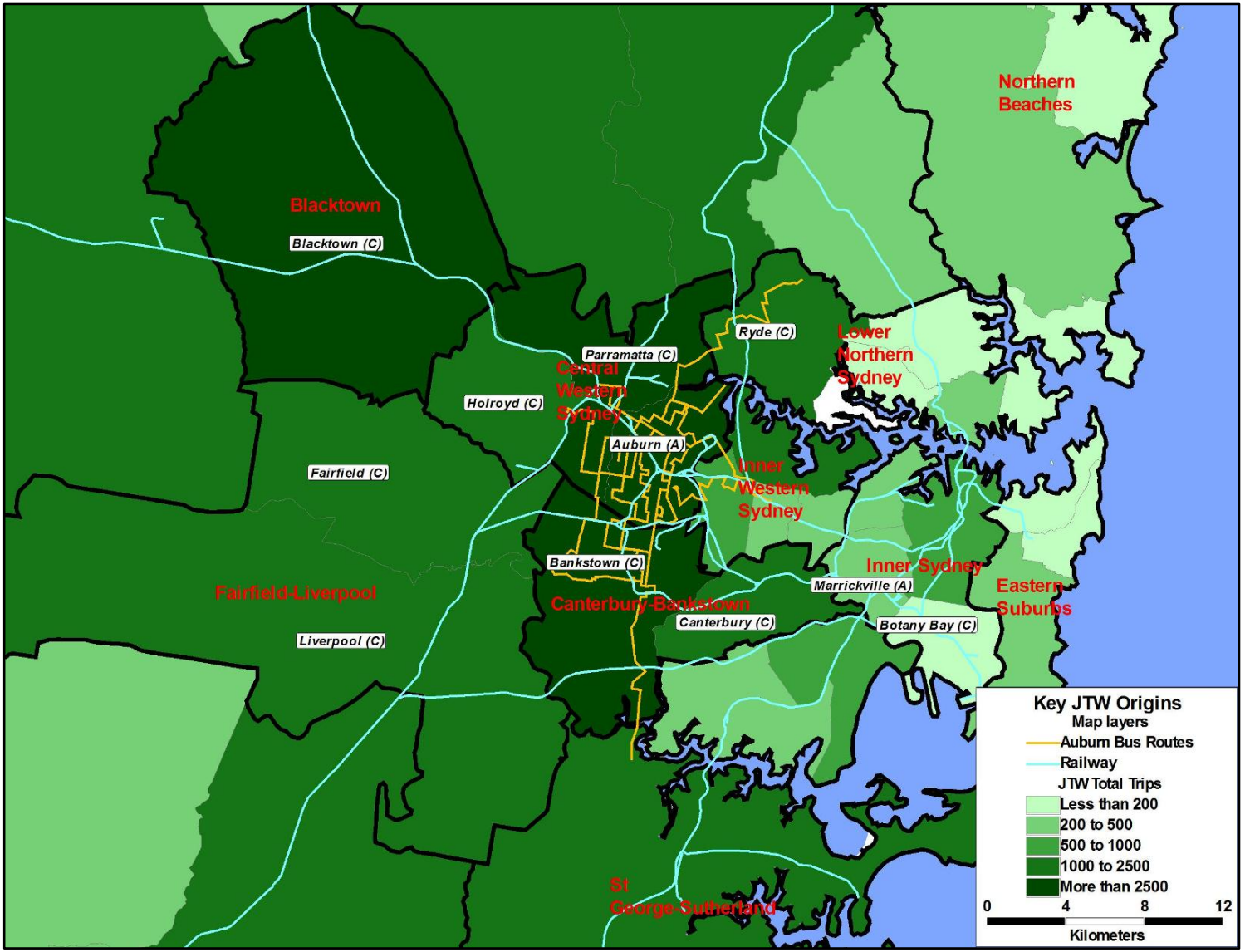


Figure 4-31 Key Journey to Work Origins of Auburn LGA (SSD's)

4.2 Auburn Travel Mode Share

Table 4-16 below summarises some of the key transport indicators for the Auburn LGA and the Sydney Statistical division sourced from the HTS. Generally, Auburn's residents exhibit lower trip making and car based mode shares than the average for Sydney. Total travel per person (km), VKT's per person and daily travel times are all below the Sydney average. The current car ownership is 1.25 vehicles per household, lower than Sydney average.

Table 4-16 Transport Indicators, Auburn LGA and Sydney SD, 2008/09 (all trips)

Indicator	Sydney	Auburn
Population	4,269,000	69,000
Households	1,626,000	23,000
Trips per person	3.76	3.7
Total travel per person (km)	31.1	23.6
Vehicles per household	1.51	1.25
Ave. trip length	8.3	6.4
VKT per person	18	12
Ave. work trips (mins)	34	30
Daily travel time (per person)	81	79

Source: BTS HTS 2011, SD – Statistical Division.

The existing Auburn JTW mode share for bus is low at about 1%. Scope exists to increase this mode share, however, care needs to be taken not to achieve such an improvement solely at the expense of rail based trips. Increased bus mode shares should be achieved at the expense of existing car based JTW trips.

Car based trip making dominates across the Auburn LGA, albeit it a rate below that prevailing across Sydney. If it were not for the accessibility of the heavy rail lines and the multiple stations themselves, the mode share to car would be even higher and the level of peak and off peak congestion much worse. These issues will be explored in greater detail in Stage 2 of this investigation.

Table 4-17 below summarises the main mode of travel for journey to work trips originating in the Auburn LGA to destinations outside the LGA. The data shows that Almost one third of Auburn workers use rail to travel to and from their place of employment which is positive and forms a solid base on which to build an even stronger public transport focussed LGA. This positive current travel characteristic also warrants investment and development.

Successfully boosting bus mode shares is likely to be achieved by boosting bus service frequencies and capacities to and from the rail stations. It is unlikely that increases in bus mode shares will be achieved where buses compete directly with the well established rail markets. Rather, the buses should supplement them by linking patrons to and from the rail hubs both during and outside peak periods.

Table 4-18 which summarises the mode of travel used for journey to work to destinations within the Auburn LGA. About 14% of work trips within LGA are made by walking, which is low compared to Inner Sydney SSD (involving Sydney, Botany Bay, Leichhardt and Marrickville). This strongly indicates needs of pedestrian facilities.

Table 4-17 Mode of Travel for JTW – Originating in LGA, Destination outside LGA

Travel Mode	Destination outside Auburn LGA	Destination outside Inner Sydney SSD(1)
Car Driver	53%	51%
Car Passenger	6%	4%
Train	29%	17%
Bus	1%	8%
Walked only	1%	4%
Cycle	Less than 1%	1%
Taxi	Less than 1%	1%
Other	1%	2%
Worked at home/ Did not travel/ Not stated	10%	13%

Source: JTW06, BTS, Consultant analysis, SSD – Statistic Sub-division
(1) Inner Sydney SSD involves Sydney, Botany Bay, Leichhardt, and Marrickville

Table 4-18 Mode of Travel for JTW – Origin and Destination within the LGA

Travel Mode	Destination within Auburn LGA	Destination within Inner Sydney SSD(1)
Car Driver	52%	24%
Car Passenger	8%	4%
Train	4%	11%
Bus	2%	18%
Walked only	14%	21%
Cycle	1%	2%
Taxi	1%	1%
Other	1%	3%
Worked at home/ Did not travel/ Not stated	17%	15%

Source: JTW06, BTS, Consultant analysis, SSD – Statistic Sub-division
(1) Inner Sydney SSD involves Sydney, Botany Bay, Leichhardt, and Marrickville

5 Key Transport Issues and Strategic Response

5.1 Key Transport Issues

The specific issues and suggested responses outlined below have been developed having regard to the following broader strategic objectives:

1. Ensuring future consistency with strategic land use and transport policy and planning directions at Federal, State and Western Sydney levels.
2. Improving transport network performance, transport efficiency, the ability of the transport system to support key economic sectors and adapt to changes in fuel price and availability.
3. Minimising environmental impacts including greenhouse gases, diesel and other exhaust emissions, water and noise pollution and issues of location sensitivity.
4. Creating positive benefits for regional and local accessibility, the liveability of the region and the health and fitness of transport users.
5. Increasing road and traffic safety, pedestrian and cyclist safety and personal security while using transport.
6. Ensuring good governance for all projects including affordability, readiness for implementation and obtaining community and business support.

The assessment of existing travel patterns across the Auburn LGA shows that there is scope to build on what is an already strong walk/cycle culture for journey to work and non work trip purposes. In this regard most of the issues and suggested responses relate to active transport (non-motorised) forms of movement.

5.1.1 Rail

The capacity of the western rail line to accommodate growth in peak period journey to work and non work travel is constrained. Peak load factors are at or exceed capacity during peak periods. Any relief is most likely to be achieved in the medium to longer term when the effects of the initiatives outlined in Sydney's Rail Future are felt. This is one reason why, in a strategic sense, the greatest short term benefits are likely to be achieved in the active transport areas. Any rail initiatives should focus on:

1. Adopting the provisions of the June 2012 announced 'Sydney Rail Future'.
2. Securing NSW Government agreement to undertake a needs study for more commuter car parking at both Auburn and Lidcombe stations.

5.1.2 Bus

Discussions with Sydney Buses indicate that there are no proposed changes in routes and timetables for services within the Auburn LGA.

Bus shelters are a concern for the Auburn LGA with some instances of inadequate shelter provision. In some cases bus stops are provided with a shelter but it is not linked to a footpath, and other locations where busy bus stops are not provided with a shelter or the shelter is only capable of protecting some waiting passengers as shown in **Figure 5-32** below.

There is also a lack of bus timetable and route information at many bus stops.

Photo taken in August 2012

Figure 5-32 Over-crowded Bus Stop on Church Street, Lacombe Station Lidcombe

Photo taken in August 2012

Figure 5-33 Bus Shelter with Narrow Walkway on Auburn Road, north of Beatrice Street

5.1.3 Cycling

Poor linemarking on shared cycle paths and lack of signage were observed on the existing local cycle routes throughout the LGA. **Figure 3-33** in Section 3 highlights those locations.

In addition, on inspection of the various bicycle routes/ parking facilities within the Auburn LGA it was discovered that some minor issues exist with the infrastructure currently in place.

Table 5-19 Recommended Need for Cycling Facilities Improvements

Routes	Description	Photo	Potential Amendment/solution
Auburn Station	Unutilised bicycle lockers and rails / fences are being used for bicycle storage instead Additionally free cycle storage on the opposite side of the station (Rawson street) is being used ahead of the hire out lockers		In addition to locker hire, implement additional free bicycle racks
Lidcombe Station	Bicycles parked against fences as there are an inadequate number of cycling racks		Install further cycling racks outside stations and major interchange points
General Route issues	Although there is adequate space provided in cycling lanes throughout the LGA there are a large number of these that are not marked appropriately		Regular inspection of cycling routes and schedule maintenance for these roads for the installation of correct delineated cycling lane markers.
Auburn Station	It is noted that eight bicycle lockers are available for hiring at Auburn Station. However, the free of charge bicycle rack parking are full		Provide more bicycle racks near the station especially on Rawson Street.

Routes	Description	Photo	Potential Amendment/solution
Lidcombe Station	All the bicycle lockers / bicycle racks are fully occupied. A number of bicycles are parked illegally on site.		Provide additional bicycle parking facilities near the station.
Berala Station	There are only a few bicycle racks at the station with high occupancy rate.		Provide additional bicycle parking facilities near the station.

Table 5-20 Recommended Need for Cycleway Improvements

Location	Description	Photo	Potential Amendment/solution
Amy Street, near Regents Park Station	Amy Street is a designated cycle route and also a busy street with bus truck running in the area with on-street parking which is not an attractive route for cyclists with potential safety issues.		Investigate the local streets as an alternative bicycle route.
General	Throughout the study are, there is not enough route maps and/or directional signage for the bicycle routes, especially for unfamiliar cyclists.		Council to review and provide more route maps and /or directional signage for unfamiliar cyclists.

5.1.4 Pedestrians

A review of the pedestrian facilities and conditions present within the Auburn LGA has shown a number of issues that are present throughout the LGA where improvements can be made to enhance the existing network for pedestrian trip patterns and desire lines with the goal being to encourage a larger number of trips to be made on foot.

The 2000 PAMP has been used in conjunction with other relevant documentation and evidence collected from site visits to establish a basis for necessary improvements to the pedestrian network in the Auburn LGA. The table below outlines the more significant issues and makes suggestions for potential amendments to the existing pedestrian network. **Table 5-21** below summarises the pedestrian facilities and needs found during the site visits.

Table 5-21 Recommended Need for Works Program for Pedestrian

Routes	Description	Photo	Potential Amendment/solution
Civic Road, Auburn	Civic Road and Auburn Road "wall" pedestrian crossing to be improved. Crossing movement to be improved.		Inclusive of PAMP 2000. Adding pedestrian refuge in centre of the crossing is recommended.
Auburn Road	Discontinuity of the pedestrian footpath is caused by the bus shelter leaving minmal space infront of and behind the shelter for the movement of pedestrians, especially during peak hours.	 Location of bus shelter reduces usable footpath width	Relocate bus stop towards the back of the footpath to the back of the path to create more room. This is not a necessary change as the bus shelter does meet the 1m minimum requirements. However for a town centre thoroughfare it is appropriate.

Routes	Description	Photo	Potential Amendment/solution
Auburn Road, Kerr Parade	Combination of angled pavers and bitumen creates an uneven footpath interface which is hazardous to pedestrians. This issue prevails throughout much of Auburn Road and the Eastern end of Kerr Parade.	 Poor pedestrian footpath quality	Maintenance / upgrade of footpath pavement.

Routes	Description	Photo	Potential Amendment/solution
Kerr parade/Station Road	Pedestrians are at risk when crossing the intersections at Kerr parade and Station Road (a) and Crossing of Kerr parade (b). (b) An existing edge kerb may cause pedestrians to cross at this location but this is unsafe due to the amount of traffic coming from the Auburn Town Centre and the traffic bridge.	 a) Lack of pedestrian safety  b) Lack of pedestrian safety	Implement signal lights at both crossing points. Zebra crossing would not be practical due to the close proximity to the intersection.

Routes	Description	Photo	Potential Amendment/solution
Berala	This route is obviously being used as a pedestrian route despite the footpath across the road. Therefore a lack of a path here may pose a risk to pedestrians.	 Lack of pedestrian footpath on Campbell Street, Berala.	Install pedestrian path on this side of the road as the use of this area is obviously required by pedestrians.
Olympic Park	Bus Shelter has a discontinued pedestrian footpath on the left hand side of the road without the provision of a pedestrian crossing within a reasonable locality.	 Lack/discontinuation of pedestrian footpath at bus stop on Oxford Street.	Install pedestrian footpath on left hand side of the road (with respect to this image). Or Install pedestrian crossing with a refuge to provide safe crossings to the opposite side of the road.

5.1.5 Taxi Services

Auburn Station taxi rank in combination with the bus stop directly behind the taxi rank will need to be investigated to ensure there is no unreasonable impact upon passing traffic. Considerations must be made for future scale or entering traffic into the town centres and villages including any increase in bus services that may cause a combined impact upon typical traffic conditions.

5.1.6 Parking

The parking survey results show that about 85% of spaces in town centres and villages were occupied during both AM and PM peak periods. The uses of short stay and long stay spaces were fairy equal throughout the study area at 85% during peak periods. On-street parking spaces were used at a higher rate than off-street counterparts.

The result shows that in general the parking supply in the town centres and villages are close to the optimal 15% vacancy level to prevent or limit cars circulating. This indicates that parking demand would be catered for by an adequate supply for both now and some years to come. However, this also indicates a need for further investigation for parking demand for new development.

5.2 Summary of Strategic Response

5.2.1 LGA wide responses

The key issues and possible responses are summarised in **Table 5-22** below:

Table 5-22 Key Multi Modal Transport Issues

Location	Issue	Possible Response	Responsibility
Rail:			
LGA wide	Constrained peak period heavy rail capacity on the western line.	Adopt provisions of the June 2012 announced 'Sydney Rail Future'.	NSW Government.
Auburn Town Centre	Provision of more formal commuter car parking.	Secure NSW Government agreement to undertake needs study.	NSW Government.
Lidcombe Town Centre	Provision of more formal commuter car parking.	Secure NSW Government agreement to undertake needs study.	NSW Government.
Berala Railway Station	Berala is the only railway station in Auburn LGA that doesn't have accessible facilities for its patrons.	Council to lobby the State government to improve accessibility at Berala Station.	NSW Government.
Bus:			
LGA wide	The existing cross regional bus services (M91 and M92) are well servicing north-south journey. However there is limited service of an east-west running across regional bus service linking the LGA with other cities.	No need for short to medium term augmentation of these north-south focussed cross regional services. There is scope to investigate the need and likely patronage of an east-west running cross regional bus service linking the LGA with the Sydney and North Sydney CBDs.	NSW Government.
LGA wide	LGA wide local and cross regional bus service coverage is good and in the short to medium term do not warrant amendment.	Monitor over time with changes to residential and employment densities	NSW Government.
LGA wide	The current mode share for bus travel represents only 1% of journey to work for the Auburn LGA.	Improve bus JTWmode shares, especially to non CBD based destinations by improving bus infrastructure, accessibility and information dissemination.	NSW Government / Auburn Council.

Location	Issue	Possible Response	Responsibility
LGA wide	Low peak period service frequencies for many bus services.	Initiate communication with TfNSW and bus operators to determine scope to increase peak period services.	NSW Government, Sydney Buses and Veolia Transport NSW.
Auburn Town Centre	Inadequate shelters, hard stand waiting areas and bus information at both interchanges.	Provide shelters, greater unobstructed hard stand waiting areas and real time bus information at bus stops on both sides of the rail line.	NSW Government & Auburn Council.
Lidcombe Town Centre	Inadequate shelters, hard stand waiting areas and bus information at both interchanges.	Provide shelters, greater unobstructed hard stand waiting areas and real time bus information at bus stops on both sides of the rail line.	NSW Government & Auburn Council.
Auburn and Lidcombe town centres, Berala and Regents Park villages.	Delays to bus access at key intersections during peak periods including (Auburn) Northumberland / Rawson, Station / Rawson, (Lidcombe) John / Church, Vaughan / Joseph.	Determine scope to provide bus priority at key intersections serving the town centres and villages.	NSW Government & RMS.
Cycling:			
LGA wide	*Implementation of new Lidcombe to Strathfield cycle route.* This link connects Lidcombe and Strathfield via the South of Rookwood Cemetery along the rail line. This new route was identified in NSW Bike Plan 2010	Determine scope to provide in consultation with TfNSW.	NSW Government & RMS.
LGA wide	*New Duck River cycleway*, between Silverwater Park and Duck River Reserve along the Duck River. This new route was identified in NSW Bike Plan 2010	Determine scope to provide in consultation with TfNSW.	NSW Government & RMS.
LGA wide	*New Regents Park to Chester Hill cycle route*. This provides a direct link between Regents Park and Park Reserves along the water supply pipeline. This new route was identified in the 2009 Auburn City Council Bicycle Route Map.	Determine scope to provide in consultation with TfNSW.	NSW Government & RMS.
LGA wide	Poor line marking on shared cycle paths.	Delineate on road cycle routes with more legible and continuous line marking.	Auburn Council.

Location	Issue	Possible Response	Responsibility
LGA wide	Directional signage for cyclists is poor and inadequate.	Increase amount and legibility of signage in and around town centres/villages and along heavy patronised routes.	Auburn Council.
Auburn Town Centre	Provided Bicycle lockers are not being used and bikes are being chained to rails and fences instead. Free cycle storage on the opposite side of the station (Rawson street) is well utilised.	Make lockers free for access to general public. Install additional bike racks on both sides of the station.	NSW Government.
Auburn and Lidcombe town centres	Opportunity to reduce car based travel to and from the town centres and rail interchanges.	Identify opportunities for shared facilities – i.e. not just serving rail passengers, but also town centre users: for example, bike hub or pods conveniently located so that it can be used by town centre workers as well as rail commuters.	Auburn Council.
Lidcombe Town Centre	As above.	Make lockers free for access to general public. Install additional bike racks on both sides of the station.	NSW Government.
Berala Station	None or few bicycle parking facilities provided.	Install bike racks on both sides of the station.	NSW Government.
Regents Park Village	Amy Street is a classified 23m B-Double Route. There is conflict between heavy vehicles and cyclists using Amy street in the vicinity of the rail station.	Consider removal of some on street parking at key pinch point locations and line mark accordingly.	Auburn Council.
Pedestrian:			
LGA wide	Location of bus shelters reduces capacity of footpaths eg: Auburn Road, Auburn.	Set shelters back against property boundary where possible.	Auburn Council.
Auburn Town Centre	As identified in the Auburn Town Centre Public Domain Plan 2009.	Consider the various actions contained within the 2009 ATCPDP.	Auburn Council.
Auburn Town Centre	Civic Road and Auburn Road “wall” pedestrian crossing safety to be improved with additional advisory signage.	Add pedestrian refuge in centre of the crossing and provide advisory signage.	Auburn Council.

Location	Issue	Possible Response	Responsibility
Auburn Town Centre	Poor paving treatment along key footpaths is both a trip hazard and a poor urban design outcome.EG: Auburn Road and the Eastern end of Kerr Parade, Auburn.	Repave extended lengths of key footpaths in consistent paving material to appropriate standards. Auburn Town Centre Upgrade currently being undertaken by Council will address this issue.	Auburn Council.
Auburn Town Centre	Pedestrian safety is compromised when crossing the Kerr Parade / Station Road intersection and Kerr Parade itself.	Possibly signalise or provide renewed zebra markings with advisory signage. Auburn Town Centre Upgrade currently being undertaken by Council will address this issue.	Auburn Council.
Berala	No concrete footpath along Campbell Street. Trip hazard and poor urban design outcome.	Provide concrete footpath.	Auburn Council.
Taxi & Kiss and Ride:			
LGA wide	Some interchange areas do not have formal designated taxi zones within close proximity of the station or have illegible signage.	Provide taxi ranks at all rail station interchange areas with appropriate and clear signage.	Auburn Council.
LGA wide	Some interchange areas do not have formal designated kiss and ride zones within close proximity of the station or have illegible signage.	Provide kiss and ride spaces at all rail station interchange areas with appropriate and clear signage.	Auburn Council.
Parking:			
Auburn Town Centre	Provision of formal commuter car parking	Secure NSW Government agreement to undertake needs study.	NSW Government.
Auburn Town Centre	Issues identified in the 2011 Auburn Town Centre Parking Strategy Study.	Consider the various actions contained within the 2009 ATCPDP	Auburn Council.
Lidcombe Town Centre	Provision of formal commuter car parking	Secure NSW Government agreement to undertake needs study.	NSW Government.
Berala Village	Unrestricted on-street parking along Campbell Street adversely impacts resident and visitor accessibility.	Monitor and assess feasibility of resident parking scheme or time restrictions.	Auburn Council in consultation with CityRail.

5.2.2 Access and Mobility Responses

Access and mobility needs to be available for all residents and their needs within the Auburn LGA. This section draws together recommendations relevant to access and mobility that have been mentioned earlier in this report.

Rail

Currently various transport sector in the Auburn local government area has been installed to assist with mobility needs. Auburn, Lidcombe, Regents Park and Sydney Olympic Park are all equipped with disabled facilities including lifts and ramps. Taxi ranks are available at all stations making journeys easier for all travellers and all stations are equipped with bus interchanges to transport resident's employees and visitors around the Auburn LGA. Berala is the only railway station that doesn't have accessible facilities for its patrons.

Bus

Additional services and special bus services are provided during major events at Sydney Olympic Park. Council provides a 24 seater wheelchair accessible community bus which can be hired out by any group or person

Facilities for waiting passengers are limited and generally comprise covered waiting areas with seating and some basic bus timetable information. In busy areas, the bus waiting facilities provided by Council are not adequate to meet demand in peak periods. In Lidcombe the lack of facilities in peak hours results in passenger queuing along the pedestrian walkway. This is an inconvenience to passengers, particularly the elderly or those with mobility difficulties.

Pedestrian

A Pedestrian Access Mobility Plan (PAMP) has been prepared previously in October 2000. It provides a strategic context of the pedestrian accessibility. In order to provide safe access to, from and within the major centres across the Auburn LGA the continued provision of safe pedestrian facilities provided in the Auburn LGA

The overall state and quality of pedestrian infrastructure which includes footpaths, pavement, signalised and marked "zebra" crossings, signage, footpath continuity and lighting is generally acceptable. Poor paving along town centre strips can create a trip hazard while also not assisting with the accessibility of accessing other areas of the LGA.

Some pedestrian access is limited due to locations of bush shelters (see above), as individuals are not able to access the pathway due to the overflow of individuals on the pathway.

Parking

Accessible parking is located at Auburn, Regents Park and Olympic Park station assisting with the ability for all residents having access what they require.

Taxi

Some residents have called for the establishment of a taxi rank in Northumberland Road near the Soccer Club. Taxis can be accessed from all railway stations and located in all major centres and villages. There is no dedicated taxi bay at St Joseph's Hospital. This is not required due to its close proximity to the Auburn Railway Station.

Table 5-23 Key Accessibility and Mobility Issues

Location	Issue	Possible Response	Responsibility
Rail:			
Berala Railway Station	Berala is the only railway station in Auburn LGA that doesn't have accessible facilities for its patrons.	Council to lobby the State government to improve accessibility at Berala Station.	NSW Government.
Bus:			
Auburn Town Centre	Inadequate shelters, hard stand waiting areas and bus information at both interchanges.	Provide shelters, greater unobstructed hard stand waiting areas and real time bus information at bus stops on both sides of the rail line.	NSW Government & Auburn Council.
Lidcombe Town Centre	Inadequate shelters, hard stand waiting areas and bus information at both interchanges.	Provide shelters, greater unobstructed hard stand waiting areas and real time bus information at bus stops on both sides of the rail line.	NSW Government & Auburn Council.
Pedestrian:			
LGA wide	Location of bus shelters reduces capacity of footpaths eg: Auburn Road, Auburn.	Set shelters back against property boundary where possible.	Auburn Council.
Auburn Town Centre	As identified in the Auburn Town Centre Public Domain Plan 2009.	Consider the various actions contained within the 2009 ATCPDP.	Auburn Council.
Auburn Town Centre	Civic Road and Auburn Road "wall" pedestrian crossing safety to be improved with additional advisory signage.	Add pedestrian refuge in centre of the crossing and provide advisory signage.	Auburn Council.
Auburn Town Centre	Poor paving treatment along key footpaths is both a trip hazard and a poor urban design outcome.EG: Auburn Road and the Eastern end of Kerr Parade, Auburn.	Repave extended lengths of key footpaths in consistent paving material to appropriate standards. Auburn Town Centre Upgrade currently being undertaken by Council will address this issue.	Auburn Council.
Auburn Town Centre	Pedestrian safety is compromised when crossing the Kerr Parade / Station Road intersection and Kerr Parade itself.	Possibly signalise or provide renewed zebra markings with advisory signage. Auburn Town Centre Upgrade currently being undertaken by Council will address this issue.	Auburn Council.
Berala	No concrete footpath along Campbell Street. Trip hazard and poor urban design outcome.	Provide concrete footpath.	Auburn Council.

