Transport and Accessibility Impact Assessment

Volume 1

Executive Summary and Main Report

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 3A Concept Plan Application

Traffic and Transport

August 2013

SYDNEY INTERMODAL TERMINAL ALLIANCE (SIMTA)

MOOREBANK INTERMODAL TERMINAL FACILITY (MITF)

TRAFFIC AND TRANSPORT

TRANSPORT AND ACCESSIBILITY IMPACT ASSESSMENT

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

SYDNEY INTERMODAL TERMINAL ALLIANCE (SIMTA)

MOOREBANK INTERMODAL TERMINAL FACILITY (MITF)

TRAFFIC AND TRANSPORT

TRANSPORT AND ACCESSIBILITY IMPACT ASSESSMENT

Author	Mukit Rahman
Checker	Greg Huzij, Mukit Rahman
Approver	Neil McMillan
Report No	1
Date	August 2013

This report has been prepared for Sydney Intermodal Terminal Alliance (SIMTA) in accordance with the terms and conditions of appointment for Traffic and Transport dated July 2010. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared By	Approved By
D	5 Aug 2011	Internal Reviews	MR	
E	8 Aug 2011	DRAFT for Client's Review	MR	
F	17 Aug 2011	DRAFT FINAL, incorporates client and internal review	MR	NM
G	26 Aug 2011	FINAL REPORT	MR	NM
H	15 Nov 2011	Final report incorporating EA adequacy comments	MR	NM
I	4 June 2013	Draft Final report incorporating additional investigation required to address TfNSW and RMS	MR	NM
J	20 June 2013	Final report incorporating additional investigation required to address TfNSW and RMS	MR	NM
K	5 Aug 2013	Draft Report incorporating comments from DOPI	MR	GH
L	8 Aug 2013	Final Report incorporating comments from DOPI	MR	GH

EXECUTIVE SUMMARY

This Traffic and Accessibility Impact Assessment has been prepared by Hyder Consulting Pty Ltd (Hyder) to accompany a Transitional Part 3A Concept Plan Application of the proposed Intermodal Terminal Facility on Moorebank Avenue, at Moorebank. The Sydney Intermodal Terminal Alliance (SIMTA) is a consortium of Qube Holdings and Aurizon (formerly QR National).

The SIMTA Moorebank Intermodal Terminal Facility (SIMTA proposal) is proposed to be located on the land parcel currently occupied by the Defence National Storage and Distribution Centre (DNSDC) on Moorebank Avenue, Moorebank, south-west of Sydney. SIMTA proposes to develop the DNSDC occupied site into an intermodal terminal facility and warehouse/distribution facility, which will offer container storage and warehousing solutions with direct rail access to Port Botany. Construction of the rail connection from the SIMTA site to the Southern Sydney Freight Line (SSFL) will be undertaken as part of the first stage of works for the SIMTA proposal.

The SIMTA site, approximately 83 hectares in area, is currently operating as a DNSDC. The SIMTA site is legally identified as Lot 1 in DP1048263 and zoned as General Industrial under Liverpool City Council LEP 2008.

The SIMTA Proposal

The proposal comprises the following:

- Rail Link – new rail link connecting the SIMTA site with the Southern Sydney Freight Line.
- Intermodal Terminal – on-site freight rail sidings to accommodate local freight trains to Port Botany with the capacity to handle up to 1 million twenty foot equivalent units (TEUs) per annum.
- Empty Container Storage will be provided within the site. Empty containers would either be packed on-site ready for transport to the port by rail, or trucked to off-site locations where they would be packed and returned to the SIMTA site to be loaded onto rail and transported to the port.
- Warehouse and Distribution Facilities - approximately 300,000m^2 of warehouses with ancillary offices will be constructed to the east of the intermodal terminal.
- Freight Village – approximately 8,000m^2 of support services will be provided on site.
- Employees - Approximately 2,260 employees on-site at full development under “business as usual” assumption.