Taxi and Kiss and Ride			
LGA wide	Some interchange areas do not have formal designated taxi zones within close proximity of the station or have illegible signage.	Provide taxi ranks at all rail station interchange areas with appropriate and clear signage.	Auburn Council.
LGA wide	Some interchange areas do not have formal designated kiss and ride zones within close proximity of the station or have illegible signage.	Provide kiss and ride spaces at all rail station interchange areas with appropriate and clear signage.	Auburn Council.
Parking:			
Berala Village	Unrestricted on-street parking along Campbell Street adversely impacts resident and visitor accessibility.	Monitor and assess feasibility of resident parking scheme or time restrictions.	Auburn Council in consultation with CityRail.

5.3 Package of Measures

This section summarise a strategic pack of measures responding the identified issues and promote sustainable transport within Auburn over the next twenty years

Rail Package of Measures

Any rail initiatives should focus on:

1. Adopting the provisions of the June 2012 announced 'Sydney Rail Future'.
2. Securing NSW Government agreement to undertake a needs study for more commuter car parking at both Auburn and Lidcombe stations.

Bus Package of Measures

PTIPS is recommended to be implemented in the Auburn LGA where traffic signal priorities are given to delayed buses. This could assist in reducing travel times and improving service delivery and reliability. Additionally PTITS can be used to provide real time information for patrons.

Cycling Package of Measures

The review of existing bicycle routes and facilities conditions shows that there are some future improvements that could be made to attract more people to cycle. These are:

- *Regents Park to Chester Hill.* This provides a direct link between Regents Park and Park Reserves along the water supply pipeline. This new route was identified in the 2009 Auburn LGA Cycling Routes.
- *Lidcombe to Strathfield.* This link connects Lidcombe and Strathfield via the South of Rookwood Cemetery along the rail line. This new route was identified in the 2009 Auburn LGA Cycling Routes.
- *Duck River cycleway*. This provides a connection between Silverwater Park and Duck River Reserve along the Duck River. This new route was identified in NSW Bike Plan 2010.
- The provision of bicycle end of trip facilities such as secure bicycle parking, change rooms / shower facilities and personal lockers will encourage more people to cycle rather than rely on motorised transportation. At present, there are not enough bicycle parking facilities at Lidcombe, Berala and Auburn stations. **Table 5-19** (in page 93) shows the need for bicycle facilities found by Hyder during the August 2012 site visits.

Walk Package of Measures

The following principles should be used for pedestrian environment and facilities:

- Ensure pedestrian facilities provided for health, mobility and accessibility; safety; reliability; convenience and direct travel; comfort and legibility; and attractiveness;
- Accommodate existing and future pedestrian demand and desire lines;
- Maximise pedestrian catchments around transport interchanges; and
- Regular maintenance and inspection of existing infrastructure.

Taxi Package of Measures

The review of existing facilities conditions shows that there are some future improvements that could be made to improve taxi services in Auburn LGA. These are:

- *New Rank at Northumberland Road*. Local residents are calling for Auburn City Council to establish a taxi rank in Northumberland Road near the Soccer Club. The closure of the overbridge has impacted on elderly passengers who rely on taxis to travel from Dartbrook Road to the Auburn City Centre and the rank would ease the situation.
- *Late Night Secure Ranks*. Late Night secure ranks which have been installed in popular pick up areas in NSW as part of the NSW Government's 'Hassle Free Nights' initiative for safer evening travel.
- *SecureCab*. The SecureCab Taxi Voucher System has been introduced to provide a safer and more reliable taxi service to licensed venues. The purpose of SecureCab is to create a common package that can be easily identified and promoted so that maximum safety and service can be achieved across NSW.

Parking Package of Measures

The following principles should be used for parking strategy:

- Achieving better integration of land use and transport;
- Improve accessibility to housing, employment and services by walk, cycling and public transport;
- Improve the transport choice of travel;
- Reducing dependence on cars for travel purposes;
- Supporting the efficient and viable operation of public transport services; and
- Supporting the viability of new development, but achieving a balance between this and traffic generation.

Part B

Traffic Assessment and Modelling

Part B Traffic Assessment and Modelling involves review of existing road traffic network and traffic survey data, development of a Paramics micro-simulation traffic model the existing condition (2012, Base Case) for the study area. The traffic model was used to identify key network capacity issues for both AM and PM peak periods.

Structure

- Chapter 6: Existing Condition
- Chapter 7: Traffic Modelling
- Chapter 8: Existing Network Capacity

6 Existing Condition

The existing traffic conditions in the study area are discussed within this chapter. It provides the regional and local traffic context within which the assessment has been undertaken. This section also establishes the existing transport network performance in the study area . An assessment of existing network capacity has been undertaken, indicating network deficiencies at key roads and intersections.

6.1 Road Hierarchy

Roads and Maritime Services (RMS), in co-operation with the local councils, defines the functional road hierarchy in an urban area to establish a consistent basis for traffic management. There are three key road categories and their functions are stated as below:

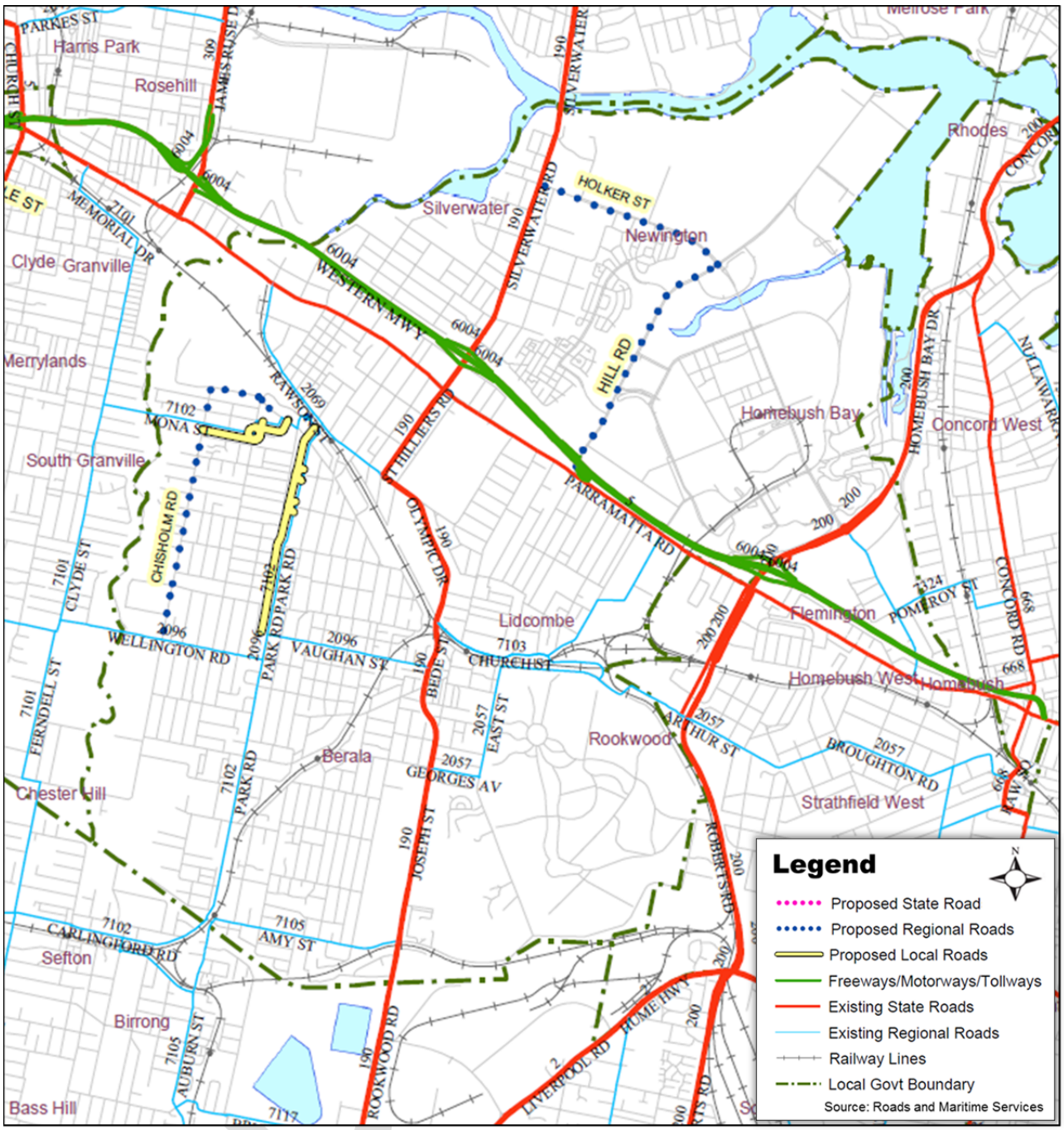
- State Roads: freeways/motorways and primary arterials.
- Regional Roads: secondary or sub arterials.
- Local Roads: collector and local access roads.

A generic road hierarchy comprises freeways, primary arterial roads, secondary or sub arterial roads, collector roads and local access roads. The State road network (including the AusLink network) is formed by the primary network of principal traffic-carrying and linking routes for the movement of people and goods within and between major urban centres. Regional roads comprise the secondary network, which together with State roads, provide for travel between smaller towns and districts and perform a sub-arterial function within major urban centres.

The road hierarchy allocated to the road network around the Auburn LGA Study Area is shown in **Figure 6-34**. The classification criteria are sourced from NSW Road Classification Review Panel – Final Report 2007.

In general, Parramatta Road, St Hilliers Road, Olympic Drive and Joseph Street are classified as State Roads. They are primary routes within the study area and carry both local and regional traffic. Parramatta Road is a cross regional link providing east-west movements and local access to the LGA. It is also a main route to Parramatta and Sydney CBD. St Hilliers Road, Olympic Drive and Joseph Street provide a north-south travel routes for both local and regional movements. The route provides access to M4 Motorway, Auburn and Lidcombe town centres.

Rawson Street, Park Road, Wellington Road, Vaughan Street, Church Street, Birnie Avenue, Railway Street and Amy Street are classified as regional roads. They provide access to state roads for both local and regional traffic movements. Rawson Street and Park Road provide a north-south travel route and access to Parramatta Road / M4 Motorway. Wellington Road, Vaughan Street, Church Street, Birnie Avenue and Railway Street provide a key east-west travel route across the LGA. Locally, these roads services local traffic between town centres and villages.



Source: RMS

Figure 6-34 Road Hierarchy in Study Area Network

6.2 Traffic Data

To satisfy the Council's requirements identified in the key study requirements, Hyder undertook an extensive data collection exercise involving key roads and intersections in the study area. A traffic survey was undertaken for the following key study purposes:

- Preliminary transport assessment (i.e. parking inventory);
- Strategic model validation;
- Parmaics micro-simulation model development, calibration and validation.

The following traffic surveys were undertaken to satisfy the needs and purposes of the study:

1 Intersection classified turning movement counts (car and heavy vehicle separately) for AM and PM peak periods at 46 intersections through the study area;

2 Queue length surveys at 11 critical intersections;

3 Mid-block daily automatic traffic counts (ATC) for one week period (24/7);

4 Travel speed and time for AM and PM peak periods for three strategic routes;

5 Parking inventory and occupancy survey for AM and PM peak periods within town centres and villages.

The survey was undertaken in July 2012. **Appendix D in Volume 2** documents traffic survey and data.

6.2.1 Intersection Counts and Queue Length Surveys

Intersection turning movement counts were undertaken for 2 hours AM peak (7-9am) and 3 hours PM peak (4-7pm) using the video survey method for 46 intersections within the study area on Thursday 26th July 2012.

Of these 46 sites, queue length surveys were also undertaken for 11 key intersections for two hours in the AM peak (7-9am) and two hours in the PM peak (4-6pm).

Table 6-24 and **Figure 6-35** summarise locations of the intersection counts.

Table 6-24 Intersections Count Locations

ID	Name	Suburb	Control Type	Queue Length Survey
I-1	Amy Street / Kingsland Road	Regents Park	Roundabout	
I-2	Amy Street / Nottinghill Road	Regents Park	Roundabout	
I-3	Weeroona Road / Joseph Street/Amy Street	Regents Park	Signals	Yes
I-4	Princes Road East / Park Road	Auburn	Signals	
I-5	Princes Road East / Chisholm Road	Auburn	Priority (Sign controlled)	
I-6	St. Johns Road / Cumberland Road	Auburn	Priority (Sign controlled)	
I-7	Wellington Road / Chisholm Road	Auburn	Signals	

ID	Name	Suburb	Control Type	Queue Length Survey
I-8	Wellington Road / Cumberland Road	Auburn	Signals	
I-9	Wellington Road / Park Road	Auburn	Signals	
I-10	Park Road / Vaughan Street	Auburn	Signals	Yes
I-11	Vaughan Street / Graham Street	Auburn	Priority (Sign controlled)	
I-12	Vaughan Street / Woodburn Road	Auburn	Signals	
I-13	Vaughan Street / Olympic Drive	Lidcombe	Signals	Yes
I-14	James Street / East Street	Lidcombe	Roundabout	
I-15	East Street / Railway Street	Lidcombe	Roundabout	
I-16	Church Street / Bachell Avenue	Lidcombe	Signals	
I-17	Church Street / Railway Street	Lidcombe	Signals	
I-18	Church Street / Olympic Drive	Lidcombe	Signals	Yes
I-19	Bachell Avenue / Birnie Avenue	Lidcombe	Priority (Sign controlled)	
I-20	Olympic Drive / Boorea Street	Auburn	Signals	Yes
I-21	Percy Street / Boorea Street	Lidcombe	Left in/Left Out	
I-22	Station Road / Rawson Street	Auburn	Signals	Yes
I-23	Mary Street / Cumberland Road	Auburn	Roundabout	
I-24	Mona Street / Chisholm Road	Auburn	Signals	
I-25	Manchester Road / Chisholm Road	Auburn	Priority (Sign controlled)	
I-26	Manchester Road / Cumberland Road	Auburn	Roundabout	
I-27	Rawson Street / Parramatta Road	Auburn	Signals	
I-28	Parramatta Road / Hampstead Road / Newton St	Auburn	Signals	
I-29	Parramatta Road / Stubbs Street	Auburn	Signals	
I-30	Parramatta Road / Station Road	Auburn	Signals	Yes
I-31	Parramatta Road / Silverwater Road	Auburn	Signals	Yes
I-32	Parramatta Road / Percy Street	Auburn	Priority (Left In only)	
I-33	Parramatta Road / Nyrang Street	Auburn	Signals	
I-34	Parramatta Road / Bombay Street	Auburn	Signals	
I-35	Silverwater Road / M4 Slip Roads South	Auburn	Signals	Yes
I-36	Silverwater Road / M4 Slip Roads North	Auburn	Signals	Yes

ID	Name	Suburb	Control Type	Queue Length Survey
I-37	St Hilliers Road/ Rawson St	Auburn	Signals	Yes
I-38	Parramatta Road/Birnie Avenue	Auburn	Signals	
I-39	Rawson Street/South Parade	Auburn	Signals	
I-40	Beatrice Street/Auburn Road	Auburn	Signals	
I-41	Queen Street/Marion Street	Auburn	Roundabout	
I-42	Helena Street/Park Road	Auburn	Roundabout	
I-43	Joseph Street/Olympic Drive	Lidcombe	Signals	
I-44	Georges Avenue/Joseph Street	Lidcombe	Signals	
I-45	Lidbury Street/Elizabeth Street/Woodburn Road	Berala	Roundabout	
I-46	Tiba Street/Woodburn Road/Kerrs Road	Berala	Roundabout	

6.2.2 Mid-Block Counts

During the same survey period (July 2012), daily automatic traffic counts (ATC) were conducted for a continuous seven-day period at following five mid-block locations:

- M-1 Station Street, between Kerr Parade and North Parade (on the bridge over the rail line).
- M-2 Joseph Street, south of Georges Avenue.
- M-3 St Hilliers Road between Hall Street and Simpson Street.
- M-4 Park Road south of Helena Street.
- M-5 Park Road north of St Johns Road.

The ATC survey data was collected as per twelve Austroads standard vehicle classes and the sites are shown in Figure 6-35.

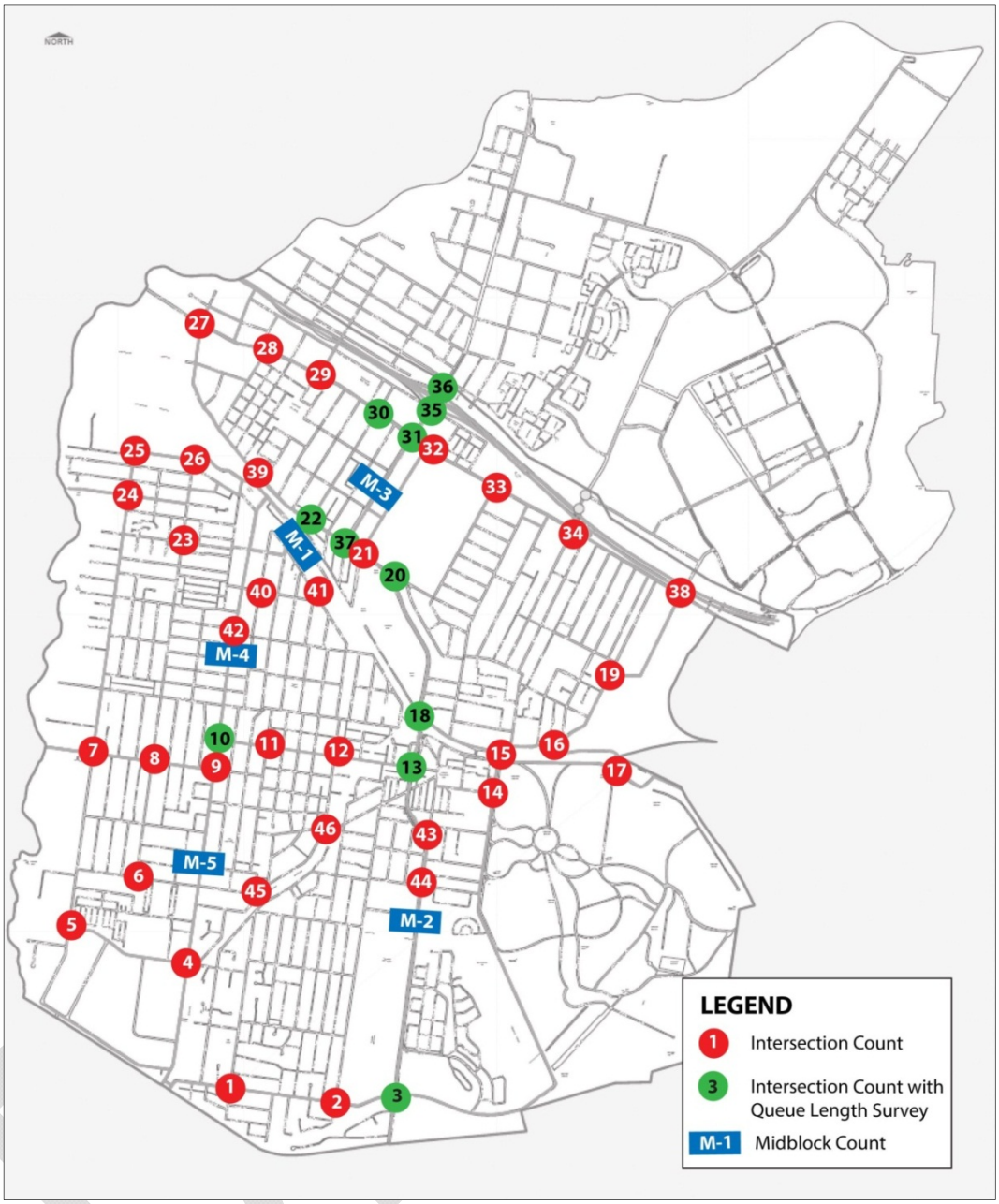


Figure 6-35 Traffic Survey Locations (July 2012)

6.2.3 Travel Speed and Time

Consistent with intersection surveys, travel speed and time data was collected on Thursday 26th July 2012 during AM peak (7-9am) and PM peak (4-6pm) for the following three routes including:

- Route 1 on Parramatta Road between Rawson Street and Birnie Avenue.
- Route 2 on M4 Ramps (south) to Weeroona/Joseph Street intersection via St Hilliers Road, Olympic Drive and Joseph Street.
- Route 3 on Wellington Road/Chisholm Road intersection to Vaughan Street /Olympic Drive intersection via Wellington Rd and Vaughan Street.

Travel speed and time data was collected using a GPS instrument. Figure 6-36 shows the travel time survey routes.

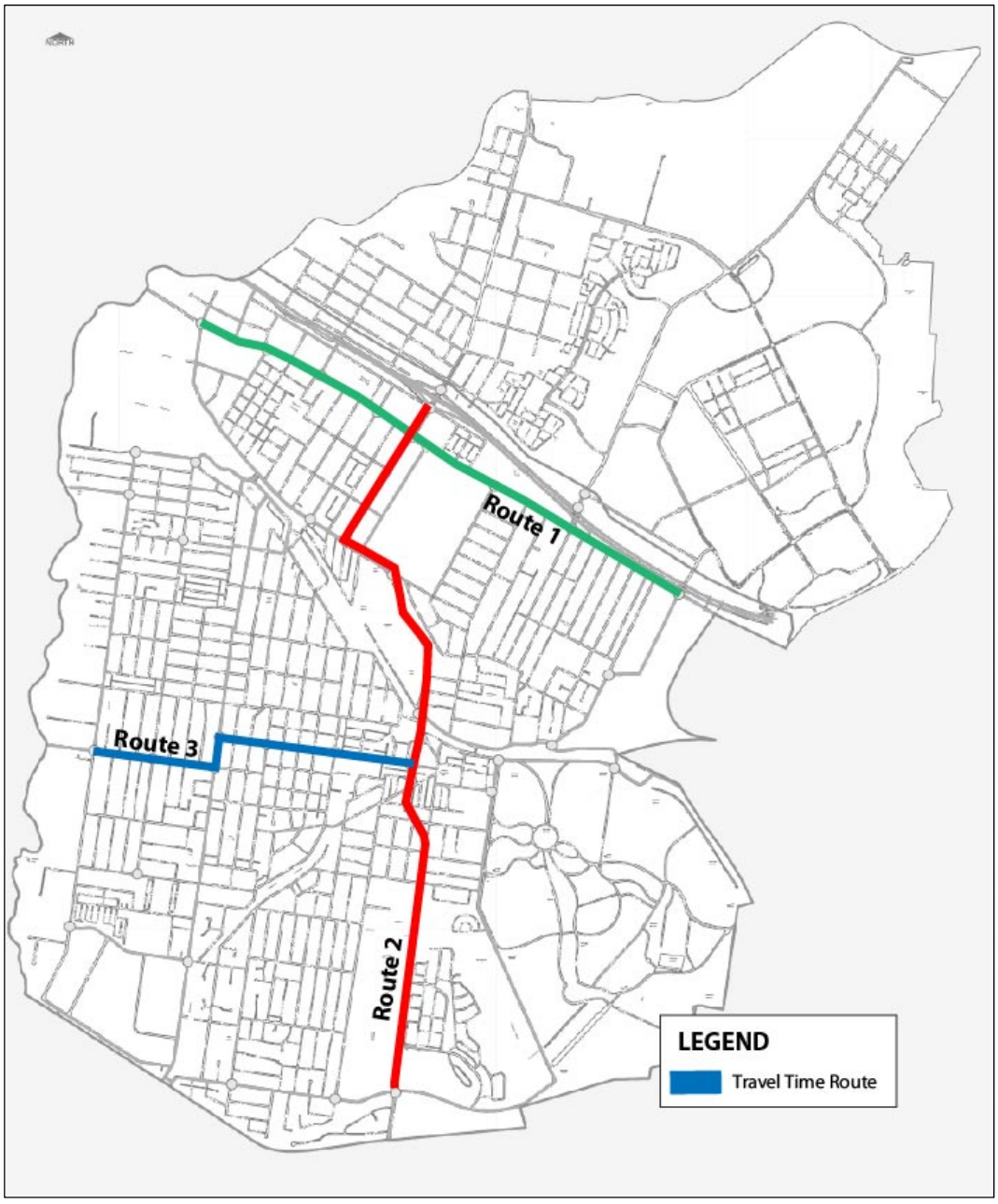


Figure 6-36 Travel Time Survey Routes

6.2.4 Parking Survey

Parking inventory and accumulation survey were undertaken during AM peak (7-9am) and PM peak (4-6pm) periods in 15 minute intervals on Thursday 2nd August 2012 at the following town centres and two villages:

- Auburn Town Centre;
- Lidcombe Tow Centre;
- Berala Village; and
- Regents Park Village.

Parking survey results was disused Section 3.6.

6.3 Traffic Results

This section quantifies the daily and peak hour traffic flows on key roads and intersections within the Auburn LGA study area. This traffic result provides a context within which to consider likely traffic changes that would result from a future growth and network road upgrade. The results are based on survey data on key roads and intersections for the year 2012.

6.3.1 Daily Traffic

Table 6-25 below summarises daily weekday traffic and truck percentage at key locations within the study area network. Based on results, the following points are noted:

- St Hilliers Road / Olympic Drive / Joseph Street are key north-south arterial road running through the heart of Auburn LGA. St Hilliers Road carried traffic in the order of 46,000 vehicles per day. Higher traffic is observed on Olympic Drive / Joseph Street in the order of 55,000 vehicles per day.
- St Hilliers Road / Olympic Drive / Joseph Street carried between 5,200 and 7,200 heavy vehicles (HV's) per day, which is about 11% to 13% of total traffic.
- Park Road is a north-south regional road connecting Regents Park and Auburn town centre. Park Road carried about 15,000 vehicles per day near Auburn town centre. Further to the south, Park Road carries about 13,000 vehicles with slightly higher heavy vehicle traffic.
- Station Road over the railway is a major connection between Auburn town centre and M4 Motorway / Parramatta Road. It carried about 20,000 vehicles per day.
- The number of heavy vehicles on Station Road and Park Road is comparatively lower than St Hilliers Road and Joseph Street. The daily heavy vehicles were recorded between 600 and 1,000 which are in the order of 4% to 6% of total traffic.

Table 6-25 Daily Traffic Volumes (2way, vehicles)

Site ID	Road/Location	Total Vehicle (Car + Heavy Vehicle)	Heavy Vehicle	% Heavy Vehicle
M-1	Station Rd - south of Rawson St	19,826	997	5%
M-2	Joseph St - south of Georges Ave	54,912	7,213	13%
M-3	St Hilliers Rd - south of Simpson St	46,013	5,207	11%
M-4	Park Rd - between Helena St and Union Rd	15,130	605	4%
M-5	Park Rd - between St Johns Rd and Atherton Cres	12,701	763	6%

6.3.2 Traffic Flow Profiles

Figure 6-37 shows the variation of the traffic profile over the one week survey period. The traffic volumes at five mid-block locations are presented on the charts with the same scale. The following points were identified:

- The traffic volume on key roads across the LGA is relatively constant across the weekdays from Monday to Friday;
- Weekend traffic volume is slightly lower than weekday;
- Traffic during AM and PM peak period across weekdays show similar level.