Transport Analysis & Modelling

A consultation process involving the Transport for NSW (TfNSW) and Roads and Maritime Services (RMS) constituted an important element of Hyder’s traffic and accessibility impact assessment. In April and May 2013 additional traffic investigations have been undertaken addressing TfNSW and RMS’s road related issues identified in their response dated April 2012, November 2012 and February 2013.

Hyder’s traffic study has assumed 2031 as the future horizon year for its assessment. By 2031, planned population and employment growth in Liverpool Local Government Area and South-West Subregion will impact traffic operations of key roads and intersections in the M5 Motorway corridor. Major works on the M5 West widening project commenced in August 2012. When completed the project will reduce travel time for motorists using the motorway and surrounding roads and support planned residential and employment growth in south-west Sydney. The project is expected to be completed in late 2014.

The proposed widening of M5 South-West Motorway and other higher order roads between now and 2031 will result in traffic growth and further traffic redistribution across the network. Hyder’s traffic model analysis took into account the higher order road network changes proposed by the RMS as well as the proposed 1 million TEU intermodal terminal capacity identified for the entire Moorebank catchment. The model analysis forecasts the highest traffic impact on the Moorebank Avenue north of SIMTA site. Without SIMTA, model forecasts peak hour average traffic growth on the Moorebank Avenue in the order of 1.6% to 1.8% per annum until 2031. The SIMTA development is forecast to increase average traffic growth on Moorebank Avenue up to 3.1% per annum. Hyder has developed the concept of the “core area” which aims to report traffic impact in those parts of the network that are of critical significance to the project. Hyder’s analysis found that additional traffic impact from SIMTA would be largely confined within the boundary of core area. The results show that outside the core area, there is no significant adverse impact on key roads following the introduction of the SIMTA proposal. The additional truck activity generated by the SIMTA proposal would be concentrated on key arterial roads such as M5 Motorway, Hume Highway and M7 Motorway. For modelling purposes, it was assumed that the SIMTA site would be fully developed by 2031.

Proposal Impacts & Mitigation

The proposal will have a number of potential traffic and transport impacts principally:

- Truck traffic generation – The site will generate about 2,600 daily truck movements articulated trucks (B-doubles, semi-trailers) and rigid trucks at full development when the terminal is fully developed and reaches its 1 million TEU throughput capacity.
- Employee Trip Generation – The site will generate about 3,600 daily car movements to the site across a 24 hour average week day.

The regional and local road network will need to be developed progressively over the next 20 years to cater for the forecast increase in traffic volumes which will result from both the SIMTA development (principally) and the general growth in traffic passing through the core study area. The analysis identified the road capacity improvements required to cater for the additional traffic demands. This investigation reviewed existing infrastructure and then identified the need for road and intersection upgrade. The proposed road upgrading works have been tested using traffic modelling. The results from an improved network showed that proposed upgrades would mitigate the SIMTA road related impacts. The analysis identified the need for road network improvements by 2031 when the SIMTA site is fully developed as follows:

- Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue grade separated interchange and the Southern SIMTA site access. Some localised improvements will be required around central access and southern access points;
- Concurrent with any four lane widening on Moorebank Avenue, the current Moorebank Avenue/Anzac Road traffic signals will require some form of widening at approach roads;
- A new signalised intersection at the Northern SIMTA entry and egress with the Moorebank Avenue;
- A new signalised intersection at the Southern SIMTA egress with the Moorebank Avenue; and
- Potential upgrade works at the M5 Motorway/Moorebank Avenue grade separated interchange to cater for both regional background and additional SIMTA traffic growth.

Travel Demand Management

A package of measures, in addition to the improvements listed above, will be necessary to ensure that employees can travel to and from the Terminal facility sustainably and in a way that reduces growth in car use. Travel demand management is required to be implemented over time as the development progresses. Key measures include:

- Designing and constructing the central spine road and other site roads to accommodate buses, bus infrastructure and cyclist use for employees;
- Construction of a covered bus drop off/pick up facility within the site to encourage the use of buses for employees;
- Review and rationalisation of the locations of Route 901 bus stops in the vicinity of the site to match the proposed northern terminal entry location and enhance accessibility;
- Providing peak period and SIMTA shift work responsive express buses to/from the site and Liverpool Station via Moorebank Avenue and Newbridge Roads with frequency dependant on the development of the site;
- Providing peak period express buses to/from the site and Holsworthy rail station via Anzac Road, Wattle Grove Drive and Heathcote Road with frequency dependant on the development of the site;
- Extending Route 901 bus through the site via the light vehicle road; and
- Increasing peak period Route 901 bus service frequencies (through the site) to better match the needs of existing and future employees of the locality as terminal development proceeds.

Glossary

AADT	Average Annual Daily Traffic
BTS	Bureau of Transport Statistics (Now Transport for NSW)
COAG	Council of Australian Governments
DGRs	Director-General's Requirements
DCP	Development Control Plan
DNSDC	Defence National Storage and Distribution Centre
DoP	Department of Planning (Now DP&I)
EA	Environmental Assessment (formerly EIS)
EIS	Environmental Impact Statement (now referred to as EA)
EPA	Environmental Planning & Assessment Act, 1979
F5	The South-Western Freeway south of Camden Valley Way through Campbelltown
GMA	Greater Metropolitan Area
IA	Infrastructure Australia
JTW	Journey to Work
LGA	Local Government Area
LoS	Level of Service
M5 West	The M5 South-West Motorway between King Georges Road at Beverly Hills and Camden Valley Way at Casula
M7	The Westlink M7 Motorway between Camden Valley Way at Casula and the M2 Motorway at Seven Hills
MPO	Moorebank Project Office
Pax	Passengers
RTA	NSW Roads and Traffic Authority (Now NSW Roads and Maritime Services, RMS)
SEPP	State Environmental Planning Policy
STM	Strategic Travel Model (mode share model operated by BTS)
SSTM	Hyder's Sydney Strategic Traffic Model
SIMTA	The Sydney Intermodal Terminal Alliance
SIMTA proposal	The SIMTA Moorebank Intermodal Terminal Facility
SME	School of Military Engineering. The Moorebank Project Office has been established to conduct a feasibility study of SME site to the west of Moorebank Avenue.
TfNSW	Transport NSW, (now Transport for NSW)
TEUs	Twenty foot equivalent units

TCA	Transport Construction Authority (previously TIDC)
TDM	Travel Demand Management
TIDC	Transport Infrastructure Development Corporation (now TCA)
TOD	Transit Oriented Development
TZ	Travel Zone
VKT	Vehicle Kilometres Travelled

CONTENTS

APPENDICES

1 INTRODUCTION

1.1 Background

This Traffic and Transport study has been prepared by Hyder Consulting Pty Ltd (Hyder) to accompany a Part 3A Concept Plan Study Requirement for the planned Moorebank Intermodal Freight Terminal (SIMTA proposal). In December 2010, the Director-General's Requirements for the SIMTA proposal were issued. The Sydney Intermodal Terminal Alliance (SIMTA) is a consortium of Qube Holdings and Aurizon (formerly QR National).

The SIMTA Moorebank Intermodal Terminal Facility (SIMTA proposal) is proposed to be located on the land parcel currently occupied by the Defence National Storage and Distribution Centre (DNSDC) on Moorebank Avenue, Moorebank, south-west of Sydney. SIMTA proposes to develop the DNSDC occupied site into an intermodal terminal facility and warehouse/distribution facility, which will offer container storage and warehousing solutions with direct rail access to Port Botany. Construction of the rail connection from the SIMTA site to the Southern Sydney Freight Line (SSFL) will be undertaken as part of the first stage of works for the SIMTA proposal.

The SIMTA site is located in the Liverpool Local Government Area. It is 27 kilometres west of the Sydney CBD, 17 kilometres south of the Parramatta CBD, 5 kilometres east of the M5/M7 Interchange, 2 kilometres from the main north-south rail line and future Southern Sydney Freight Line, and 0.6 kilometres from the M5 motorway.