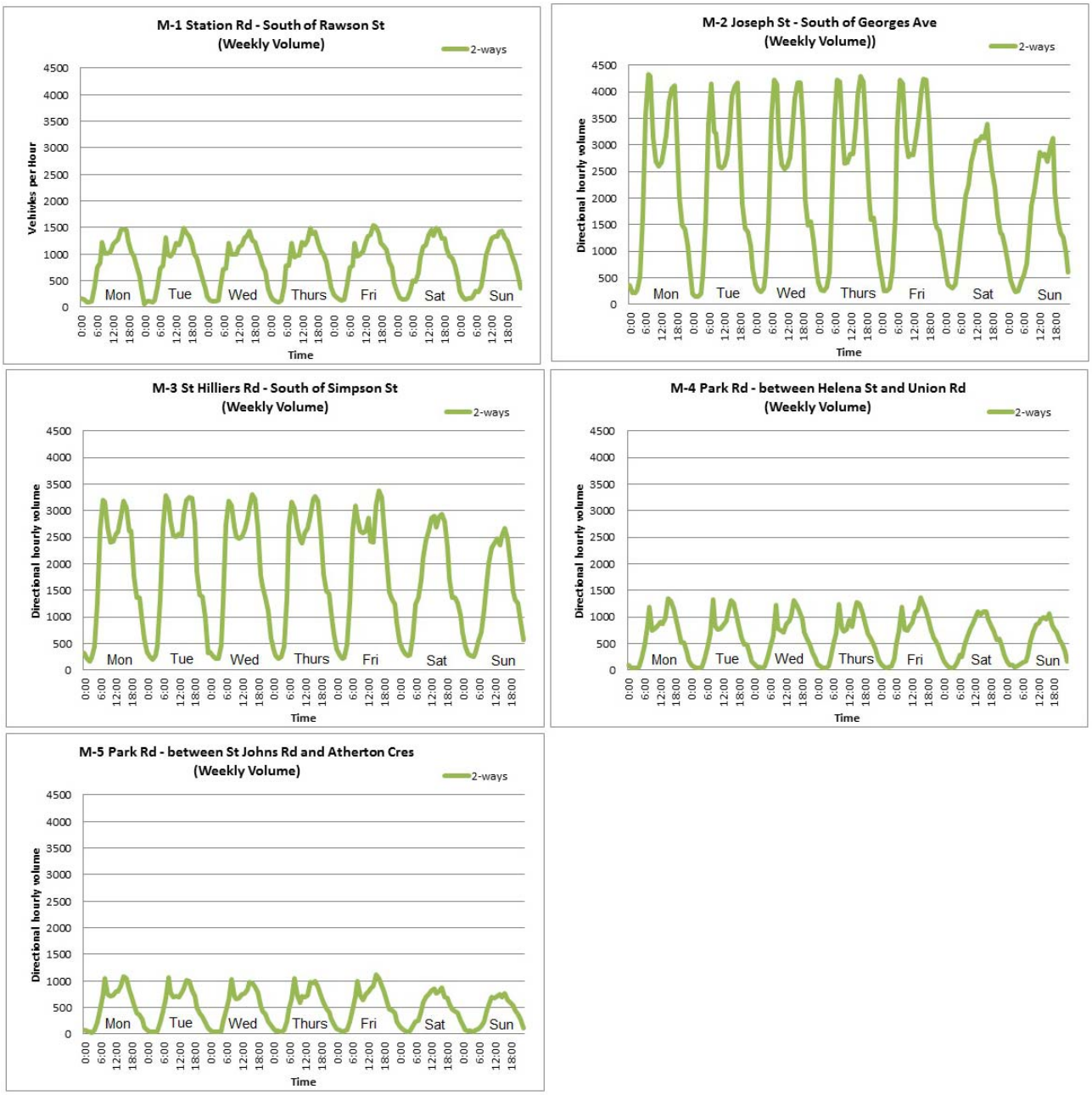


Figure 6-37 Daily Traffic Profiles

6.3.3 Peak Hour Traffic

Figure 6-38 shows the temporal distribution of traffic flows for key roads by travel direction. The temporal distribution is shown by peak travel directions. **Table 6-26** shows AM and PM peak traffic volume.

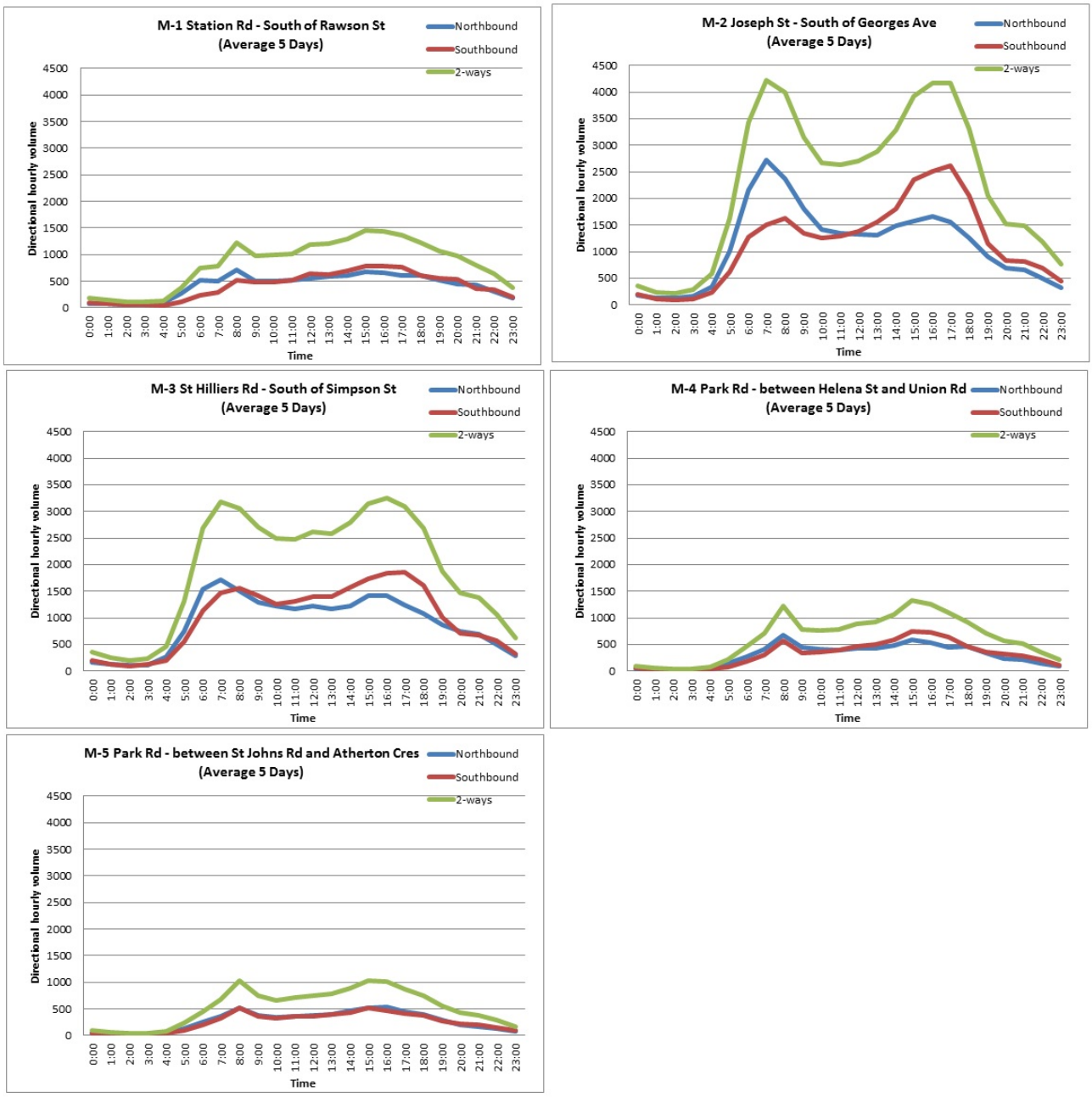


Figure 6-38 Hourly Traffic Profiles

Table 6-26 Peak Hour Traffic on Key Roads

Site ID	Locations	AM Peak 1 Hour			PM Peak 1 Hour		
		NB/EB	SB/WB	2way	NB/EB	SB/WB	2way
M-1	Station Rd - south of Rawson St	600	400	1,000	650	800	1,450
M-2	Joseph St - south of Georges Ave	2,600	1,600	4,200	1,650	2,600	4,250
M-3	St Hilliers Rd - south of Simpson St	1,650	1,550	3,200	1,350	1,900	3,250
M-4	Park Rd - between Helena St and Union Rd	550	450	1,000	500	700	1,200
M-5	Park Rd - between St Johns Rd and Atherton Cres	450	450	900	500	450	950
N-1	Silverwater Rd - north of Parramatta Rd	2,500	2,000	4,500	2,500	2,100	4,600
N-2	Parramatta Rd - east of Birnie Ave	1,400	1,500	2,900	1,350	1,800	3,200
N-3	Parramatta Rd - west of Rawson St	1,800	1,300	3,100	1,650	1,800	3,500
N-4	Mona St - west of Chisholm Rd	1,250	700	1,900	700	1,350	2,050
N-5	Wellington Rd - west of Chisholm Rd	1,250	900	2,100	800	1,350	2,200
N-6	Railway St - east of Church St	1,100	800	1,900	850	1,250	2,100
N-7	The Crescent - south of Rawson St	1,000	850	1,850	750	1,400	2,150
N-8	Birnie Ave - north of Parramatta Rd	650	350	1,000	450	950	1,350
N-9	Amy St - east of Park Rd	550	600	1,150	500	750	1,250
N-10	Vaughan St - east of Park Rd	550	450	1,000	500	650	1,150
N-11	Stubbs St - north of Parramatta Rd	350	200	550	150	250	400
N-12	Kingsland Rd - north of Amy St	200	250	450	150	250	450
N-13	Nottinghill Rd - north of Amy St	150	100	300	150	150	350
N-14	Lidbury St - east of Elizabeth St	300	250	500	250	350	600

The traffic survey result shows:

- In general the AM peak period on key arterial roads (St Hilliers Road / Olympic Dirve / Joseph Street) begins early at 6am and PM peak period begins at 3pm. The AM peak period on regional roads (Park Road, Station Road) starts slightly later at 7am.
- Olympic Drive / Joseph Street show contra flow traffic distribution. The northbound traffic was observed as peak direction in morning, and the southbound traffic was observed as peak direction in evening.
- However, no obvious contra flow traffic distribution was observed at Station Road, St Hilliers Road and Park Road.
- During peak hour directional traffic on St Hilliers Road was observed in the order of 3,300 vehicles. Further south on Olympic Drive / Joseph Street higher traffic was observed 4,300 vehicles.

- Further north on Silverwater Road about 4,600 vehicles per hour were recorded.
- Parramatta Road was observed carrying between 3,200 and 3,500 vehicles per hour, west of Rawson Street.
- Park Road carried traffic in order of 1,000 vehicles per hour during peak hours.
- The peak hour traffic volume on Station Road was recorded in order of 1,000 and 1,400 during AM peak and PM peak hour respectively.
- Regional roads including Mona Street, Wellington Road, Railway Street carried about 2,000 vehicles per hour during peak hour.
- Other regional roads including Birnie Avenue, Amy Street and Vaughan Street were observed carrying about 1,000 vehicles per hour during peak hour.
- Local roads including Stubbs Street, Kingsland Road, Nottinghill Road and Lidbury Street carried between 300 and 600 vehicles per hour in peak periods.
- Intersection turning counts data show that in order of 40 to 50 heavy vehicles were observed on Boorea Street between Olympic Drive and Parramatta Road.

6.3.4 Intersection Turning Volumes

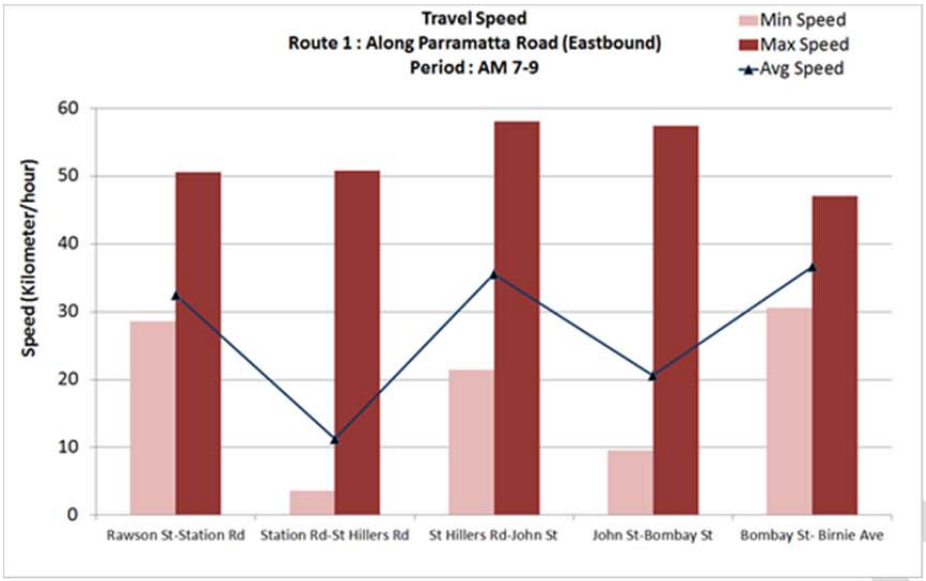
Appendix D in Volume 2 documents observed intersection movement turn volume diagrams.

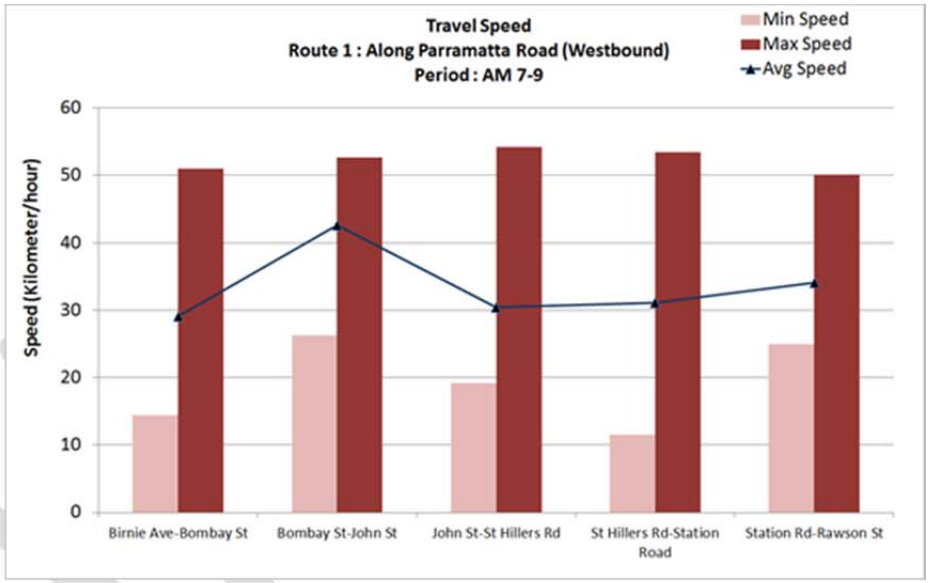
6.3.5 Travel Speed and Time

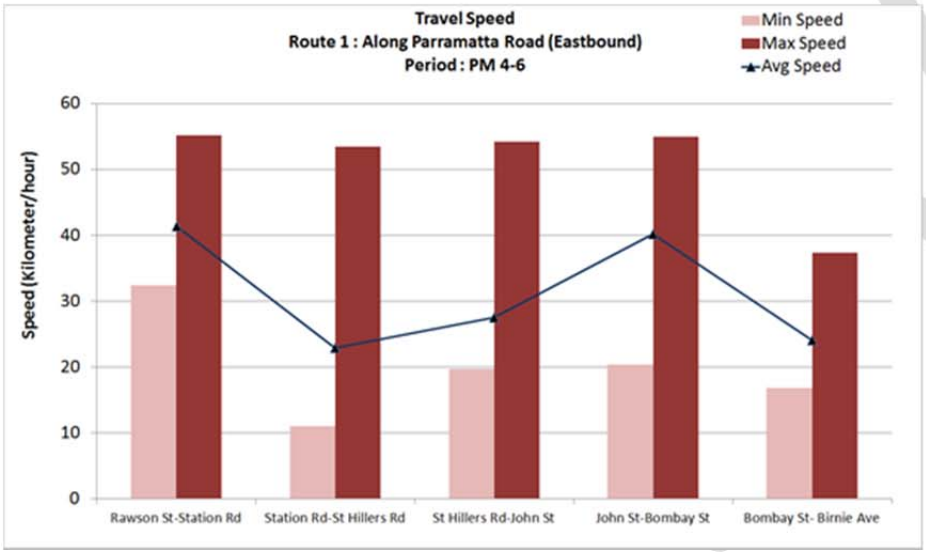
Figures below summarise observed travel speed on three major routes in Auburn LGA Study Area. The diagrams depict a range of travel speeds are experienced on different sections of the travel routes during AM and PM peak periods

The survey result shows:

- Average traffic speed on Parramatta Road (Route 1) eastbound ranges from 10 km/h to 40 km/h. During AM peak, the slow travel speed (10 km/h) was observed in the section between St Hilliers Road and Station Road during AM peak.
- On Route 2. St Hilliers Road, Olympic Drive and Joseph Street corridor, slow travel speed (10 km/h) was observed on the section north of Rawson Street during congested periods.
- Along the Route 3, Wellington Road / Vaughan Street, a slow travel speed (10km/h) was observed on the section between Woodburn Road and Olympic Drive in eastbound direction during congested periods.







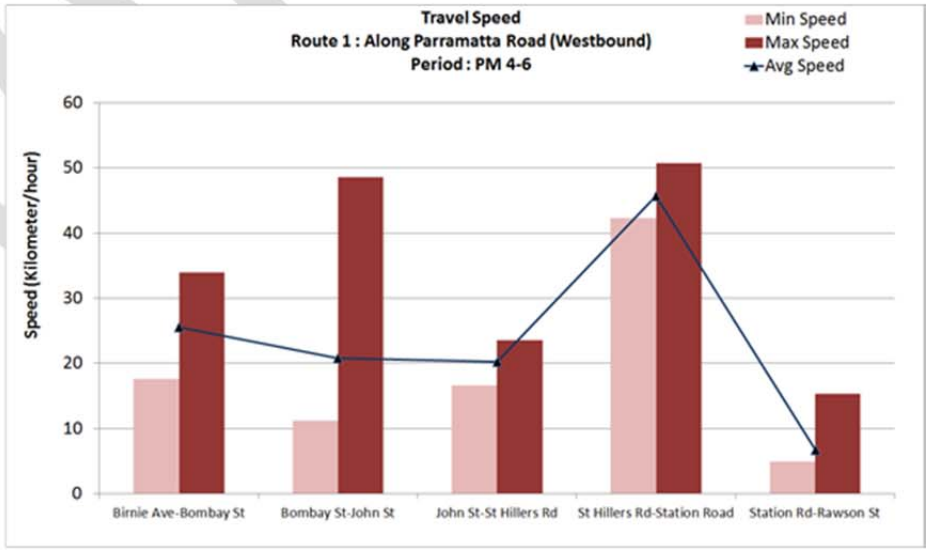
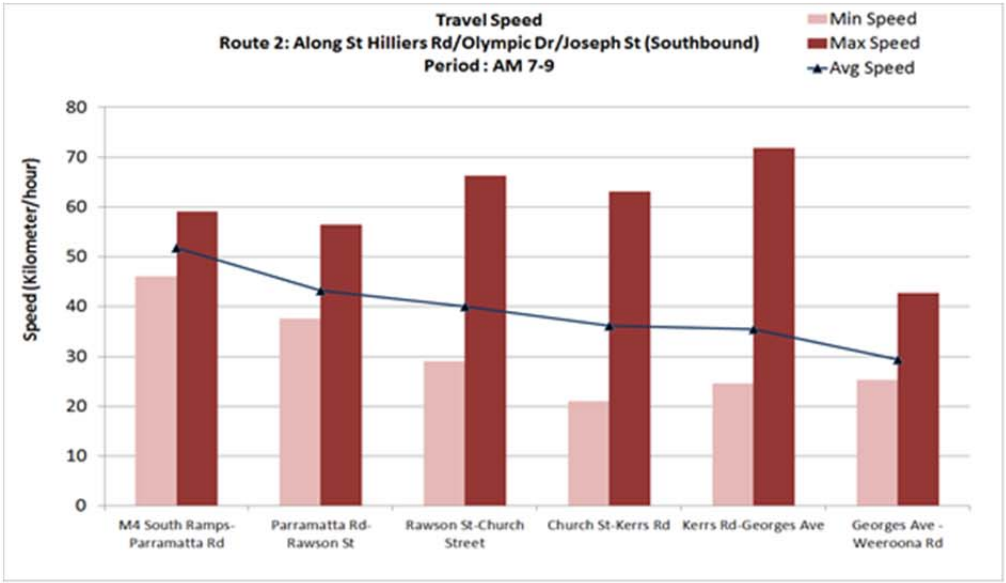
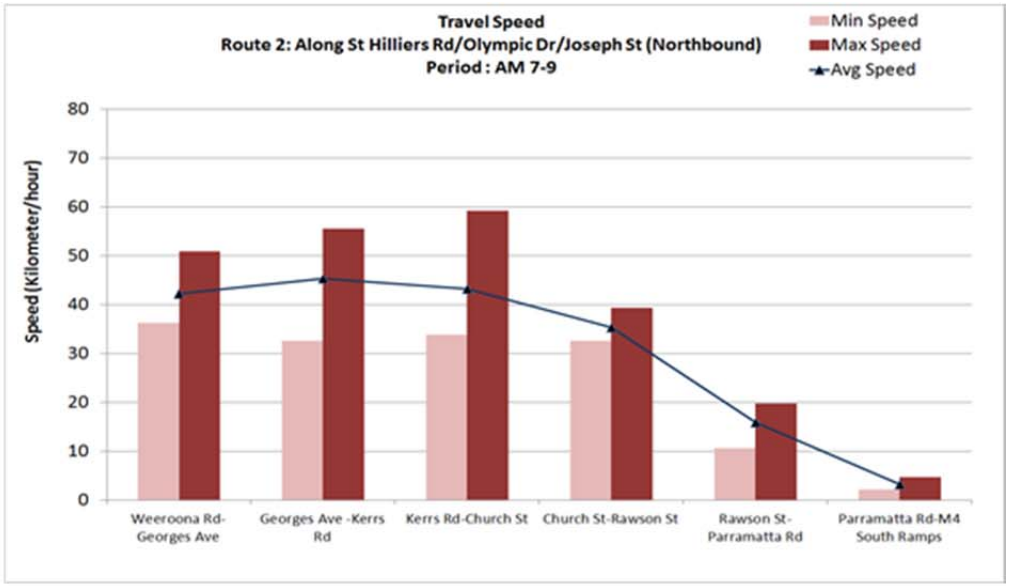
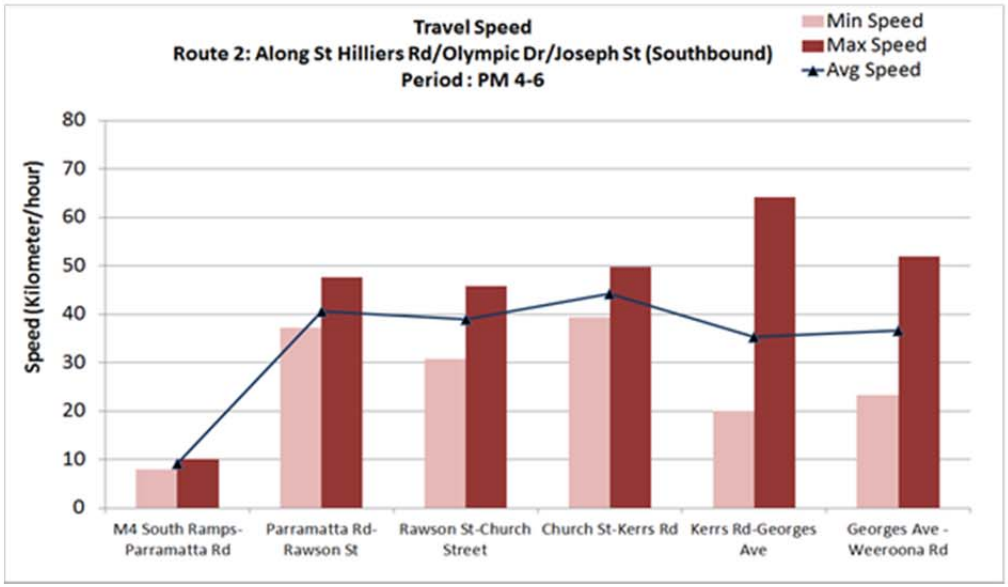


Figure 6-39 Observed Travel Speed on Route 1 - Parramatta Road







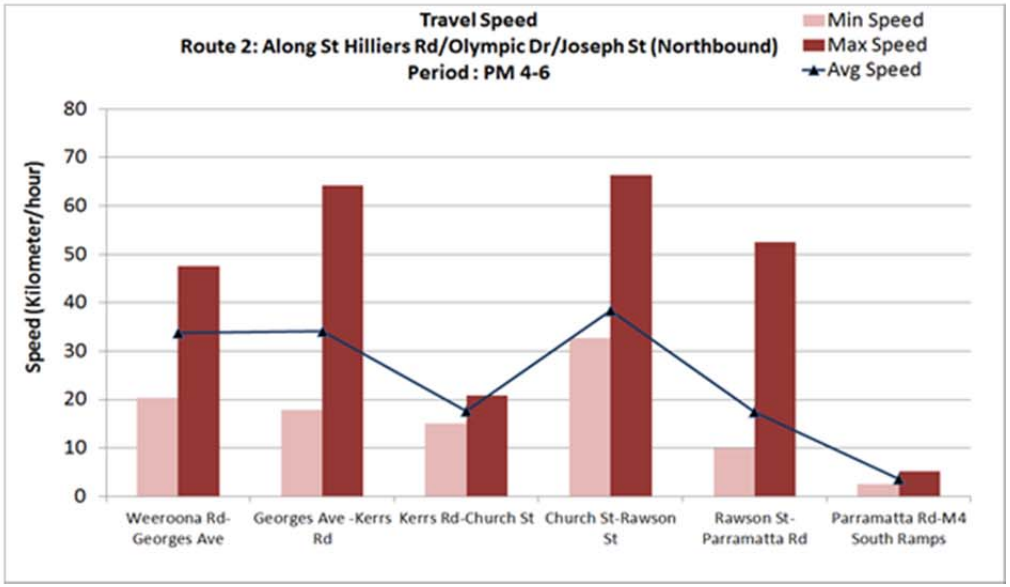
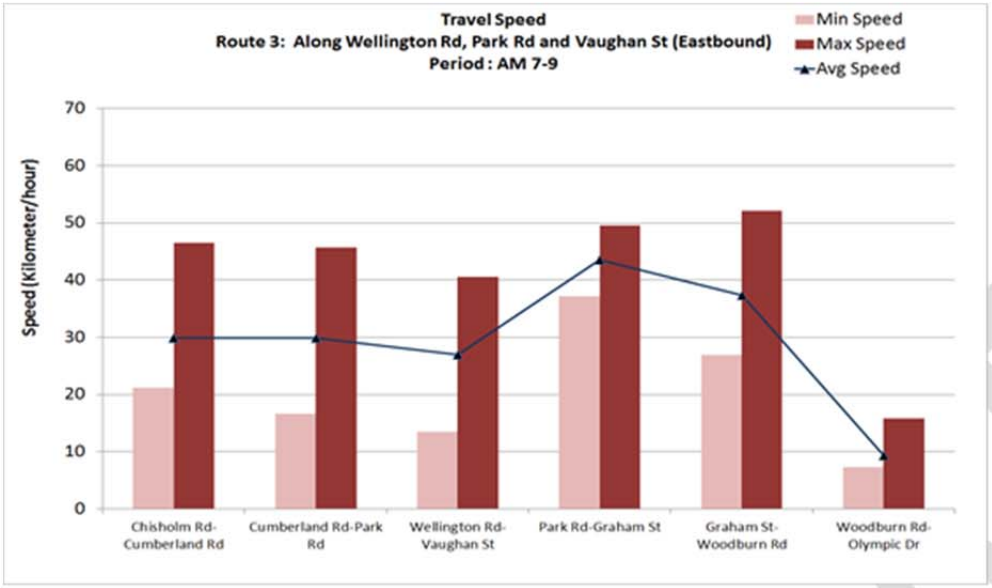
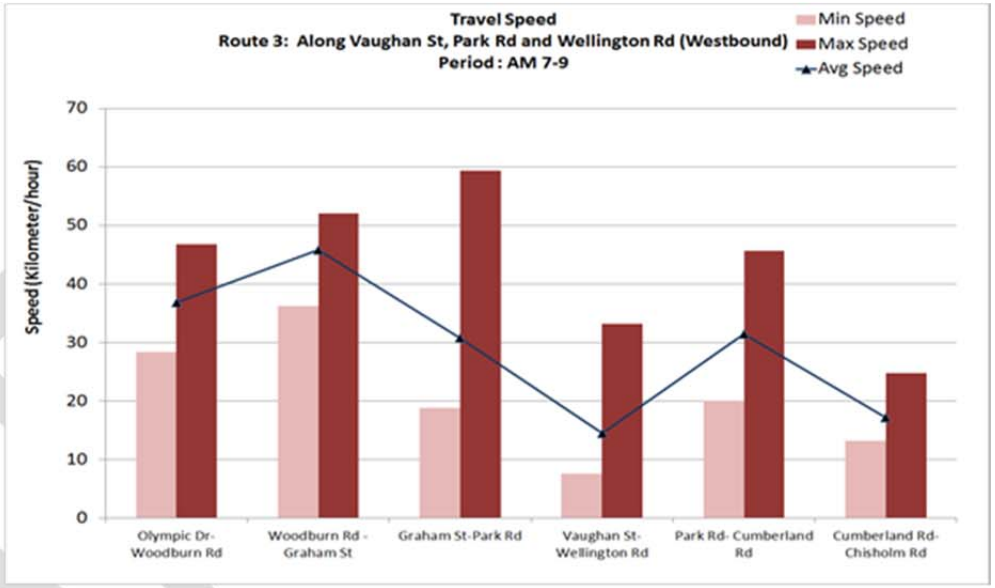
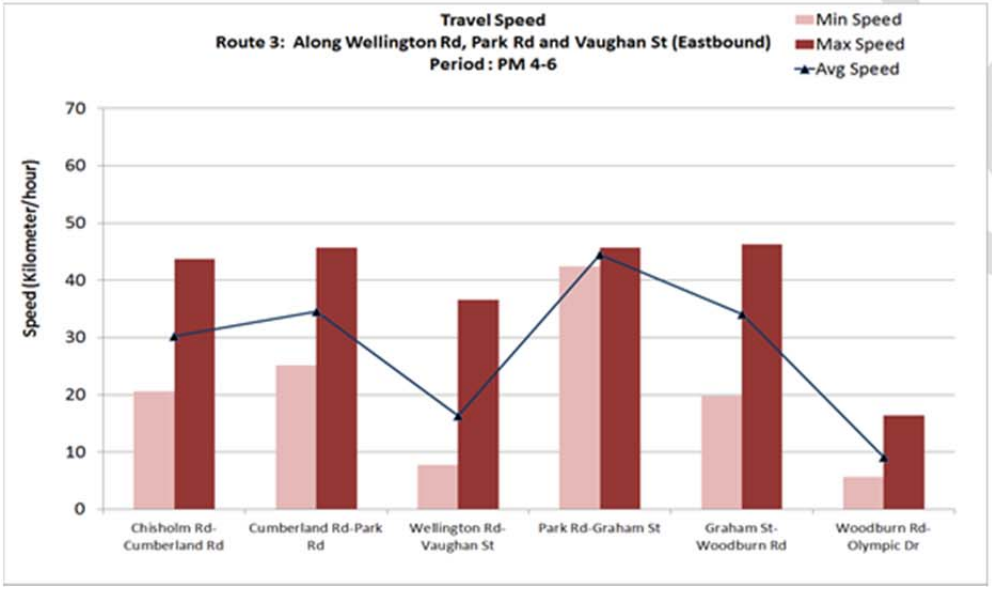


Figure 6-40 Observed Travel Speed on Route 2 - St Hilliers Road - Olympic Drive - Joseph Street







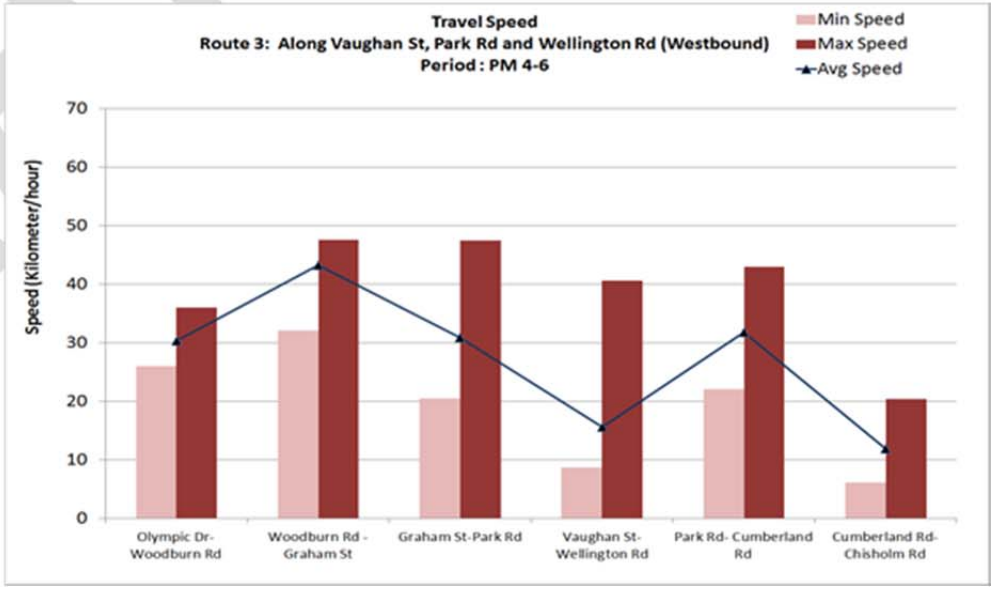


Figure 6-41 Observed Travel Speed on Route 3 - Vaughan Street - Park Road - Wellington Road

6.3.6 Crash Data

This assessment is based on the crash data supplied by the Council for the six-year period from 2005 to 2010 inclusive. The data covers crashes reported to the Police, and includes fatal, injury or vehicle damage only accidents.

Table 6-27 shows total number of crashes by category of traffic participant by year and total number for the six year period between 2005 and 2010.

Following points are noted from data presented in **Table 6-27**:

- Between 900 and 1,000 crashes were recorded each year over the last six year period (2005-2010);
- All categories showed steady trends in crash records;
- The majority of crashes (approximately 71%) involved private cars;
- Approximately 19% of crashes involved heavy vehicles;
- Buses participated about 2% in total number of crashes;
- The most vulnerable categories (Motorcycles, Bicycles and Pedestrians) were involved in 8% of all crashes.
- Of about 5,900 cases recorded for the six year period, approximately 2,600 crashes or 45% caused injuries and 28 crashes were with fatal outcome.

Figure 6-42 graphically shows crash locations within study area for the period between 2006 and 2011 (half). Crashes shown in the figure are classified by severity: fatal, injury and non-casualty (tow-away) crashes

The record indicates crashes often occurred along the key roads and intersections including:

- M4 Motorway off-ramps;
- Parramatta Road;
- Silverwater Road / St Hilliers Road;
- Rawson Street ;
- Olympic Drive / Joseph Street;
- Park Road;
- Wellington Road between Chisholm Road and Park Road;
- South Parade between Park Road and Auburn Road;
- Auburn Road / Mary Street intersection;
- Mona Street / Chisholm Road intersection;
- Helena Street / Park Road intersection;
- East Street / Railway Street intersection;
- Amy Street / Auburn Road intersection; and
- Weeroona Road / East Street intersection;

Table 6-27 Total Number of Crashes for Six Year Period (2005-2010)

Category of Traffic Participant	Total Number of Crashes							
	2005	2006	2007	2008	2009	2010	6 years summary (2005-2010)	
Car	646	720	739	641	691	715	4,152	71%
Light Truck	101	101	103	94	104	116	619	10%
Heavy Truck	42	45	61	40	38	43	269	5%
Rigid Truck	22	19	34	24	24	23	146	2%
Articulated Truck	21	27	28	17	14	20	127	2%
Bus	11	8	4	11	9	8	51	1%
Heavy Bus	5	4	2	9	6	4	30	1%
Emergency Vehicle	1	2	2	3	5	5	18	0%
Motorcycle	16	20	23	31	27	31	148	2%
Bicycle	22	13	13	19	15	14	96	2%
Pedestrian	42	32	32	45	34	32	217	4%
Total	**929**	**991**	**1,041**	**934**	**967**	**1,011**	**5,873**	**100%**

Source: Auburn City Council

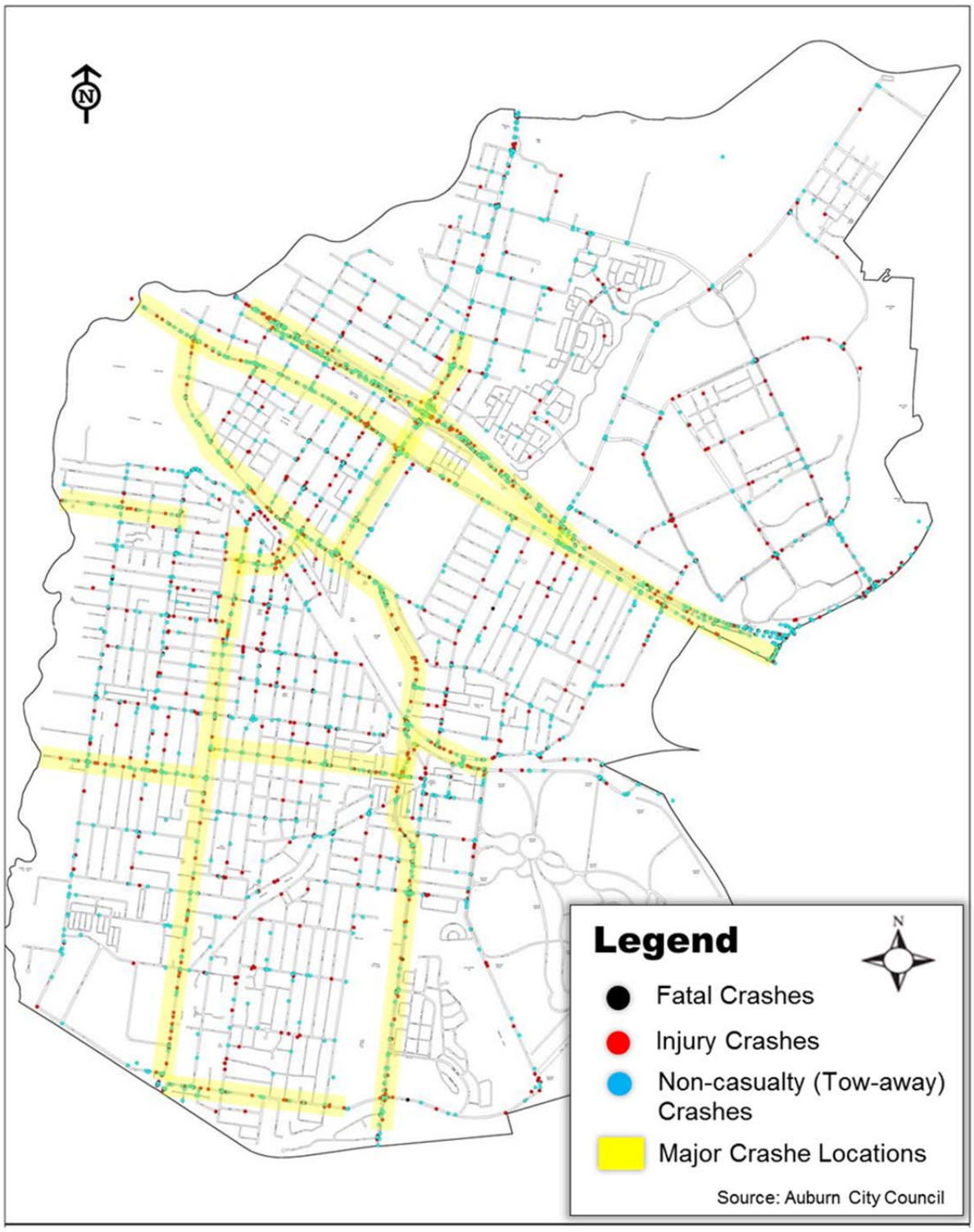


Figure 6-42 Spatial Distribution of Crashes between 2005 and 2011 for Auburn LGA

7 Traffic Modelling

Traffic model was developed for the specific purpose of investigating existing network performance and identifying operational issues within the Auburn LGA study area. Hyder has produced the overall traffic modelling for the specific project purpose with inputs from Sydney Travel Model (STM) developed by the Bureau of Transport Statistic (BTS).

7.1 Overview of Modelling Approach

A Paramics micro-simulation model has been developed to facilitate a more in-depth analysis of the existing operational performance and identify of key traffic issues within the study area. A base year 2012 AM and PM peak Paramics model was developed comprising key strategic roads and intersections within the LGA. Model coverage includes part of the Auburn LGA south of M4 Motorway with Chisholm Road on the western boundary, Birnie Avenue on the east and Amy Street on the south (See **Figure 6-45**). The main line traffic on M4 was not counted in accordance with study scope.

The initial core demand matrix (OD) used within Paramics model was developed using the Hyder's Sydney Strategic Traffic Model TransCAD (SSTM) which covers the entire Sydney Metropolitan Area. The advantage of initial core matrix (OD) development using strategic (TransCAD) model is that SSTM provides accurate study area cordon flows which includes traffic distribution pattern between external to external, external to internal and internal to internal travel zones. The calibrated strategic model was cordoned to provide an OD matrix for each vehicle type and for each time period consistent with the Paramics micro-simulation model. The perceived mode share between car and public transport will be dealt outside the SSTM model by adjusting trip generation rates at zone level.

In addition, Hyder's strategic traffic model is based on 2006 travel zone system covering the Sydney Metropolitan Area. Hyder's base and future year models were developed using STM trip tables. The land use assumptions in STM was based on recent population and employment forecast (October 2009 Release). The population and employment forecast was compatible with the Department of Planning and Infrastructure (then Department of Planning) 2008 Release Population Projections and the 2010 Metropolitan Plan.

Hyder's SSTM model was calibrated and validated at key RMS regional screenlines across the Sydney road network. A considerable past effort had been invested in the model when assessed major strategic projects particular for the study area. Hyder's SSTM is in progressive state of improvement. The SSTM model specifically quantifies traffic for an average weekday, by way of modelling the morning and evening peaks explicitly, then applying factors to expand to represent average weekday traffic.

- AM 7am to 9am; and
- PM 3pm to 6pm.

These time periods coincide with those adopted by BTS's STM model.

The detailed model update, calibration and validation are documented in **Appendix A in Volume 2**.

Figure 7-43 shows the base year road network in the context the study area.

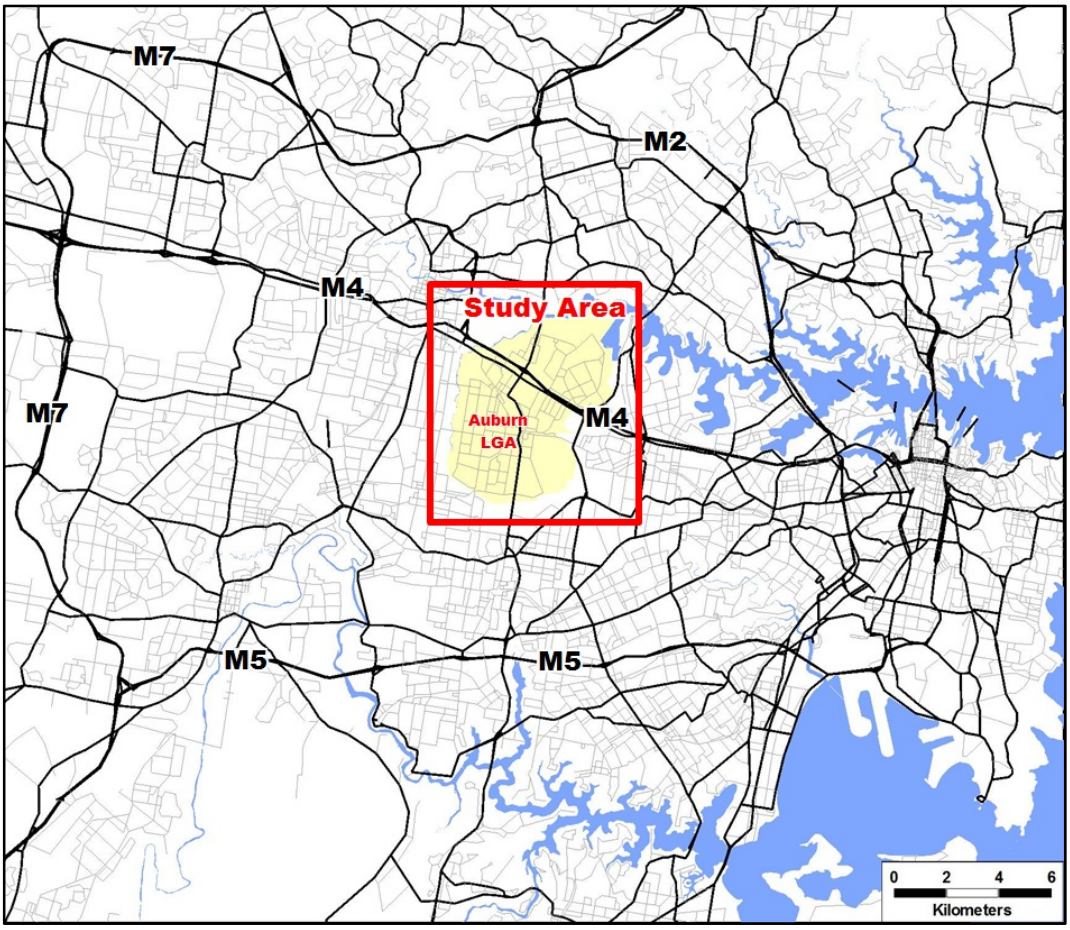


Figure 7-43 Strategic Road Network

7.2 Fit for Purpose

Hyder's Sydney Strategic Traffic Model (SSTM) was updated for the specific purpose of investigating traffic issues within the study area. The traffic demand model was developed to:

- Create a tool capable of forecasting the traffic volumes within the study area with outputs sufficiently detailed to provide as input to Paramics micro simulation model.

A Paramics micro-simulation model has been developed to:

- Facilitate an analysis of the existing operational performance and identify key traffic issues;
- Provide input to develop a strategic response to the identified traffic issues; and
- Prepare a traffic report which can be used as a basis for identifying proposed infrastructure upgrades needed to accommodate future growth within the LGA study area.

7.3 Model Software

Hyder's Sydney Strategic Model (SSTM) was built and operated in TransCAD Transportation GIS software. Version 4.7 was used for SSTM. TransCAD fully integrates GIS with planning, modelling and logistics applications. It combines the capabilities of digital mapping, geographic database management and presentation graphics with sophisticated transport models.

TransCAD provides a full complement of traffic assignment procedures that are used for modelling urban traffic. TransCAD is widely used in both the public and private sectors.

Paramics Version 6.9.1 was used. Azalient Plug-in software (Version 6.9.0.H01) was used to provide additional functionality in the developed models. The Paramics software provides Application Programming Interface (API), which allows user to develop customised modules to augment core simulation. These developed modules are known as plug-ins. A number of plug-ins have been developed for RMS to enhance Paramics core capability.

7.4 Strategic Model Calibration and Validation

A base year highway model was calibrated and validated using 2012 count data for AM and PM peak period. Detailed model calibration and validation outcomes are documented in **Appendix A in Volume 2**. The calibration and validation results in **Appendix A** demonstrate that Hyder's SSTM model has been calibrated and validated appropriately in accordance with the industry practice acceptance criteria. A robust calibration and validation has been achieved for both AM and PM peak period. The strategic models therefore are fit for the study purpose.

7.5 Paramics Model Development

A Paramics model has been developed to facilitate an in-depth analysis of the operational issues the study area. The Paramics models were calibrated and validated according to the RMS' Paramics modelling guidelines. The models represented 2012 traffic conditions for both morning (AM) peak and afternoon (PM) peak periods, i.e.:

- The AM peak period between 7am and 9am, and
- The PM peak period between 4pm and 6pm.

The Paramics model included warm up period that coincides with the school peak traffic. The Paramics model specifically represents traffic for an average weekday by the way of modelling the AM and PM peak periods. These time period (AM peak between 7:00 and 9:00, PM peak between 3 pm and 6 pm) coincide with Sydney Strategic Traffic Model (STM) developed by the Bureau of Transport Statistics (BTS).

Detailed Paramics model development is documented in **Appendix B in Volume 2**.

Figure 7-44 shows Paramics model road network coverage (highlighted in yellow) and travel zone system (highlighted in green). Within the study area, two interchanges with M4 Motorway was coded and modelled at Silverwater Road and Hill Road. The main line traffic on M4 was not counted as per study scope.

Figure 7-44 Paramics Model Network and Travel Zone System

7.6 Paramics Demand

The initial demand matrix was estimated using Hyder's own Sydney Strategic Transport Model, (SSTM) using a sub-area technique. Further travel zone and network refinements were undertaken for the study area. The demand matrix was calibrated to the RMS's standards using the 2012 traffic counts data.

The demand matrix was estimated separately for two vehicle types:

- Cars/light vehicles.
- Rigid and articulated heavy vehicles.

The proportion of heavy vehicles has been taken directly from classified traffic surveys undertaken for this Study.

7.7 Paramics Model Calibration and Validation

Both AM and PM peak Paramics models were calibrated and validated according to the RMS' Paramics modelling guideline. Detailed model calibration and validation are documented in **Appendix B in Volume 2**. The model calibration and validation results documented in **Appendix B** confirmed that both AM and PM peak Paramics models for the Auburn LGA Study Area were calibrated and validated adequately and models are fit for the study purpose. The calibration and validation of Paramics modelling was agreed with Council staff.

8 Existing Network Capacity

8.1 Level of Service (LoS)

Performance of an intersection is measured in accordance with the RMS' guideline (Guide to Traffic Generating Developments, Issue 2.2, RMS, October 2002). It recommends that for priority intersections such as a roundabout and sign controlled intersections, the Level of Service (LoS) value is determined by the critical movement with the highest delay whereas for a signalised intersection LoS criteria are related to the average intersection delay measured in seconds per vehicle.

The performance of an intersection can be measured by the intersection average delay per vehicle which in turns leads to a "level of service" measure for the intersection. These measures are:

- Level of Service A – good operation;
- Level of Service B – good operation with acceptable delays and spare capacity;
- Level of Service C – satisfactory operation;
- Level of Service D – operating near capacity;
- Level of Service E – operating at capacity; incidents at signals will cause excessive delays;
- Level of Service F – extra capacity required.

A total of 46 intersections within study area have been analysed using Paramics model to determine their respective operating performance. The calibrated and validated 2012 Paramics model formed the basis of assessing intersection capacity.

Detailed Paramics LoS modelling results by each approach at key intersections are included in **Appendix C in Volume 2**.

Table 8-28 below summarises intersection level of service (LoS) results using Paramics. The map at **Figure 8-45** (in page 142) shows the intersections experiencing capacity and/or operational issues.