The SIMTA site, approximately 83 hectares in area, is currently operating as a DNSDC. The SIMTA site is legally identified as Lot 1 in DP1048263 and zoned as General Industrial under Liverpool City Council LEP 2008. The parcels of land to the south and south-west that would be utilised for the proposed rail link are referred to as the rail corridor. The proposed rail corridor covers approximately 75 hectares and adjoins the Main Southern Railway to the north. The rail line is approximately 3.5 kilometres in length, 20 metres in width (variable width) and includes two connections to the SSFL, one south and one north.

The proposed rail corridor is owned by several third parties, including the Commonwealth of Australia, RailCorp, private owners and Crown Land held by the Department of Primary Industries, and would link the SIMTA site with the Southern Sydney Freight Line. Existing uses include vacant land, existing rail corridors (East Hills Railway and Main Southern Railway), extractive industries and a waste disposal facility. The rail corridor is intersected by Moorebank Ave, Georges River and Anzac Creek. Native vegetation cover includes woodland, forest and wetland communities in varying condition. The proposed rail corridor is zoned partly 'SP2 Infrastructure (Defence and Railway)' and partly 'RE1 - Public Recreation'. The surrounding Commonwealth lands are zoned 'SP2 Infrastructure (Defence)'.

This traffic and transport study has been prepared to support the proposed Concept Plan for Part 3A study. This report details the findings of an impact assessment of the proposed SIMTA proposal. The investigation includes a Transport Management and Accessibility Plan (TMAP) assessment of the proposal, identifying a package of measures designed to achieve sustainable employee and visitor travel to and from the site. This assessment has been undertaken with the assistance of Urbanhorizon Pty Ltd, and includes a review of the public transport needs and opportunities for the SIMTA development. A copy of the Urbanhorizon report is provided in **Appendix A.**

The SIMTA proposal comprises the following key components:

- **Rail Link** – new rail link connecting the SIMTA site with the Southern Sydney Freight Line. The detailed design of the rail infrastructure comprising the rail link will be subject to a further application and approval process.
- **Intermodal Terminal** – the terminal is proposed to include on-site freight rail sidings to accommodate local freight trains to Port Botany. Freight will arrive by rail and be transported to the warehouse and distribution facilities within the SIMTA site, or be directly loaded on to trucks for transport to warehouses and nearby logistics centres. Exports and empty freight containers will be transported to the facility by truck and then loaded onto rail for transport back to Port Botany. The terminal is expected to contain four rail sidings, with areas for container handling and storage, and is anticipated to have the capacity to handle up to 1 million twenty foot equivalent units (TEUs) throughput per annum.
- **Empty Container Storage** – will be provided within the site. Empty containers would either be packed on-site ready for transport to the port by rail, or trucked to off-site locations where they would be packed and returned to the SIMTA site to be loaded onto rail and transported to the port.
- **Warehouse and Distribution Facilities** - approximately 300,000m^2 of warehouses with ancillary offices will be constructed to the east of the intermodal terminal. These buildings are proposed to be constructed in stages in response to site servicing availability and market demands. It is expected that warehouses will range in size, depending on tenant needs.
- **Freight Village** – approximately 8,000m^2 of support services will be provided on-site. These may include site management and security offices, meeting rooms, driver facilities and convenience retail and business services.

The terminal facility operations will involve freight being loaded onto trains at Port Botany, directly transporting containers to Moorebank on a dedicated freight line, unloading the containers at Moorebank into warehouses on-site or onto trucks for delivery to businesses and warehouses across south-western Sydney. This operation would also work in reverse, taking freight containers to Port Botany. It is expected that once fully operational, the facility will have capacity to handle up to 1 million TEUs throughput annually.

The project will be undertaken as a staged development. The proposed Concept Plan is included in the Environmental Assessment (EA) prepared by Urbis.

Figure 1-1 below shows the SIMTA proposal in the context of surrounding land use.