Table 8-28 Existing (2012) Intersection LoS

ID	Intersection	Road Classification	Control Type	AM Peak		PM peak	
				Overall Average Delay (sec)	LoS	Overall Average Delay (sec)	LoS
I-1	Amy Street[2] / Kingsland Road	Regional/Local	Roundabout	10	A	10	A
I-2	Amy Street[2] / Nottinghill Road	Regional/Local	Roundabout	10	A	8	A
I-3	Weeroona Road / Joseph Street[1] / Amy Street[2]	State/Regional	Signals	47	D	79	F
I-4	Princes Road East / Park Road[2]	Regional/Local	Signals	29	C	21	B
I-5	Princes Road East / Chisholm Road	Local/Local	Priority	6	A	5	A
I-6	St. Johns Road / Cumberland Road	Local/Local	Priority	7	A	6	A
I-7	Wellington Road[2] / Chisholm Road	Regional/Local	Signals	52	D	52	D
I-8	Wellington Road[2] / Cumberland Road	Regional/Local	Signals	16	B	26	B
I-9	Wellington Road[2] / Park Road[2]	Regional/Regional	Signals	31	C	50	D
I-10	Park Road[2] / Vaughan Street[2]	Regional/Regional	Signals	29	C	71	F
I-11	Vaughan Street[2] / Graham Street	Regional/Local	Priority	8	A	58	E
I-12	Vaughan Street[2] / Woodburn Road	Regional/Local	Signals	26	B	23	B
I-13	Vaughan Street[2] / Olympic Drive[1]	State/Regional	Signals	57	E	64	E
I-14	James Street / East Street[2]	Regional/Local	Roundabout	12	A	10	A
I-15	East Street[2] / Railway Street[2]	Regional/Regional	Roundabout	17	B	10	A
I-16	Church Street[2] / Bachell Avenue[2]	Regional/Regional	Signals	28	B	24	B
I-17	Church Street[2] / Railway Street[2]	Regional/Regional	Signals	20	B	13	A
I-18	Church Street[2] / Olympic Drive[1]	State/Regional	Signals	18	B	63	E
I-19	Bachell Avenue[2] / Birnie Avenue[2]	Regional/Regional	Priority	8	A	7	A
I-20	Olympic Drive[1] / Boorea Street	State/Local	Signals	17	B	29	C
I-21	Percy Street / Boorea Street[1]	State/Local	Left in/Left Out	17	B	16	B

ID	Intersection	Road	Control	AM Peak		PM peak	
I-22	Station Road(2) / Rawson Street(2)	Regional/Regional	Signals	24	B	39	C
I-23	Mary Street / Cumberland Road	Local/Local	Roundabout	6	A	7	A
I-24	Mona Street(2) / Chisholm Road	Regional/Local	Signals	14	B	21	B
I-25	Manchester Road / Chisholm Road	Local/Local	Priority	4	A	5	A
I-26	Manchester Road / Cumberland Road	Local/Local	Roundabout	11	A	15	B
I-27	Rawson Street(2) / Parramatta Road(1)	State/Regional	Signals	42	D	82	F
I-28	Parramatta Road(1) / Hampstead Road / Newton Street	State/Local	Signals	18	B	20	B
I-29	Parramatta Road(1) / Stubbs Street	State/Local	Signals	12	A	10	A
I-30	Parramatta Road(1) / Station Road(2)	State/Regional	Signals	37	C	31	C
I-31	Parramatta Road(1) / Silverwater Road(1)	State/State	Signals	59	E	55	D
I-32	Parramatta Road(1) / Percy Street	State/Local	Priority	3	A	2	A
I-33	Parramatta Road(1) / Nyrang Street	State/Local	Signals	25	B	53	D
I-34	Parramatta Road(1) / Bombay Street	State/Local	Signals	32	C	36	C
I-35	Silverwater Road(1) / M4 off ramp (east)	State/State	Signals	33	C	30	C
I-36	Silverwater Road(1) / M4 off ramp (west)	State/State	Signals	32	C	32	C
I-37	St Hilliers Road(1) / Rawson Street(2)	State/Regional	Signals	49	D	36	C
I-38	Parramatta Road(1) / Birnie Avenue(2)	State/Regional	Signals	51	D	70	E
I-39	Rawson Street(2) / The Crescent(2)	Regional/Regional	Signals	47	D	63	E
I-40	Beatrice Street / Auburn Road	Local/Local	Signals	14	B	16	B
I-41	Queen Street / Marion Street	Local/Local	Roundabout	6	A	5	A
I-42	Helena Street / Park Road(2)	Regional/Local	Roundabout	10	A	8	A
I-43	Joseph Street(1) / Olympic Drive(1)	State/State	Partial Signals	17	B	14	B
I-44	Georges Avenue(2) / Joseph Street(1)	State/Regional	Signals	54	D	29	C

ID	Intersection	Road	Control	AM Peak		PM peak	
I-45	Lidbury Street / Elizabeth Street/Woodburn Road	Local/Local	Roundabout	10	**A**	9	**A**
I-46	Tiba Street / Woodburn Road / Kerrs Road	Local/Local	Roundabout	7	**A**	6	**A**

Source: Paramics model (Model file Ref: 2012_AM Peak_BC_TZ100_1712012_1 and 2012_PM Peak_BC_TZ100_11122012_2, F:\AA005093\Modelling\Paramics\2-Models)

Note: (1) State roads, (2) Regional roads. The road classification was sourced from RMS (Figure 6-34)

The analysis determined level of service (LoS) between A and F for key intersections within the study area. Model predicted low level of service D to F either in AM or PM peak at following 12 intersections:

- Weeroona Road / Joseph Street / Amy Street (I-3);
- Wellington Road / Chisholm Road (I-7);
- Wellington Road / Park Road (I-9);
- Park Road / Vaughan Street (I-10);
- Vaughan Street / Olympic Drive (I-13);
- Church Street / Olympic Drive (I-18);
- Rawson Street / Parramatta Road (I-27);
- Parramatta Road / Silverwater Road (I-31);
- St Hilliers Road / Rawson Street (I-37);
- Parramatta Road / Birnie Avenue (I-38);
- Rawson Street / The Crescent (I-39); and
- Georges Avenue / Joseph Street (I-44).

Table 8-29 summarises number of intersections identified with low level of service (LoS) either in AM or PM peak.

Table 8-29 Intersections identified with low level of service in AM or PM peaks

Intersection Classification	Number of intersections identified with low level of service either in AM or PM peak
State / State	1
State / Regional	7
State / Local	1
Regional / Regional	3
Regional / Local	n/a
Local / Local	n/a

8.2 Network Operational Issues

Intersection analysis, based on the Paramics assessment indicated intersection related operational issues at following 19 intersections including:

- Weeroona Road / Joseph Street / Amy Street (I-3);
- Wellington Road / Chisholm Road (I-7);
- Wellington Road / Park Road (I-9);
- Park Road / Vaughan Street (I-10);
- Vaughan Street / Olympic Drive (I-13);
- Church Street / Olympic Drive (I-18);
- Rawson Street / Parramatta Road (I-27);
- Parramatta Road / Silverwater Road (I-31);
- St Hilliers Road / Rawson Street (I-37);
- Parramatta Road / Birnie Avenue (I-38);
- Rawson Street / The Crescent (I-39);
- Georges Avenue / Joseph Street (I-44);
- Station Road / Rawson Street (I-22);
- Station Road / Parramatta Road (I-30);
- Joseph Street / Olympic Drive (I-43)
- Kerrs Road / Olympic Drive;
- Olympic Drive / Childs Street;
- Amy Street / Auburn Road and
- Carlingford Street / Park Road.

Figure 8-45 shows location of these intersections identified as problematic within LGA study area.

The modelling result indicates that some movements at these 19 intersections are operating close to or at capacity level with low level of service (LoS) F. While some of these issues do not necessarily reflect an overcapacity situation for the entire intersection, any further increase on the demand from both future background and precinct development traffic at these locations will impact network capacity. **Table 8-30** summarises number of intersections identified with operational issues by classification.

Table 8-30 Intersections identified with operational issues in AM or PM peaks

Intersection Classification	Number of intersections identified with operational issues in AM or PM peaks
State / State	1
State / Regional	7
State / Local	3
Regional / Regional	7
Regional / Local	1
Local / Local	n/a

Regular overflow queues are observed on key state and regional roads including Parramatta Road, St Hilliers Road, Olympic Drive, Joseph Street, Wellington Road and Vaughan Street in both morning and afternoon peak periods. **Figures 8-46 and 8-47** show Paramics forecast queue length on road network. Forecast queues are highlighted in Red.

Base on above results, some likely 17 locations identified having operational issues either AM or PM peak or both periods. **Table 8-31** documents detailed operational issues identified at these 17 locations. Location IDs are referred to **Figure 8-45**.

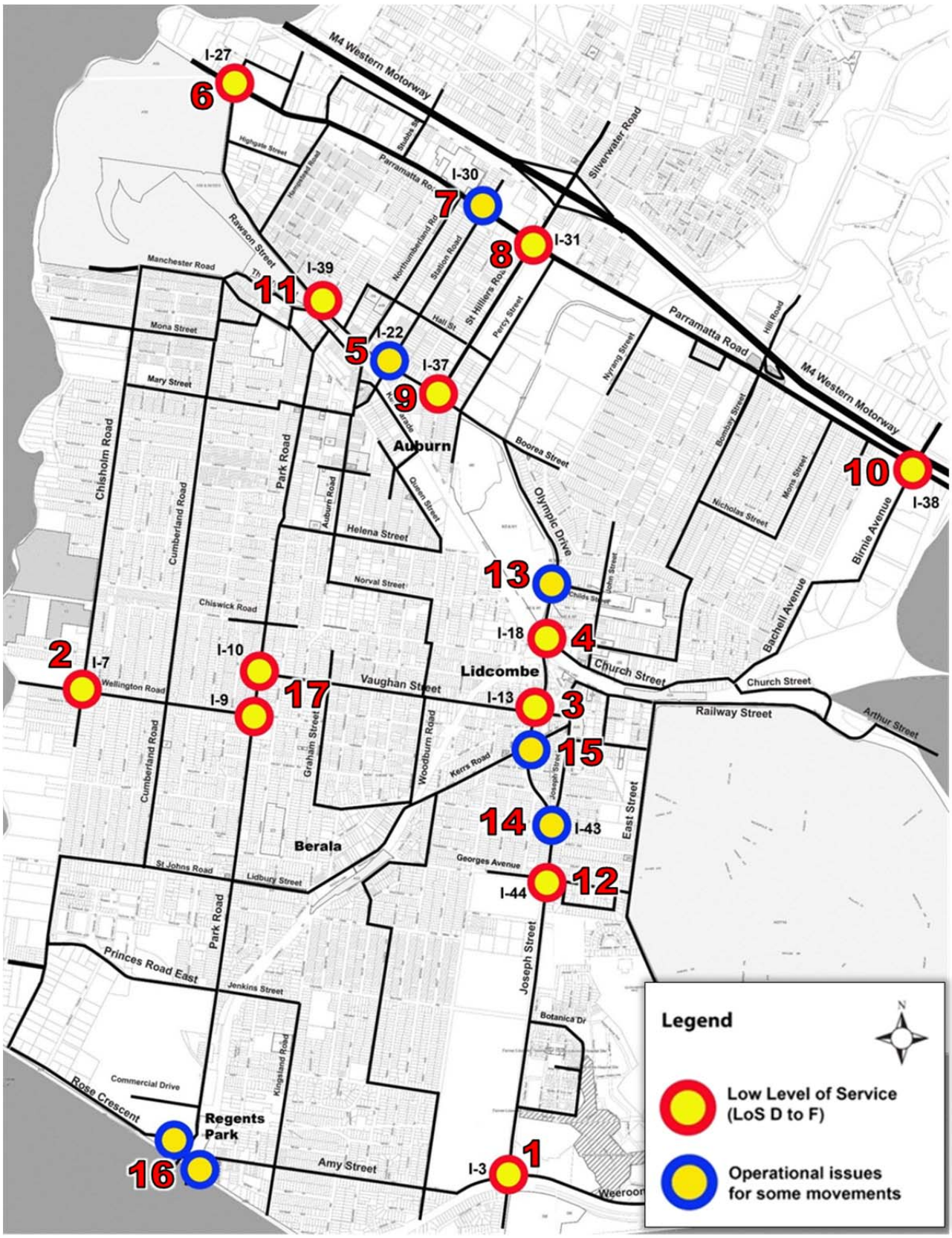
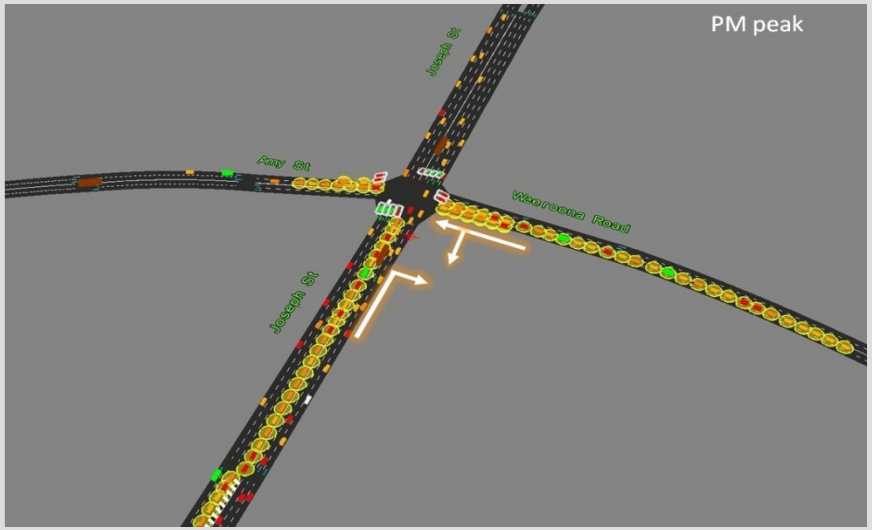
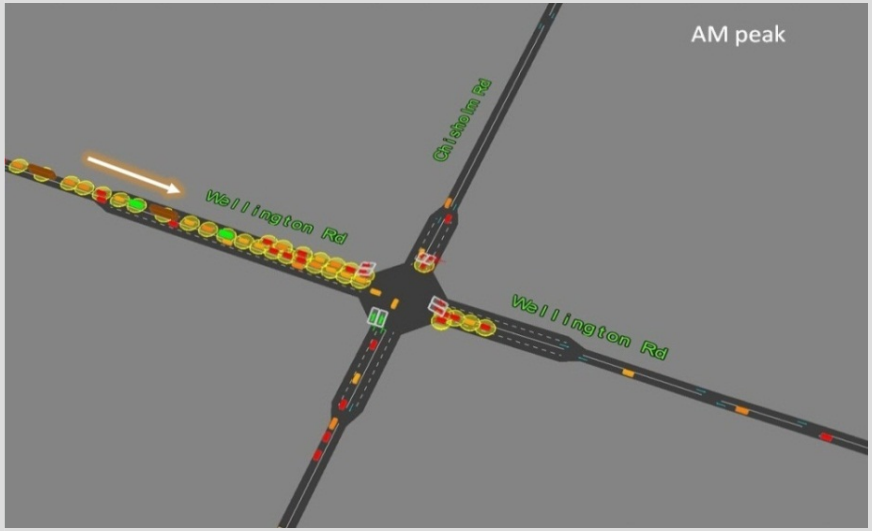


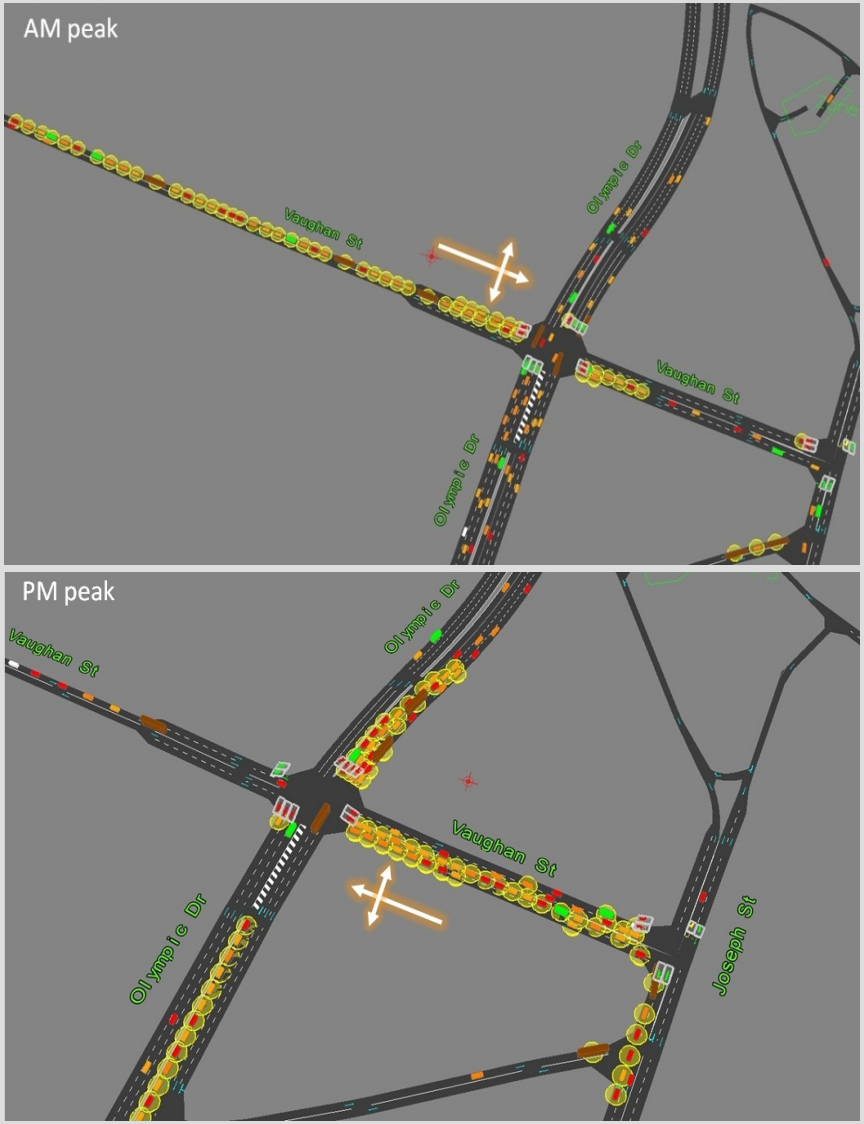
Figure 8-45 Location of Key Intersection Showing Existing Capacity Issues

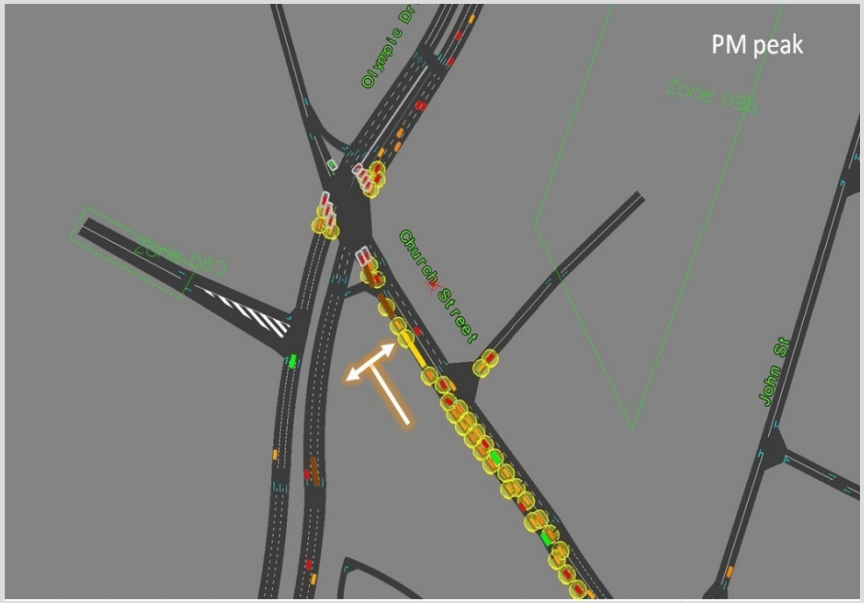
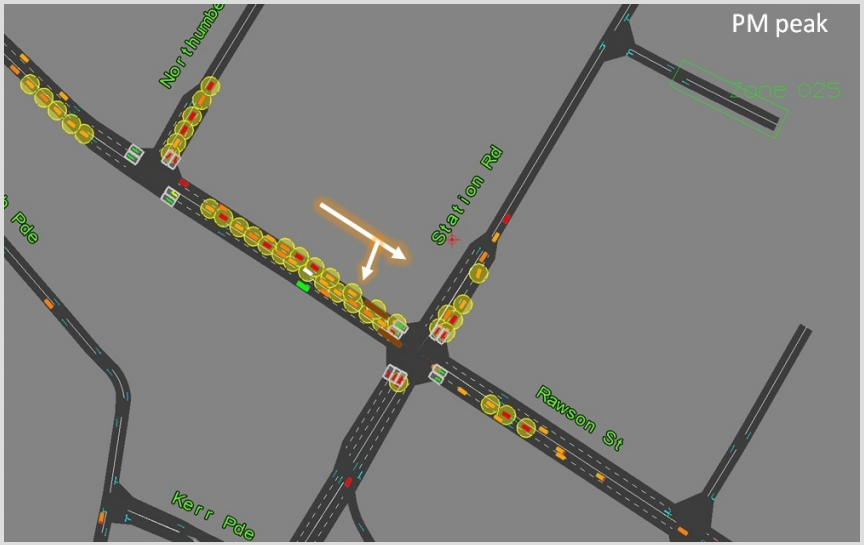
Figure 8-46 Modelled Forecast Queue Level during AM peak

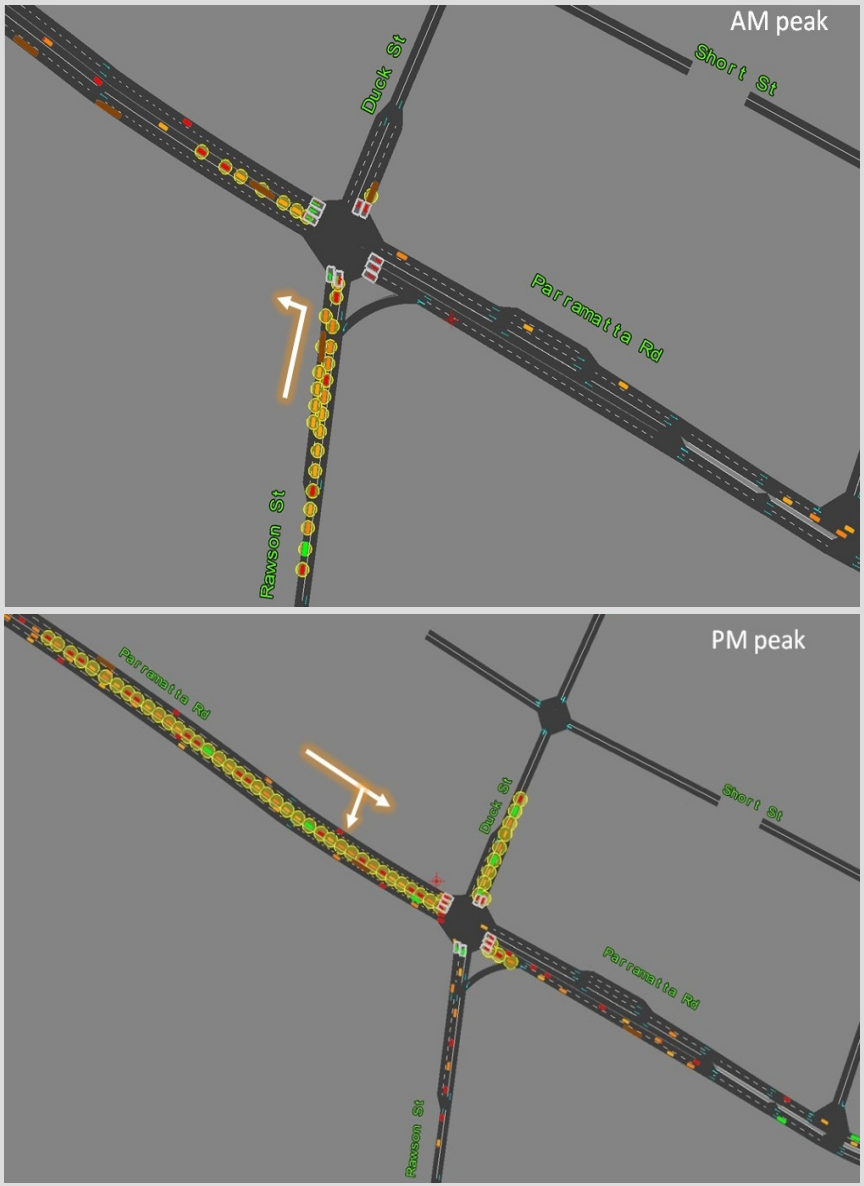
Figure 8-47 Modelled Forecast Queue Level during PM peak

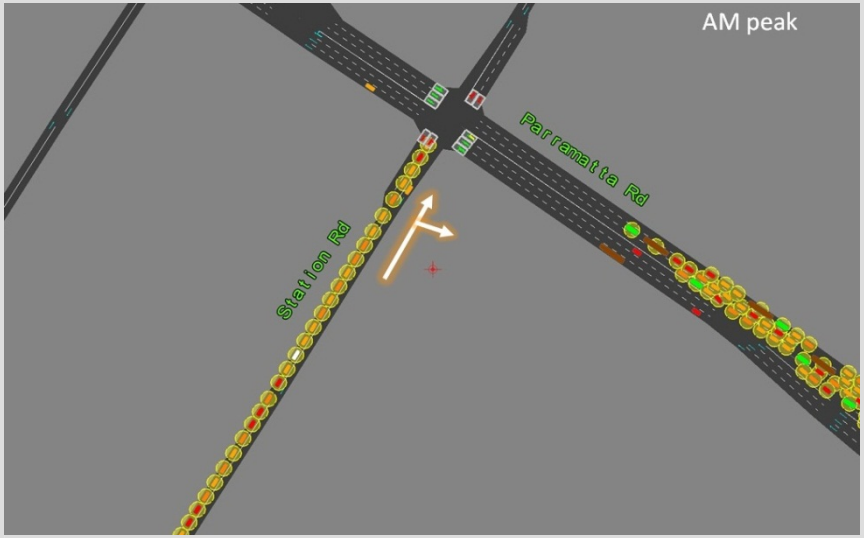
Table 8-31 Key Network Operational Issues (ID referring Figure 8-45 in page 142)

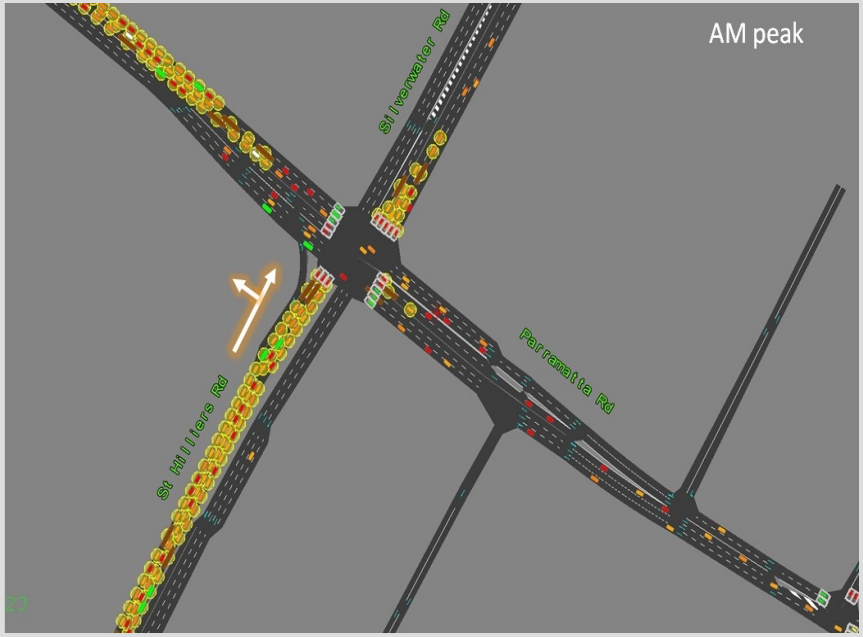
ID	Intersection	Control	Network Issues	Paramics Snapshot
1	Weeroona Rd/Joseph St/ Amy St (I-3)	Signals	▪ Intersection is currently operating at poor level of service (LoS F) during PM peak. ▪ Major movement is observed on north-south through traffic on Joseph Street (4,000 to 4,400 veh/hr) ▪ Vehicles on Weeroona Road and Amy Street are experiencing occasional queue and delay. ▪ Right turn movement from Joseph Street on to Weeroona Road shows extensive queue and occasionally blocks through movement in shared traffic lane in PM peak.	
2	Wellington Rd / Chisholm Rd (I-7)	Signals	▪ Intersection is currently operating at near capacity (LoS D) during both peaks. ▪ Modelling indicates right turn vehicles from Wellington Road southbound on to Chisholm Road are experiencing extensive queues and delays and occasionally block through traffic movement in shared traffic lane on Wellington Road.	

ID	Intersection	Control	Network Issues	Paramics Snapshot
3	Vaughan St / Olympic Dr (I-13)	Signals	▪ Intersection is currently operating at capacity (LoS E) during both peaks. ▪ Major movement is found on north-south through traffic on Olympic Drive (3,500 to 3,900 veh/hr). ▪ Model indicates vehicles on Vaughan Street are experiencing extensive long queues and delays during both peak periods. ▪ Right or left turn movement from Vaughan Street on to Olympic Drive occasionally blocks through traffic in shared traffic lane. ▪ Capacity on Vaughan Street west of Olympic Drive is currently limited by on-street parking.	

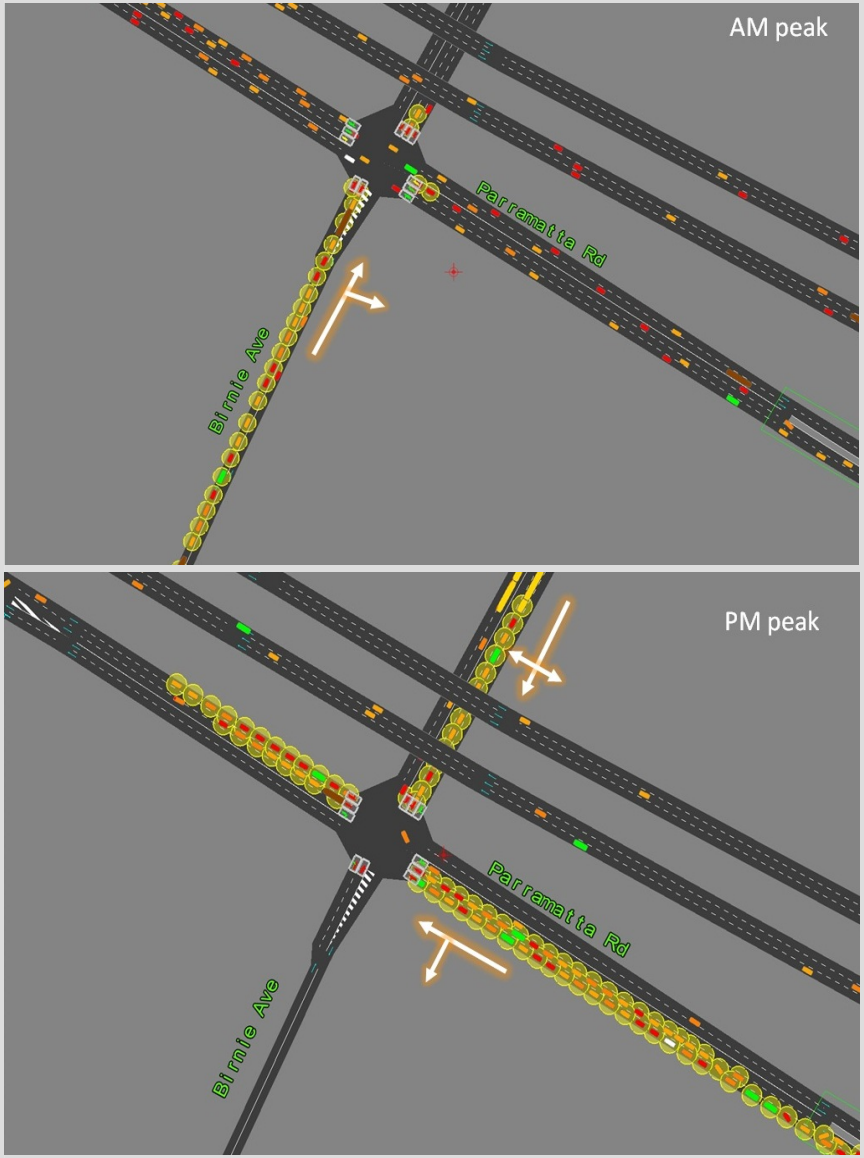
ID	Intersection	Control	Network Issues	Paramics Snapshot
4	Church St / Olympic Dr (I-18)	Signals	▪ Intersection is currently operating at capacity with level of service E during PM peak. ▪ Major movement is observed on north-south through traffic on Olympic Drive (3,800 to 4,000 veh/hr). ▪ During PM peak, high right turn (300 veh/hr) and left turn (400 veh/hr) traffic from Church St on to Olympic Drive were observed. Model indicates they are experiencing extensive long queues and delays (LoS F).	
5	Station Road / Rawson Street (I-22)	Signals	▪ Intersection is currently operating at good overall level of service (LoS B and C) during AM and PM peak. ▪ Model shows occasional queue on Rawson Street west of Station Road during PM peak with poor level of service E. ▪ Right turn movement from Rawson Street southbound on to Station Road occasionally block through traffic.	

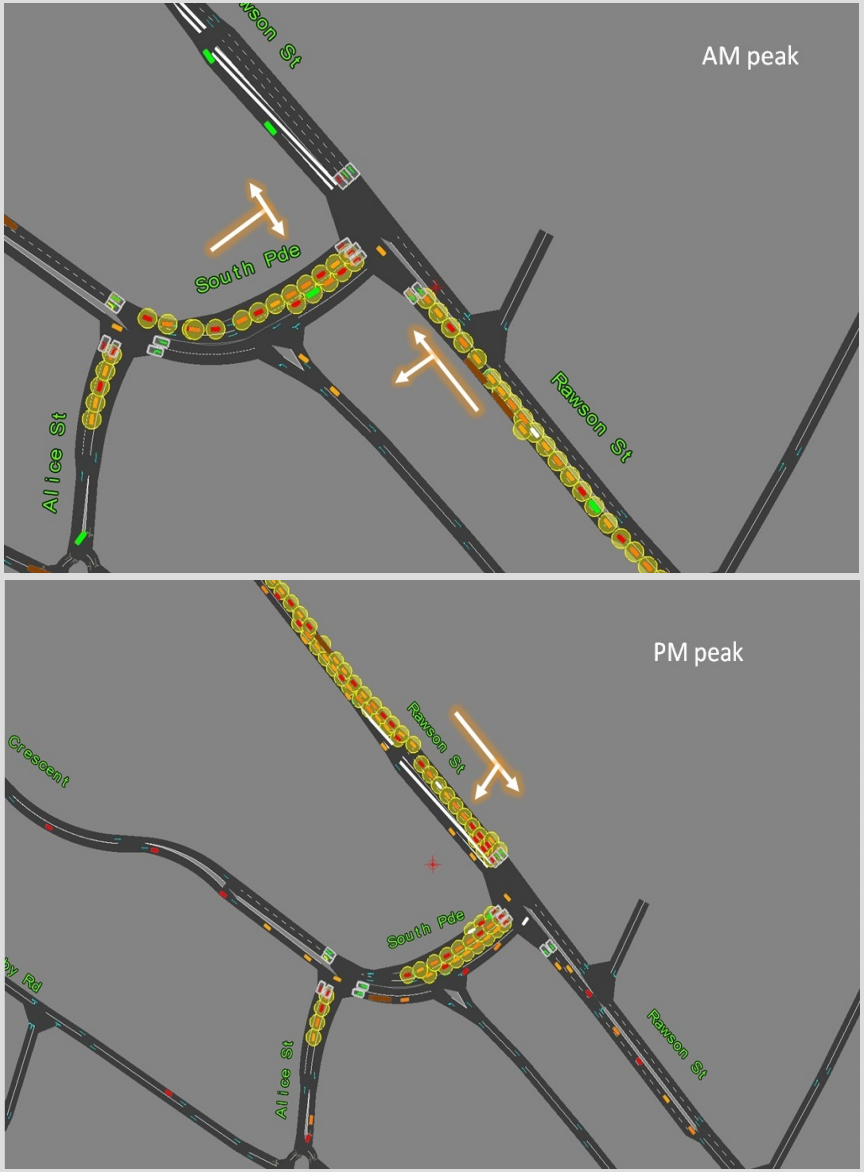
ID	Intersection	Control	Network Issues	Paramics Snapshot
6	Parramatta Rd / Rawson St/Duck Street (I-27)	Signals	▪ Intersection is currently operating at poor level of service (LoS F) during PM peak. ▪ High left turn traffic (700 veh/hr) from Rawson Street on to Parramatta Road was observed during AM peak. ▪ Model indicates high delays and occasional long queues on Rawson Street south of Parramatta Road during AM peak periods (LoS D). ▪ High right turn traffic (500 veh/hr) from Parramatta Road on to Rawson Street was observed during both peak periods. ▪ Model indicates that right turn vehicles from Parramatta Road on to Rawson Street are experiencing high delays and residual queuing (LoS F). ▪ Model also indicates that right turn movement (280 veh/hr, PM peak) from Duck Street on to Parramatta Road are experiencing occasional delays in PM peak period (LoS F).	

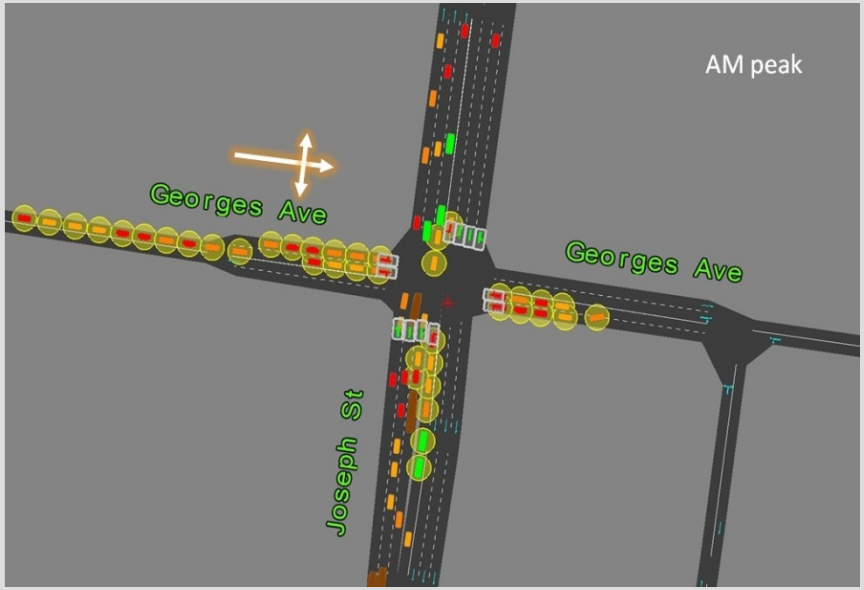
ID	Intersection	Control	Network Issues	Paramics Snapshot
7	Parramatta Rd / Station Rd (I-30)	Signals	▪ Intersection is currently operating at good overall level of service (LoS C) during AM and PM peak. ▪ Model shows vehicles on Station Road south of Parramatta Road are experiencing high delays in both AM and PM peak periods (LoS F).	

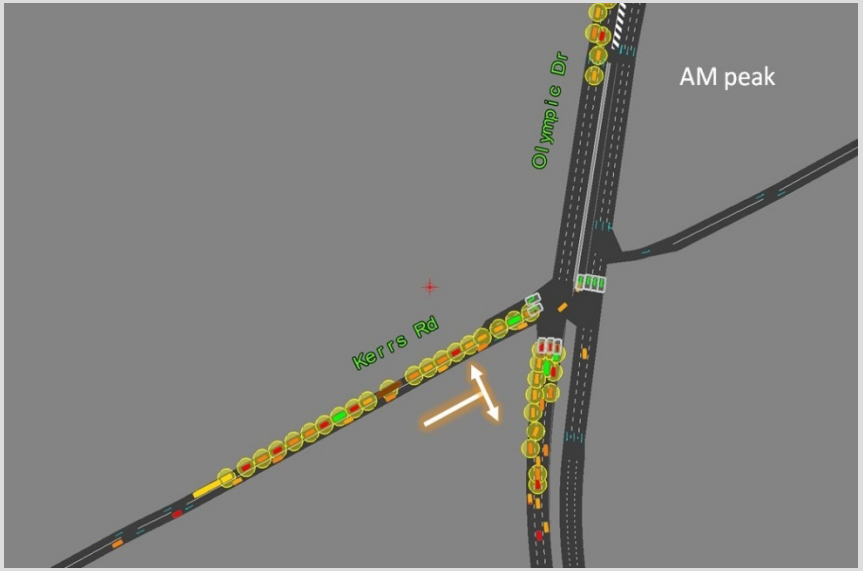
ID	Intersection	Control	Network Issues	Paramics Snapshot
8	Parramatta Rd / St Hilliers Rd / Silverwater Rd (I-31)	Signals	▪ Intersection is currently operating at capacity (LoS E) during AM peak. ▪ Major traffic was observed on north-south movement on St Hilliers Road / Silverwater Road (3,100 to 3,400 veh/hr). ▪ Model indicates high delays for northbound traffic on St Hilliers Road in AM Peak (LoS F) and westbound traffic on Parramatta in PM peak (LoS F).	

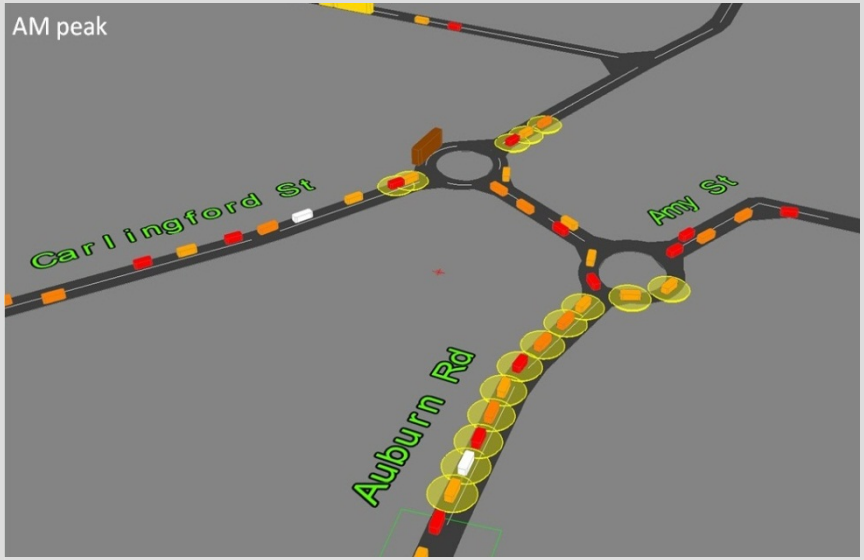
ID	Intersection	Control	Network Issues	Paramics Snapshot
9	St Hilliers Rd / Rawson St (I-37)	Signals	▪ Intersection is currently operating at near capacity (LoS D) during AM peak. ▪ Major traffic was observed on east-north movement between Rawson Street and St Hilliers Road (3,000 to 3,200 veh/hr) ▪ Model shows eastbound traffic on Rawson Road is experiencing queues and delays during AM peak (LoS F). ▪ Left turn slip lane from Rawson Street on to St Hilliers Road is currently unsignalised.	

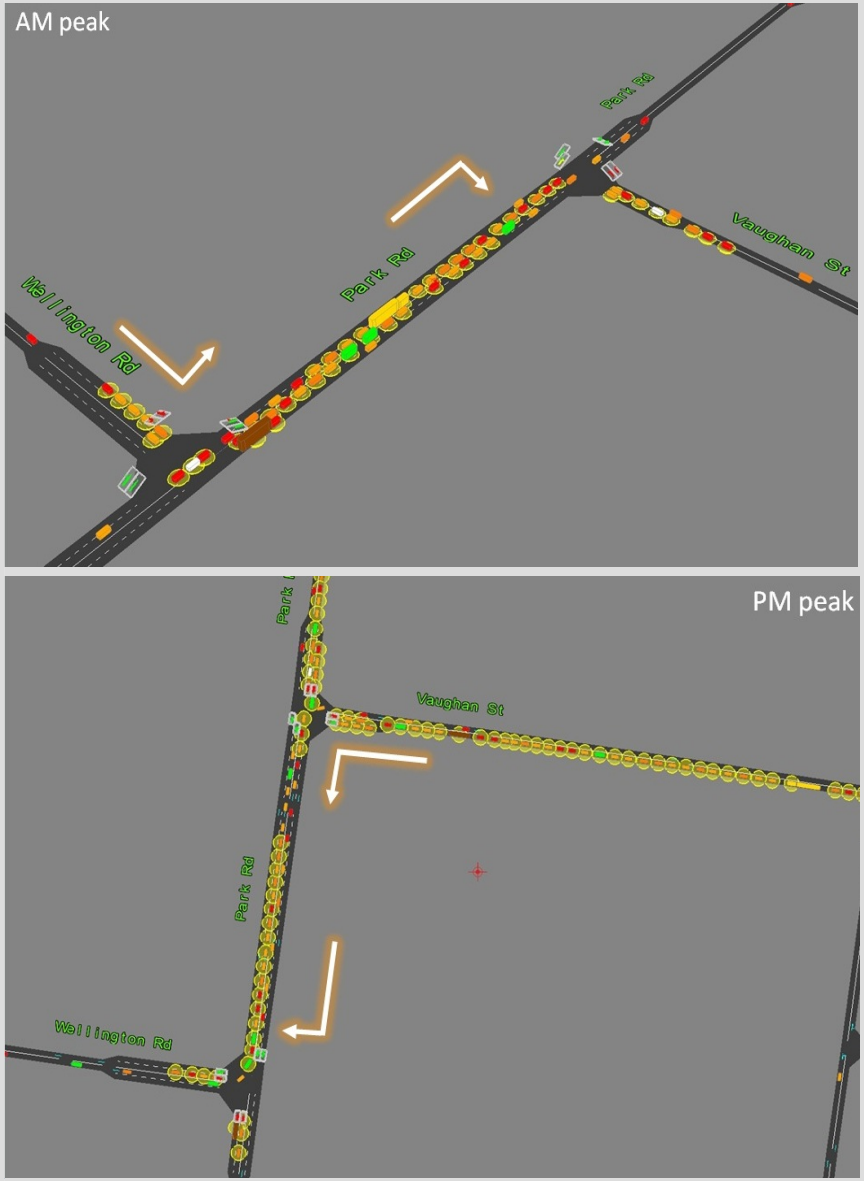
ID	Intersection	Control	Network Issues	Paramics Snapshot
10	Parramatta Rd / Birnie Avenue (I-38)	Signals	▪ Intersection is currently operating at capacity (LoS E) during PM peak. ▪ Currently there are two lanes at the stop line on Birnie Avenue south of Parramatta Road with no lane discipline marking. Capacity of Birnie Avenue south of Parramatta Road is limited by on-street parking. ▪ Long queues and high delays was observed on Birnie Avenue in both peak periods ▪ Model also shows queues and delays on Parramatta Rd east of Birnie Avenue during PM peak (LoS F);	

ID	Intersection	Control	Network Issues	Paramics Snapshot
11	Rawson St / The Crescent (I-39)	Signals	▪ Intersection is currently operating at capacity (LoS E) during PM peak. ▪ Model indicates long queues on the Crescent during AM peak (LoS E). Queues occasionally spill back to adjacent Alice Street / South Parade Signals. ▪ High right turn traffic was observed from Rawson Street on to The Crescent and South Parade (700 veh/hr). These right turn vehicles are experiencing long queues and delays and block through traffic on Rawson Street in shared traffic lane. ▪ Capacity of The Crescent is limited by width of rail over bridge.	

ID	Intersection	Control	Network Issues	Paramics Snapshot
12	Georges Ave / Joseph St (I-44)	Signals	▪ Intersection is currently operating near capacity (LoS D) during AM peak. ▪ High north-south through movement was observed on Joseph Street (4,000 to 4,400 veh/hr). ▪ Model indicates right turning traffic from Georges Avenue southbound on to Joseph Street occasionally blocks east-west through traffic in shared traffic lane. As a result queues and delays are built up on Georges Avenue west of Joseph Street (LoS F).	
13	Olympic Drive / Childs Street	Priority	▪ In AM peak, model shows queue built up on the 'unsignalised' right turn bay on Olympic Drive on to Childs Street. The built queues occasionally spill back on through traffic lane on Olympic Drive during AM peak.	

ID	Intersection	Control	Network Issues	Paramics Snapshot
14	Joseph St / Olympic Dr (I-43)	Partial signals	▪ Intersection is currently operating at good overall level of service B. ▪ In AM peak, high right turn traffic was observed from Joseph Street on to Joseph Street (600 veh/hr). ▪ Model shows queues built up on right turn bay on Joseph Street. The built queues occasionally block northbound through traffic from Joseph Street on to Olympic Drive.	
15	Kerrs Rd / Olympic Dr	Signals	▪ Model shows occasional long queues and high delays on Kerrs Road west of Olympic Drive in AM peak (LoS E). ▪ The capacity on Kerrs Road west of Olympic Drive is currently limited by on-street parking.	

ID	Intersection	Control	Network Issues	Paramics Snapshot
16	Amy St/Auburn Rd & Carlingford St/Park Rd	Roundabout	▪ Currently, there are two single lane roundabouts closely connected with the single lane railway overpass (bridge) near Regent's Park train station (Note: during the modelling study, the Council's proposed upgrade work was not yet implemented). ▪ Model indicates high delays on the bridge and long queues at both roundabouts, particularly along approaches from Auburn Road, Carlingford Street and Amy Street during AM and PM peak periods (LoS F).	

ID	Intersection	Control	Network Issues	Paramics Snapshot
17	Vaughan St / Park Rd & Park Rd / Wellington Rd (I-9 & I-10)	Signals	▪ These intersections are currently operating at poor level of service (LoS D and F). ▪ High east-west movement (1,000 to 1,200 veh/hr) was observed between Wellington Road and Vaughan Street. This movement passes these two junctions. As a result, the network issues at these two junctions are associated. Eastbound traffic was observed as peak direction during AM peak and vice versa during PM peak. ▪ During AM peak, model shows queues built up from right turn movement from Parks Road on to Vaughan Street. The built queues split back to Wellington Road and Parks Road Signals and also blocks northbound through traffic on Parks Road in shared traffic lane. ▪ During PM peak, the observed issue is vice versa. Queues built from right turn traffic from Parks Road on to Wellington Road spill back to Parks Road and Vaughan St Signals and blocks southbound through traffic on Parks Road in shared traffic lane.	

8.3 Proposed Intersection Upgrades

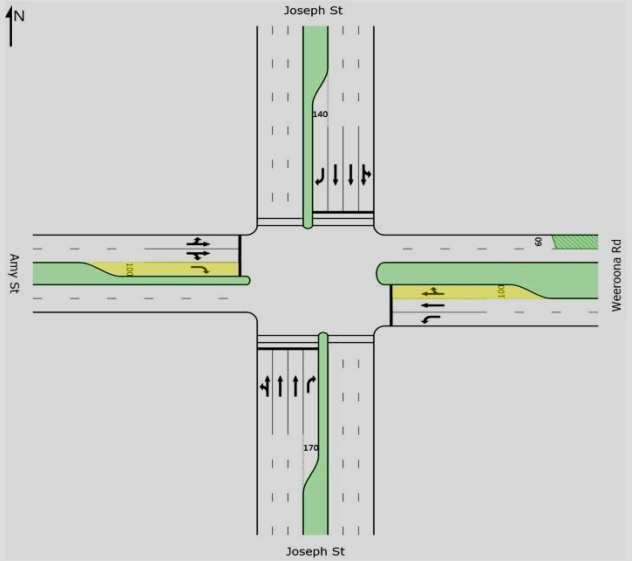
Based on the existing network performance assessment results and modelling investigations, Hyder identified about 17 proposed improvements which have the potential to improve traffic flow of Auburn LGA road network. The improvements includes a range of localised changes to the following key roads to favour the major north south and east west movement of traffic within LGA:

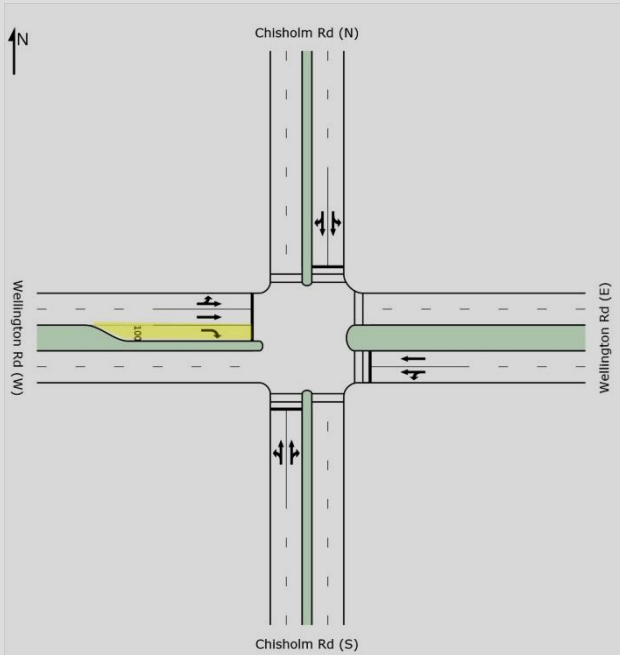
- Parramatta Road;
- St Hilliers Road / Silverwater Road;
- Olympic Drive / Joseph Street;
- Station Road;
- Rawson Street; and
- Wellington Road / Vaughan Street.

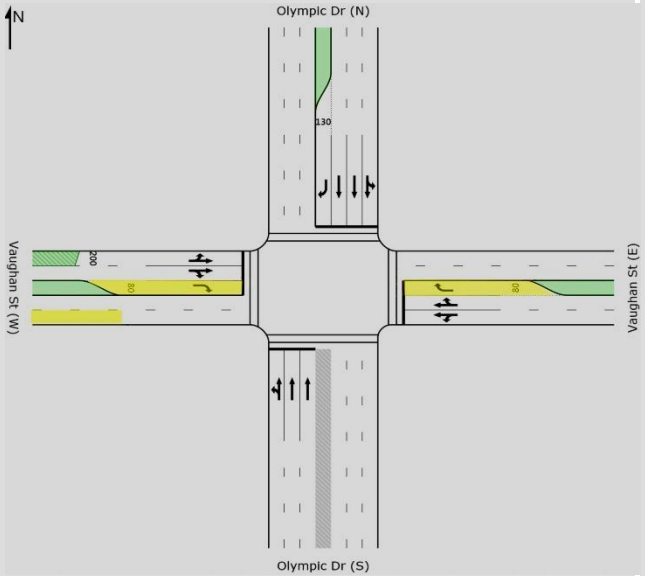
Table 8-32 shows proposed intersection upgrades identified at 17 locations. An indicative upgrade is shown in yellow colour in table. It is likely that identified intersection upgrades will require some property acquisition and utility adjustments. RMS has commenced investigation on the M4 Managed Motorway. The RMS study will identify a number of supporting infrastructure need to improve the Motorway traffic. Depending on RMS study outcome a number of on-ramps may require additional metered lane and geometric improvements to arterial roads approaching ramps.

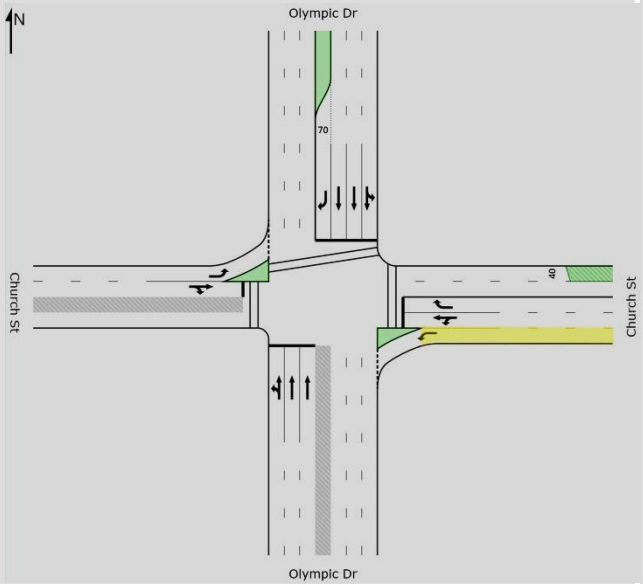
Future consultation with RMS is recommended where potential upgrades are identified at state and regional roads/ intersections within the Auburn study area.

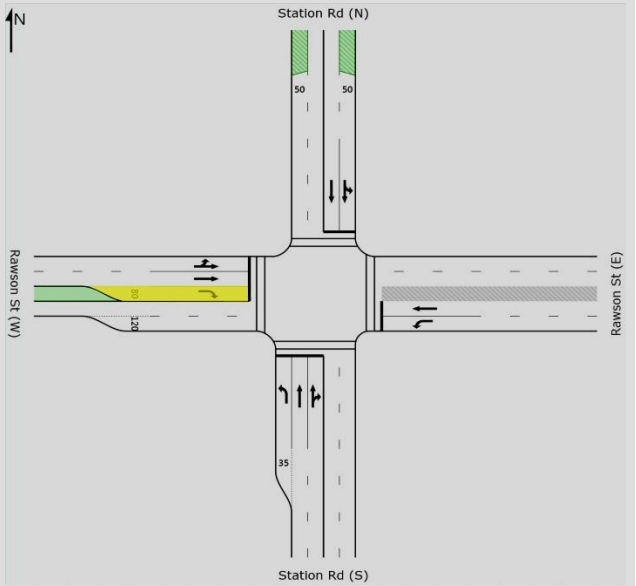
Table 8-32 Proposed Improvements (ID referring Figure 8-45 in page 142)

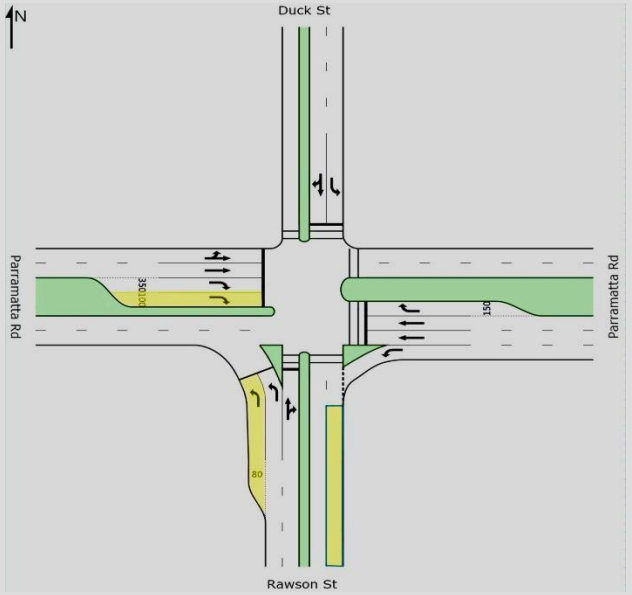
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
1	Weeroona Rd / Joseph St / Amy St (I-3)	▪ Provide one additional exclusive right turn bay on Amy Street approach to allow double right turn traffic movement from Amy Street. Length of right turn bay will be determined during detailed assessment study. ▪ Provide one additional exclusive left turn bay on Weeroona Road approach. This upgrade implies lane discipline change on Weeroona Road approach providing one shared through-right, one exclusive through and one excusive left turn lane at the stop line. ▪ It is expected that providing additional capacity (exclusive right and left turn bays) on Amy Street and Weerona Road approaches would increase portion of signal green time allocation for critical traffic movements on Joseph Street.	▪ Olympic Drive is a classified state road. Future consultation with RMS is recommended. ▪ The recommended improvement would require property acquisition/additional land and utilities (service) relocation..		High

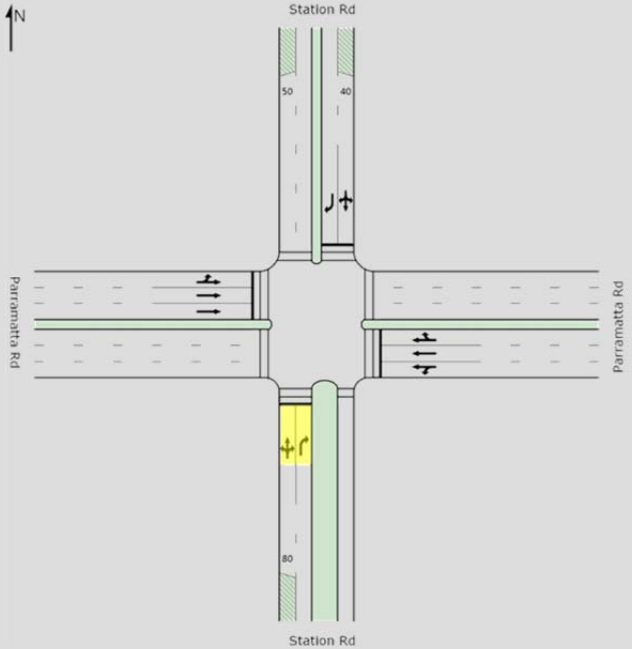
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
2	Wellington Road/Chisholm Rd (I-7)	▪ Provide additional exclusive right turn bay on Wellington Road eastern approach. This upgrade implies lane discipline change on Wellington Road western approach providing one shared through-left, one exclusive through and one exclusive right turn lane at the stop line. Length of right turn bay will be determined during detailed assessment study.	▪ The recommended improvement would require property acquisition, additional land and utilities (service) relocation.		Medium

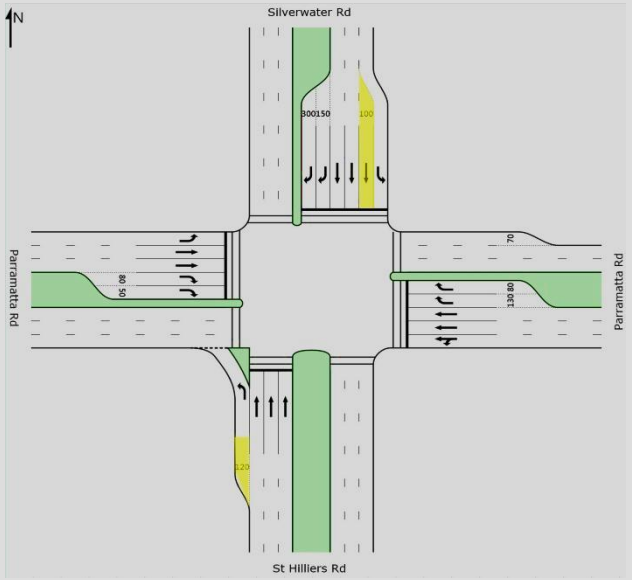
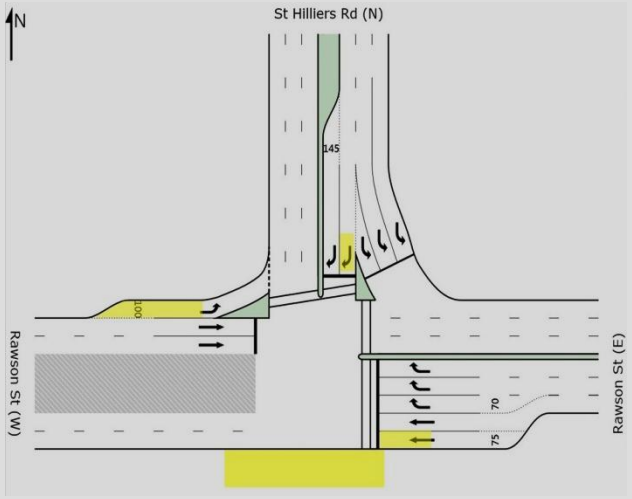
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
3	Vaughan St / Olympic Dr (I-13)	▪ Provide additional exclusive right turn bay on Vaughan Street eastern and western approaches. This upgrade implies lane discipline change on Vaughan Street eastern and western approaches providing one shared through-left, one exclusive through and one exclusive right turn lane at the stop line. Length of right turn bays will be determined during detailed assessment study. ▪ Possible removal of pedestrian crossing across Olympic Drive northern approach. This may provide additional capacity for vehicular traffic. ▪ Possible clearway during peak period on Vaughan Street western exit lane from Olympic Drive to railway bridge. This implies on-street parking ban during peak period on approximately 20 parking spaces.	▪ Olympic Drive is a classified state road. Future consultation with RMS is recommended. ▪ The recommended improvement would require property acquisition, additional land and utilities (service) relocation..		Medium

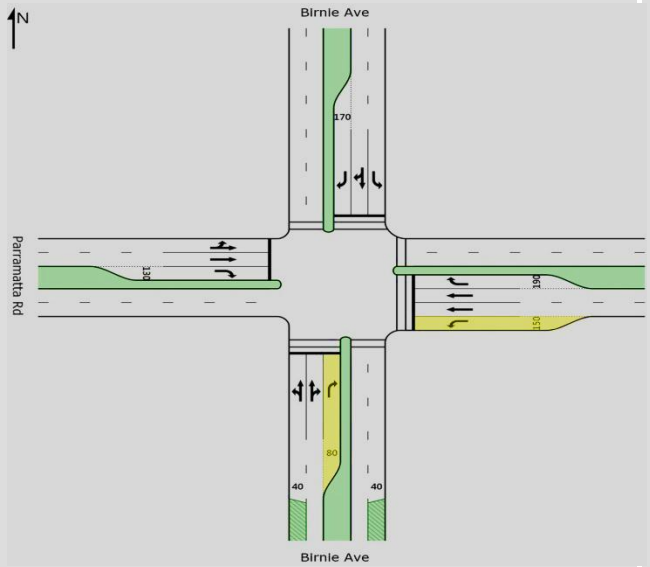
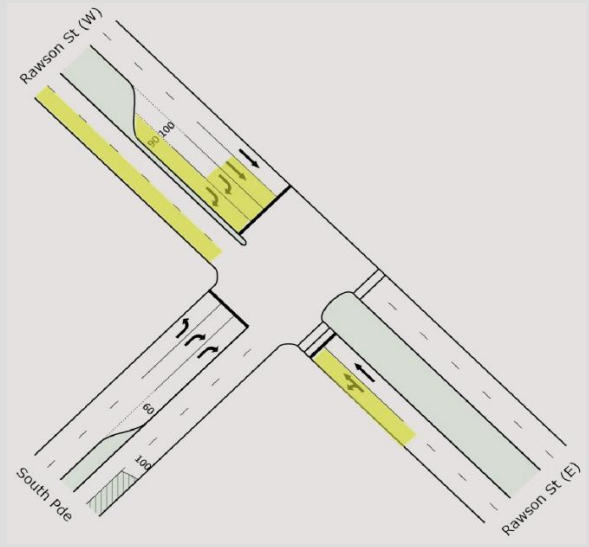
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
4	Church St / Olympic Dr (I-18)	▪ Provide additional exclusive left turn lane to connect with the existing (unsignalised) short left turn slip lane on Church Street eastern approach. This upgrade implies removal of approximately 10 existing parking spaces on Church Street east of Olympic Drive. Length of left turn bay will be determined during detailed assessment study.	▪ Olympic Drive is a classified state road. Future consultation with RMS is recommended. ▪ The recommended improvement would require property acquisition, additional land and utilities (service) relocation.		Medium

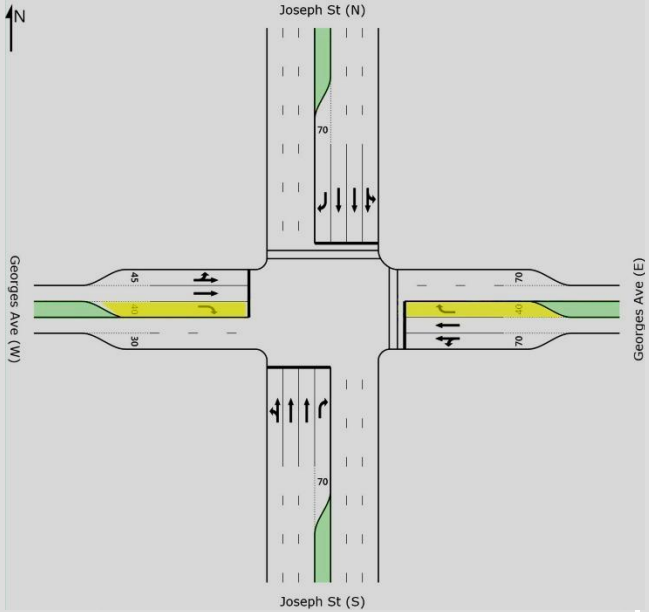
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
5	Station Rd / Rawson St (I-22)	▪ Provide additional exclusive short right turn bay on Rawson Street western approach allowing lane discipline change to accommodate one shared left-through, one exclusive through and one exclusive right turn bay. Length of right turn bay will be determined during detailed assessment study.	▪ The recommended improvement would require property acquisition, additional land and utilities (service) relocation.		Low

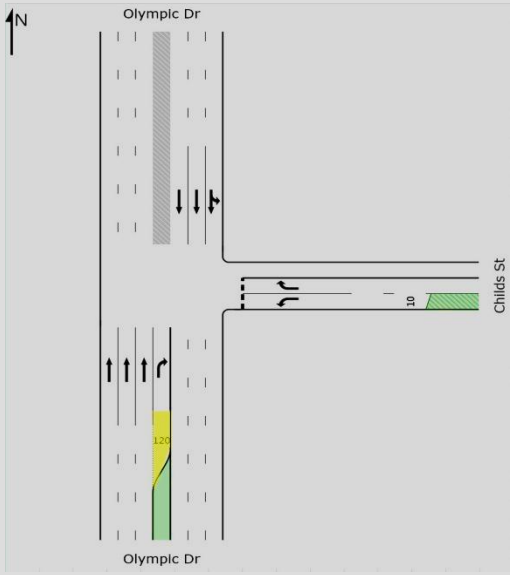
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
6	Parramatta Road/Rawson Street (I-27)	▪ Provide double left turn (signalised) slip lanes on Rawson Street. This upgrade implies lane discipline change on Rawson Street approach providing double signalised left turn slip lanes and one shared through –right lane at the stop line. Length of left turn bay will be determined during detailed assessment study. ▪ Provide additional short right turn bay on Parramatta Road western approach to accommodate double right turn traffic movement from Parramatta Road to Rawson Street. Length of right turn bay will be determined during detailed assessment study. ▪ To accommodate double right turn from Parramatta Road on to Rawson Street, two southbound exit lanes are proposed on Rawson Street between Parramatta Road and Highgate Street ▪ Further consultation with RMS is recommended as part of M4 Managed Motorway Project.	▪ Parramatta Road is a classified state road. Future consultation with RMS is recommended. ▪ The recommended improvement would require property acquisition, additional land and utilities (service) relocation.		High

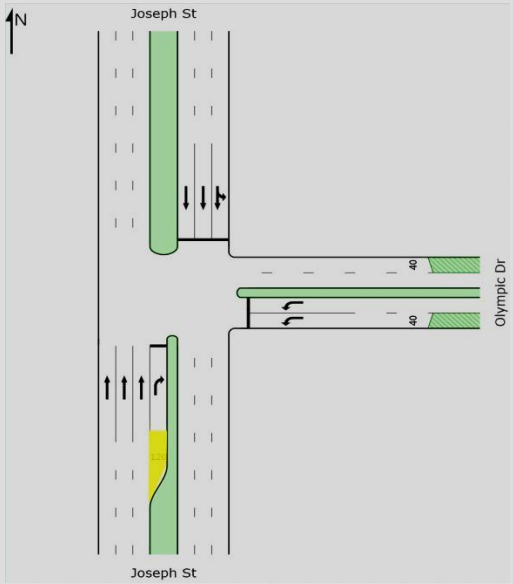
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
7	Station Rd / Parramatta Rd (I-30)	▪ Provide additional right turn lane on Station Road southern approach to accommodate double right turn traffic movement from Station Road south to Parramatta Road. ▪ This upgrade implies lane discipline change on Station Road southern approach providing one exclusive right turn lane, one shared through-right and one exclusive left turn lane at the stop line. ▪ Note: the improvement work was implemented during the study process and was not including in traffic modelling.			Upgrade work was recently undertaken by RMS.

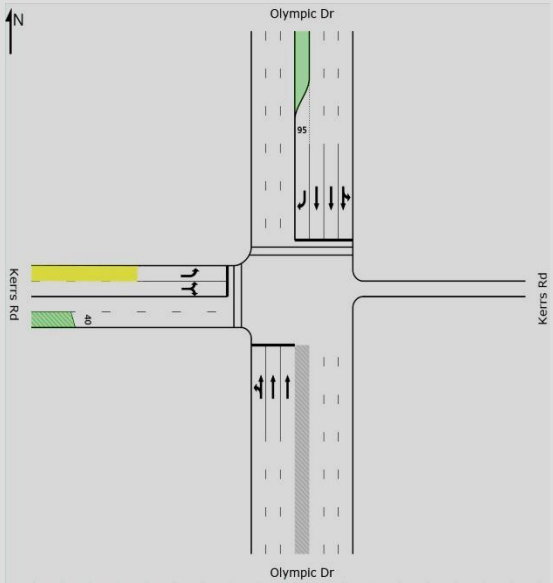
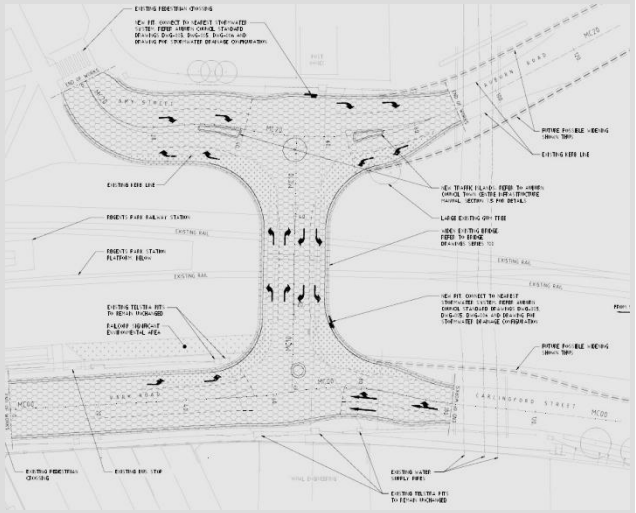
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
8	Parramatta Rd / St Hilliers Rd / Silverwater Rd (I-31)	▪ Extend the length of the existing left turn bay on St Hilliers Road approach. Length of left turn bay will be determined during detailed assessment study. ▪ Provide additional southbound through lane on Silverwater Road to utilise existing three lane capacity on St Hilliers Road southbound carriageway. Length of left turn bay will be determined during detailed assessment study. ▪ Further consultation with RMS is recommended as part of M4 Managed Motorway Project.	▪ St Hilliers Rd is classified state road. Future consultation with RMS is recommended ▪ The recommended improvement would require property acquisition, additional land and utilities (service) relocation..		Medium
9	St Hilliers Rd / Rawson St (I-37)	▪ Provide additional exclusive left turn lane to connect with the existing (unsignalised) short left turn slip lane on Rawson Street western approach. Length of left turn bay will be determined during detailed assessment study. ▪ Possible conversion of four leg intersection to three -leg T-junction. This can be achieved by closing St Hilliers Road south approach, as this approach carries small traffic volumes (less than 20 vehicles in one hour). ▪ Provide alternative access for traffic to/from St Hilliers Road south potentially via North Pde-Dartbrook Road and North Parade-Percy Street.	▪ St Hilliers Road (north) and Rawson Street (east) form part of the state road. Future consultation with RMS is recommended ▪ The possible closure of St Hilliers Road southern approach will adversely impact accessibility of residents particularly visitors to the Auburn Gallipoli Mosque. A detailed accessibility and impact assessment should be undertaken should this identified upgrade proceed.		Medium

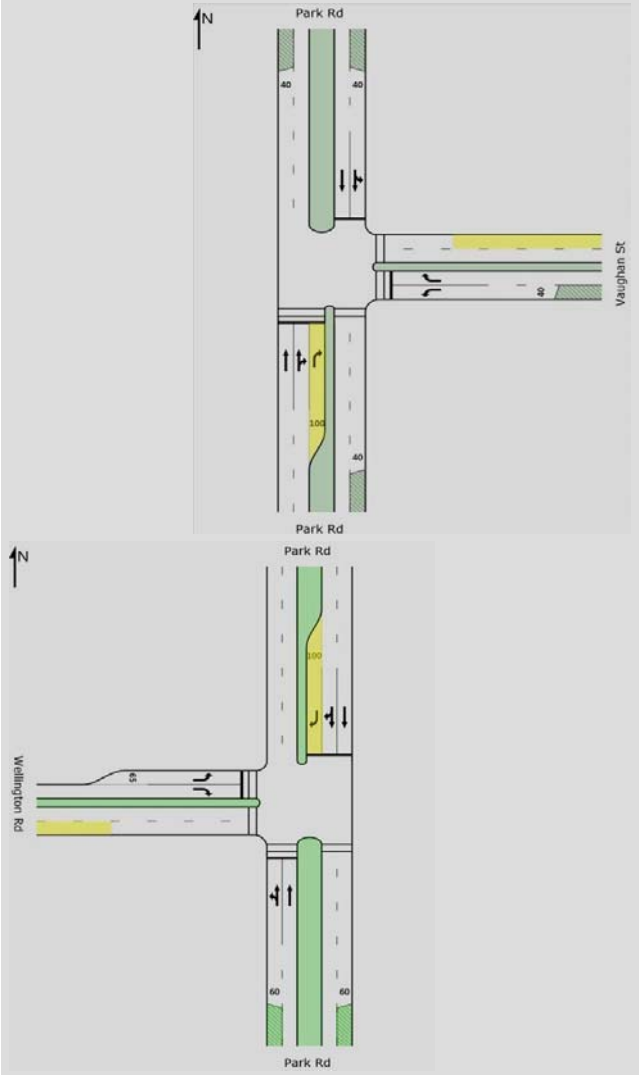
ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
10	Parramatta Rd / Birnie Ave (I-38)	▪ Provide additional exclusive right turn bay on Birnie Avenue southern approach to accommodate double right turn traffic movement from Birnie Avenue south to Parramatta Road. This upgrade implies lane discipline change on Birnie Avenue southern approach providing one shared left-through lane, one shared through right and one exclusive right turn lane at the stop line. Length of right turn bay will be determined during detailed assessment study. ▪ Provide additional left turn bay on Parramatta Road eastern approach allowing double exclusive through lanes on Parramatta Road in westbound direction.	▪ Parramatta Road is a classified state road. Future consultation with RMS is recommended. ▪ The identified widening may require property acquisition and utilities (service) relocation.		Medium
11	Rawson St / The Crescent (I-39)	▪ Provide two through lanes in westbound direction on Rawson Street west of The Crescent. ▪ Lane discipline change on Rawson Street eastern approach allowing two through lanes (one shared left-through and one exclusive through lane) in westbound direction. ▪ Provide additional exclusive short right turn bay on Rawson Street western approach allowing double right turn and two eastbound exclusive through lanes at the stop line.	▪ Rawson Street is a classified regional road. ▪ Due to adjacent railway reserve, it may not be possible to widen Rawson Street on the southern side. Property acquisition may be required to widen Rawson Street on the northern side.		Medium

ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
12	Georges Ave / Joseph St (I-44)	▪ Provide additional exclusive short right turn bay on Georges Avenue eastern and western approaches allowing lane discipline change from shared right-through lanes to excusive through lanes in eastbound and westbound direction. Length of right turn bays will be determined during detailed assessment study.	▪ The identified widening may require property acquisition and utilities (service) relocation.		Low

ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
13	Olympic Dr / Childs St	▪ Extend the length of existing right turn bay on Olympic Drive southern approach. Length of right turn bay will be determined during detailed assessment study.	▪ Olympic Drive is a classified state road. Future consultation with RMS is recommended.		Low

ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
14	Joseph St / Olympic Dr (I-43)	• Extend the length of existing right turn bay on Joseph Street southern approach. Length of right turn bay will be determined during detailed assessment study.	▪ Olympic Drive is a classified state road. Future consultation with RMS is recommended.		Low

ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
15	Kerrs Rd / Olympic Dr	▪ A clearway is proposed during peak period on Kerrs Road western approach between Carroll Street and Olympic Drive. This implies on-street parking ban during peak period on approximately 10 parking spaces.			Low
16	Amy St / Auburn Rd & Carlingford St / Park Rd	▪ Preliminary upgrade proposal (dated: 4/10/2012) provided by Council involves railway overpass (bridge) widening to accommodate two lanes in each direction and additional turning lanes at the roundabout approaches.			High

ID	Intersection	Potential Improvements	Potential Constraints	Indicative Upgrade Sketch	Priority
17	Vaughan St/Park Rd & Park Rd Wellington Rd (I-9 & I-10)	▪ Provide additional right turn bay on Park Road northern approach at the intersection with Wellington Road to allow double right turn from Park Road to Wellington Road. Length of right turn bay will be determined during detailed assessment study. ▪ To accommodate double right turn from Park Road to Wellington Road, a clearway is proposed on Wellington Road between Park Road and Cumberland Road in westbound direction. This implies on-street parking ban during peak period on approximately 20 parking spaces. ▪ Provide additional right turn bay on Park Road southern approach at the intersection with Vaughan Street to allow double right turn from Park Road to Vaughan Street. Length of right turn bay will be determined during detailed assessment study. ▪ Clearway condition on Vaughan Street between Graham Street and Park Road is proposed in both eastbound and westbound directions during peak periods. This implies on-street parking ban during peak period on approximately 35 parking spaces.	▪ The identified widening may require property acquisition and utilities (service) relocation.		High

8.4 Level of Service of Upgrade Proposals

Further modelling assessment was undertaken to determine level of service (LoS) of proposed intersection upgrades at 17 locations using Paramics. The LoS was determined for 2012 traffic condition. The service life of proposed upgrade was also estimated taking into account future growth potentials.

In general, with proposed upgrade in place modelling analysis showed substantial improvements in level of service particularly on key State and Regional roads. With all proposed upgrades traffic model predicted level of service C/D or better in either morning or afternoon peak.

Detailed modelling investigation is reported to Council as **Addendum 1** and appended to this document.

8.5 Strategic Cost Estimates

The pre-strategic construction only costs have been used as a basis to develop the cost estimates for this study. The strategic cost estimates for each of the upgrade were provided to assist Council in prioritising suitable infrastructure upgrades for planning proposal purpose. Cost estimates are based on average costs per square metre for the demolition and reconstruction of concrete and asphalt road pavements. These costs have been sourced from recent comparable projects.

Schematic design of upgrade proposals is included in **Appendix E**.

Given the preliminary strategic nature of cost estimates undertaken for this study, a contingency between 40% and 200% has been added to cover any unforseen costs in design or construction of works. No allowance has been made for the management / relocation of utilities, stormwater and other infrastructure.

Table 8-33 below shows administrative responsibility of roads where upgrades are proposed. It also shows notional cost apportionment between State (RMS) and Council.

Table 8-33 Administrative Road Classification where Upgrades are proposed

Intersection Classification	Number of intersections	State Contribution	Council Contribution
State / State	1	100%	
State / Regional	7	50%	50%
State / Local	3	50%	50%
Regional / Regional	7	50%	50%
Regional / Local	1	50%	50%
Local / Local	n/a		100%
Totals	19		

Table 8-34 below shows preliminary strategic cost estimates of upgrading works proposed for 19 intersections (at 17 locations).

Table 8-34 Summary of Strategic Estimate of Infrastructure

ID (Table 8.32)	Location / Intersection	Road Classification	Strategic Estimate		
			Total Cost	Contributable by State	Contributable by Council
1	Weeroona Road / Joseph Street(1) / Amy Street(2)	State/Regional	$ 2.4 M	$ 1.2 M	$ 1.2 M
2	Wellington Road(2) / Chisholm Road	Regional/Local	$ 1.1 M	$ 550,000	$ 550,000
3	Vaughan Street(2) / Olympic Drive(1)	State/Regional	$ 2.2 M	$ 1.1 M	$ 1.1 M
4	Church Street(2) / Olympic Drive(1)	State/Regional	$ 400,000	$ 200,000	$ 200,000
5	Station Road(2) / Rawson Street(2)	Regional/Regional	$ 1.2 M	$ 600,000	$ 600,000
6	Parramatta Road(1) / Rawson Street(2)	State/Regional	$ 2.6 M	$ 1.3 M	$ 1.3 M
8	Parramatta Road(1) / St Hilliers Road(1) / Silverwater Road(1)	State/State	$ 2.1 M	$ 2.1 M	-
9	St Hilliers Road(1) / Rawson Street(2)	State/Regional	$ 800,000	$ 400,000	$ 400,000
10	Parramatta Road(1) / Birnie Avenue(2)	State/Regional	$ 2.6 M	$ 1.3 M	$ 1.3 M
11	Rawson Street(2) / The Crescent (South Parade) (2)	Regional/Regional	$ 2.3 M	$ 1.15 M	$ 1.15 M
12	Georges Avenue(2) / Joseph Street(1)	State/Regional	$ 1 M	$ 500,000	$ 500,000
13	Olympic Drive(1) / Childs Street	State/Local	$ 400,000	$ 200,000	$ 200,000
14	Joseph Street(1) / Olympic Drive(1)	State/Local	$ 400,000	$ 200,000	$ 200,000
15	Kerrs Road / Olympic Drive(1)	State/Local	$ 100,000	$ 50,000	$ 50,000
16	Amy Street(2) / Auburn Road(2) & Carlingford Street / Park Road(2)	Regional/Regional	$ 8 M	$ 4 M	$ 4 M
17	Vaughan Street(2) / Park(2) Road & Park Road(2) / Wellington Road(2)	Regional/Regional	$ 2.5 M	$ 1.25 M	$ 1.25 M
	Totals		**$ 30.1 M**	**$ 16.1 M**	**$ 14 M**

Note: The cost of property acquisition is based on a rate that excludes demolition and repair/modification of dwellings (or full lot acquisition). As such, the estimated cost for this item is likely to be substantially higher than that listed here.

Note: (1) State roads, (2) Regional roads. The road classification was sourced from RMS (Figure 6-34)

The cost of proposed upgrading works is estimated in the order of $30.1 million. The upgrading works are identified on State, Regional and Local Roads depending on intersection locations. Should a notional cost apportionment between State and Council were adopted (as per Table 8-33), the cost contribution would be $16.1 million to State (RMS) and 14 million to Council.

Part C

Apportionment Methodology

Part C examines three apportionment methodologies.

Structure

- Chapter 9: Apportionment Methodology.

9 Apportionment Methodology

A number of methodology options have been identified and reviewed. Three options have been developed to strengthen the current Council's contribution plan across the road works program.

- Option A is based on quantitative and qualitative measures. It is based on four criteria such as current congestion (measured by level of service), future congestion (measured by level of service), proposed road upgrade linked to new development and road upgrade linked to existing background traffic.
- Option B is based on vehicle kilometres travelled (VKT) measure. It is based on current VKT (without development) and future VKT (with development). The apportionment is based on additional VKT attributable to new development.
- Option C is based on spare capacity measure. This is based on new development traffic relative to spare capacity available.

All three apportionment options have considered traffic modelling output. The rationale behind the options is illustrated overleaf in **Figure 9-48**. Each of the methods aims to strengthen the nexus between the identified road works program and the proposed development through the application of both qualitative and quantitative criteria. The qualitative criteria are applied via a tiered ranking system while the quantitative elements are obtained from the traffic model and are intended as a more direct indicator of current and forecast road system performance. The combination of the subjective and objective criteria types serves to strengthen the reasonableness of the apportionment process.

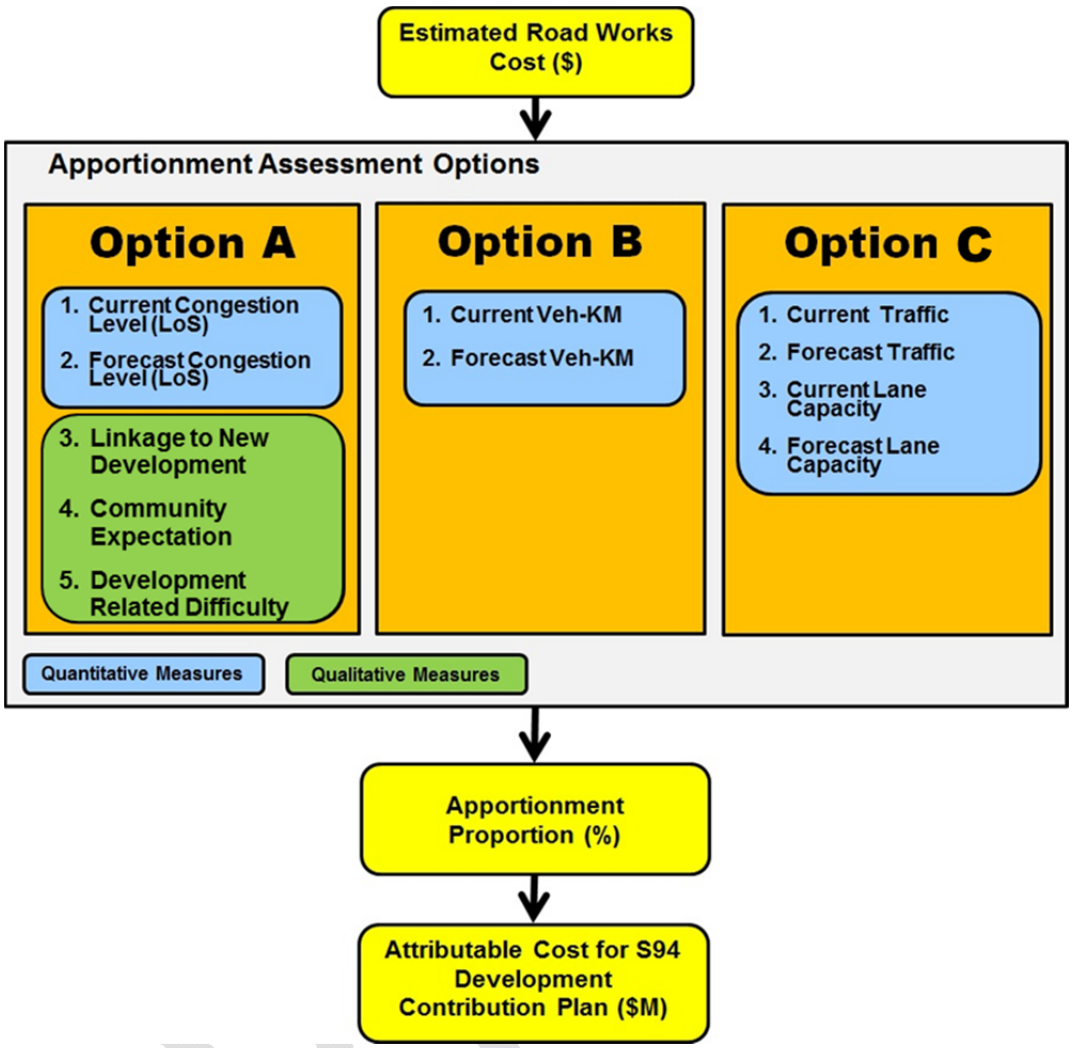


Figure 9-48 Apportionment Methodologies

9.1.1 Option A

Option A is designed to determine apportionment contribution using outputs from traffic model, an apportionment for each of the candidate road work program has been estimated on the basis of four criteria:

- A *quantitative* measure of available road/intersection capacity (level of service), where a current poor level of service means the proponent of development meets a lower percentage of the upgrade cost. The rationale is that an already poor system performance is largely the result of existing development and therefore the proponent need not meet the full cost of the required upgrades.
- A *qualitative* measure of the extent to which the road/intersection upgrade is triggered by the proposed new development, where a strong linkage means the proponent of development meets a higher percentage of the upgrade cost.
- A *qualitative* measure of the level of public expectation regarding the particular road/intersection upgrade, where current strong public support means the proponent of development meets a lower percentage of the upgrade cost.
- A *qualitative* measure of the level of difficulty in delivering the required upgrade where a proponent of development meets a higher percentage of the upgrade cost if the road upgrade is required to meet the traffic needs of the particular development.

For qualitative measures, it is recommended that Council should further investigate and develop a guild line.

Apart from the level of service criteria, the ***Option A*** method assumes that if Council would have undertaken the road works program anyway and under public pressure to deliver the upgrade and the proposed development makes it no more difficult, then the attributable cost percentage is low. Conversely, if the Council would not have undertaken the road upgrade but for the development and the level of public concern is low, then the proponents of development would contribute a higher percentage. The criteria are subjective but do seek to take account of the level of existing support for a particular road/intersection upgrade from road users. In this regard the criteria seeks to take account of the road works program that are presently being proposed for, presumably as a consequence of an existing network deficiency, high background traffic levels or other existing or emerging issue. Accordingly, the cost of the particular road/intersection upgrade is more the responsibility of the Council and RMS, as opposed to the proponent of future development. The spreadsheet scoring shown below provides for the projects to be assessed and the cost allocated as for instance either 25, 50 or 75 per cent attributable cost allocation to Section 94 Development Contribution. The below **Table 9-35** shows assessment criteria of Option A.

Table 9-35 Assessment Criteria for *Option A*

Assessment Criteria / Description	Measurement Index	Index Description	Score
1 Current Congestion Level A *quantitative* measure of available road/intersection capacity (level of service), where a current poor level of service (E to F) means the proponent of development meets a lower percentage of the upgrade cost.	Poor level of service E to F	Currently road / intersection operates over capacity.	1
	Acceptable level of service D	Currently road / intersection operates close to capacity.	2
	Good level of service A to C	Currently, there is no capacity issue.	3
2 Future Congestion Level A *quantitative* measure of predicted road / intersection capacity (level of service), if the road / intersection upgrade did not go ahead, where a predicted poor level of service (E to F) means the proponent of development meets a higher percentage of the upgrade cost.	Good level of service A to C	Predicted no capacity issue. Road / intersection upgrade is required irrespective of development	1
	Acceptable level of service D	Predicted to operate close to capacity. Road / intersection upgrade is partially triggered by development	2
	Poor level of service E to F	Predicted to operate over capacity. Road / intersection upgrade is triggered by development	3
3 Road Upgrade Linked to Development A *qualitative* measure of the extent to which the road / intersection upgrade is triggered by the proposed development, where a strong linkage means the proponent of development meets a higher percentage of the upgrade cost.	None	Road / intersection upgrade required irrespective of proposed development	1
	Some	Road / intersection upgrade partially triggered by proposed development	2
	Exclusive	Road / intersection upgrade triggered by proposed development	3
4 Community Expectation and Awareness A *qualitative* measure of the level of public expectation regarding the particular road / intersection upgrade, where current strong public support means the proponent of development meets a lower percentage of the upgrade cost.	Highly public	Very public and long awaited road upgrade project	1
	Some	Road / intersection upgrade critical to small interest groups only	2
	None	Low visibility road upgrade project	3
5 Development Related Difficulty A *qualitative* measure of the level of difficulty in delivering the required upgrade where a proponent of development meets a higher percentage of the upgrade cost if the road	None	Developments have no bearing on the level of difficulty	1
	Some	Developments have some impact	2

Assessment Criteria / Description	Measurement Index	Index Description	Score
upgrade is required to meet the traffic needs of the particular development.	Specific	Road / intersection upgrade designed specifically to accommodate traffic generated by development	3

Note: For qualitative measures, it is recommended that Council should further investigate and develop a guild line

9.1.2 Option B

Similar to Option A, ***Option B*** uses outputs from traffic model to estimate attributable costs for each of the road works program on the basis of current (without developments) and forecast (with developments) vehicle kilometres travelled. The percentage share of allocation is based on the level of additional vehicle kilometres travelled (VKT)'s attributed to the proposed development. This is a quantitative measure and can be taken from the traffic model. If forecast change in VKT on a particular road/intersection upgrade is high as a result of planned development, then the attributable cost percentage will be high. If forecast change in VKT on a particular road/intersection upgrade is low, then the attributable cost percentage will be low. The proportion of the project cost attributable to the Section 94 Development Contribution is ranked for instance between 25 to 75 per cent depended on change in VKT contributed by development on the project.

Table 9-36 below shows relationship of these two parameters. For example, if development is forecast to increase VKT on the project less than 50 per cent, the proportion of the project cost attributable to the S94 Developer Contribution is 25 per cent. The attributable cost is capped to 75 per cent is if development is forecast to increase VKT by more than 100 per cent.

Table 9-36 Assessment Criteria for *Option B*

Change in VKT (%)	Attributable Cost Allocation to Section 94 Developer Contribution (%)
Less than 50%	25%
50% to 75%	45%
75% to 100%	65%
More than 100%	75%

9.1.3 Option C

Option C also uses outputs from the traffic model. An apportionment for each of the candidate upgrade work program has been estimated on the basis of the traffic forecast to be generated by development relative to current traffic volumes and maximum available capacity post road/intersection upgrade.

For example, in the case of the proposed road widening (two-lane to four-lane upgrade) the percentage attributable cost can be calculated as follows:

- Maximum available road capacity after the four lane road upgrade can be X (for example 5600 vehicles per hour). This assumes road capacity of an urban arterial road is up to 1400 vehicles per hour per lane (Austroads Guideline).
- Current average traffic volume on Road A (Road A is an example) on the subject section can be Y (for example 3000 vehicles per hour).
- Forecast traffic generation by proposed development can be Z (for example 950 vehicles per hour). This can be generated using model.
- Estimated percentage attributable to four lane upgrade cost can be P% (for example this case 36%). This is calculated as a ratio of development traffic and available spare capacity.ie (Z /(X-Y), in this case example 950 / (5600 - 3000).

The rationale of this method is that the proponents of development should meet the costs of the road/intersection upgrades required to accommodate the traffic generated by their developments. In this regard there is a nexus between the need for the upgrade and its attributable cost. If a development or developments generate substantial traffic in proportion to the existing and future capacity then they would be required to pay a higher percentage of the cost of the upgrade. Conversely, if the development traffic is low as a proportion of available spare capacity, then the attributable cost percentage will be lower. In this regard the method is equitable because proponents share the costs of the upgrades relative to the amount of traffic they generate and hence relative to the "need".

It is recommended that all three options be tested using the traffic model. It is expected that Council will undertake the review of future land use as part of its proposed residential development strategy, which may be used to inform the Section 94 Development Contributions. A preferred apportionment option can be identified once future land use strategy is complete.

10 Conclusion and Recommendations

10.1 Key Study Findings

This Traffic and Transport Study for the Auburn Local Government Area has been prepared by Hyder Consulting (Hyder). Hyder's Study outcome has been reported into the following three parts:

- *Part A*: Preliminary Assessment documents Study findings from Stage 1 investigation.
- *Part B*: Traffic Assessment and Modelling documents Study findings from Stage 2 investigation; and
- *Part C*: Apportionment Methodology documents Study findings from Stage 3 investigation.

Part A: Preliminary Assessment

Part A Preliminary Assessment documents the findings of a preliminary assessment of transport in the Auburn LGA. The assessment has been undertaken as Stage 1 of a 3 stage process for the Auburn LGA Traffic and Transport Study 2012. The purpose of this Part A investigation is as follows:

- To document the findings of a desktop literature review of relevant policies and studies pertaining to transport and movement within, to and from the Auburn LGA.
- To document the findings of observational surveys of transport issues undertaken in August 2012.
- To identify existing and likely future multi modal transport issues within the Auburn LGA; and
- To develop a preliminary program of works to address the identified issues.

The Study does not reassess issues already identified through other investigations such as those undertaken in 2009 as part of the Auburn Town Centre Public Domain Plan and in 2012 as part of the Berala Village Centre Study. It does reaffirm the need for some previously identified projects to be actioned if deemed appropriate by Council.

Strategic Context

The Metropolitan Plan for Sydney 2036 (the Metropolitan Plan) released by the then Department of Planning in December 2010, seeks to address the challenges facing Sydney through an integrated, long-term planning framework based on the following strategic directions:

- Strengthening a City of Cities;
- Growing and renewing centres;
- Transport for a connected city;
- Housing Sydney's population;
- Growing Sydney's economy;
- Balancing land uses on the city fringe;
- Tackling climate change and protecting the natural environment;
- Achieving equity, liveability and social inclusion; and
- Delivering the Plan.

The Department of Planning and Infrastructure (DP&I) proposes to update and reissue Draft Subregional Strategies and an updated Metropolitan Plan.

Draft West Central Sub-Regional Strategy, 2007

Under the Plan this sub region will be expected to accommodate some in fill residential and commercial development. Minor improvements to transport systems are proposed or currently being implemented consistent with the Strategy which seeks to:

- Extend the bus and rail networks to Connect Centres;
- Extend transport networks to serve growth;
- Improve operational management of existing transport networks; and
- Improve local and regional walking and cycling networks.

The Plan makes reference to only a few specific actions within the Auburn LGA including a RTA (RMS) led road upgrade of a bridge on Parramatta Road at Auburn North.

Projected Growth in the Auburn LGA

Auburn LGA is home to about 69,000 residents and provides over 542 ha of employment land or approximately 45,800 jobs. In combination with the Parramatta and Bankstown this constitutes the greatest concentration of industrial jobs in Sydney's middle ring. Draft West Central Sub-Regional Strategy 2007 (DWCSS) provides for Auburn to accommodate an additional 17,000 dwellings and an additional 12,000 jobs by year 2031.

Strategic Planning Principles

In undertaking this preliminary review, a number of guiding principles have been borne in mind.

- One relates to the main centres across the LGA; Lidcombe, Berala, Regents Park and Auburn Town Centre itself. In the cores of these centres and especially within the transport interchanges around which they function, an access hierarchy should apply. This access hierarchy, expressed as proximity to the interchanges, aims to ensure that town centres and villages give highest priority to the most efficient and sustainable access modes. Pedestrians and cyclists are the highest priority access modes, followed by buses and taxis, kiss and ride, and lastly private vehicles.
- Adjoining residential and commercial areas have good access to the rail station precincts.
- The provision of cycle storage facilities at stations increases the catchment for non-motorised forms of transport to the stations. The provision of specific cycle facilities is an important aspect in increasing the attractiveness of this sustainable mode of transport.
- The bus trip portion of the trip should be as short and direct as possible.
- All major bus facilities should be clearly signposted and be provided with adequate facilities (including seating, lighting and shelters) for waiting passengers. Where possible timetable information/contact numbers should be provided.
- Taxis play an important role for less mobile people and for travel occurring at times when other transport services are not available. Across the Auburn main centres and villages there is a need to provide rank space so that they are visible and reasonably close to the transport interchange.
- Kiss and ride is also important within centres and villages, and leads to adverse traffic and parking impacts if not adequately catered for.
- Commuter parking can assist in expanding the catchment area of stations and provide the opportunity to reduce overall car based trips lengths on the wider regional road network.

Auburn Council's Strategic Objectives

Council has, through various strategic documents and its 2012 response to the Draft NSW Long Term Transport Masterplan, made known its broader strategic objectives for the LGA. The key objectives are as follows:

- Ensure future consistency with strategic land use and transport policy and planning directions at Federal, State and Western Sydney levels,
- Improve transport network performance, transport efficiency, the ability of the transport system to support key economic sectors and adapt to changes in fuel price and availability.
- Minimise environmental impacts including greenhouse gases, diesel and other exhaust emissions, water and noise pollution and issues of location sensitivity.
- Create positive benefits for regional and local accessibility, the livability of the region and the health and fitness of transport users.
- Increase road and traffic safety, pedestrian and cyclist safety and personal security while using transport.
- Ensure good governance for all projects including affordability, readiness for implementation and obtaining community and business support.
- The responses to the issues identified below need to have regard to the assessment of travel within the Auburn LGA which found as follows:
- Auburn's journey to work bus mode share is poor (about 1%) and scope exists for it to be increased.
- Auburn's mode share to train is strong at about 29% for journey to work trips from Auburn.
- Car based journey to work trips are about 60% (drivers and passengers combined) which is too high given Auburn's proximity to the western rail line.
- Auburn's walk/cycle mode share of about 15% provides a good base upon which to build more sustainable trip making.

Identified Issues

In undertaking this preliminary review and transport system assessment, the key multi modal issues identified across the LGA are summarised in **Section 5.2.**

Part B: Traffic Assessment and Modelling

Part B Traffic Assessment and Modelling has been prepared to response the Stage 2 of the Study. A road based micro-simulation traffic model was developed for the study area. For the micro-simulation model, Hyder used Paramics software and built upon and intergraded with wider strategic traffic model (operates in TransCAD). Paramics model were developed for the 2012 existing condition to provide an assessment tool to identify key existing network issues.

Hyder undertook extensive traffic survey and data collection through the study area. Hyder's strategic traffic model has been calibrated and validated appropriately in accordance with the industry practice acceptance criteria. A robust calibration and validation has been achieved for both AM and PM peak period. The Paramics model has been calibrated and validated as per RMS Paramics modelling guideline. Both AM and PM peak Paramics models have been calibrated and validated adequately and models are fit for the study purpose.

The existing network capacity was investigated for 46 key intersections. The analysis determined level of service (LoS) between A and F for modelled intersections within the study area. Traffic model indicates 12 intersections within the study area are operating near or close to capacity in either morning or afternoon peak. Model has predicted low level of service D to F either morning or afternoon peak at the following intersections:

- Weeroona Road / Joseph Street/Amy Street (I-3);
- Wellington Road / Chisholm Road (I-7);
- Wellington Road / Park Road (I-9);
- Park Road / Vaughan Street (I-10);
- Vaughan Street / Olympic Drive (I-13);
- Church Street / Olympic Drive (I-18);
- Rawson Street / Parramatta Road (I-27);
- Parramatta Road / Silverwater Road (I-31);
- St Hilliers Road/ Rawson Street (I-37);
- Parramatta Road/Birnie Avenue (I-38);
- Rawson Street/The Crescent (I-39); and
- Georges Avenue/Joseph Street (I-44).

Regular overflow queues are observed on key state and regional roads in both morning and afternoon peak periods including:

- Parramatta Road;
- St Hilliers Road / Silverwater Road;
- Olympic Drive / Joseph Street;
- Station Road;
- Rawson Street; and
- Wellington Road / Vaughan Street.

Based on the modelling investigations, Hyder has identified preliminary improvements required at seventeen locations. These improvements include intersection widening, providing clearway condition during peak period. The proposed improvements will have potential to improve traffic flow in the Auburn LGA study area. **Table 8-32 in Section 8.3** of this report summarises proposed intersection upgrade.

In general, with proposed upgrades in place, the modelling analysis showed substantial improvements in level of service particularly on key State and Regional roads. With proposed upgrades in place traffic model showed acceptable level of service between A and C to those intersections (either morning or afternoon peak) where significant capacity problems were identified for pre-upgrade condition.

To improve current capacity problems and provide an acceptable level of service to key roads/intersections within the LGA, the cost of proposed upgrading works is estimated in the order of $30.1 million. Should a notional cost apportionment between State and Council were adopted (as per **Table 8-33**), the cost contribution would be $16.1 million to State (RMS) and $14 million to Council.

It is likely that identified intersection upgrades will require property acquisition and utility adjustments. RMS has commenced investigation on the M4 Managed Motorway. The RMS study will identify a number of supporting infrastructure need to improve the Motorway traffic. Depending on RMS study outcome a number of on-ramps may require additional metered lane and geometric improvements to arterial roads approaching ramps.

Future consultation with RMS is recommended where potential upgrades are identified at state and regional roads/ intersections within the Auburn study area.

Part C: Apportionment Methodology

A number of methodology options have been identified and reviewed. Three options have been developed to strengthen the current Council's contribution plan across the road works program.

- *Option A* is based on quantitative and qualitative measures. It is based on four criteria's such as current congestion (measured by level of service), future congestion (measured by level of service), proposed road upgrade linked to new development and road upgrade linked to existing background traffic.
- *Option B* is based on vehicle kilometres travelled (VKT) measure. It is based on current VKT (without development) and future VKT (with development). The apportionment is based on additional VKT attributable to new development.
- *Option C* is based on spare capacity measure. This is based on new development traffic relative to spare capacity available.

All three apportionment options have considered traffic modelling output. Chapter 9 of this report documents detailed methodologies of three apportionment options.

Recommendations

Further modelling assessment will be required to confirm that potential improvements identified in **Table 8-32** would work and provide an acceptable level of service. It is expected that Council will undertake the review of future land use as part of its proposed residential development strategy, which may be used to inform the Section 94 Development Contribution. Once Council's future land use strategy is complete, it is recommended to test apportionment methodologies identified in this Study. A preferred apportionment option can be identified once future land use strategy is complete. It is recommended that Council further develops design concepts of proposed upgrades to enable a strategic cost estimate to be completed in accordance with the RMS's Estimating Manual.