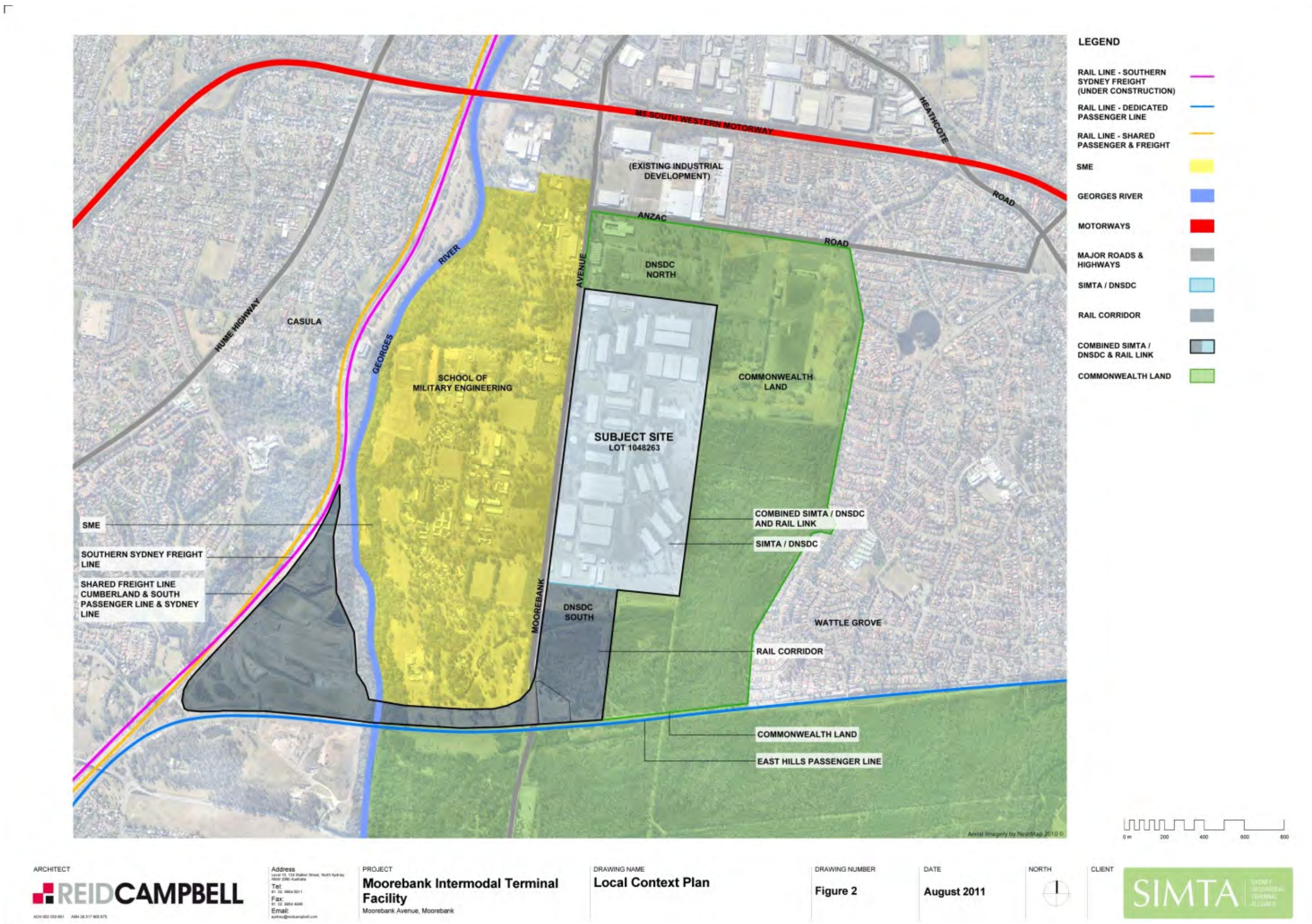


Figure 1-1 Moorebank Intermodal Freight Terminal Site (SIMTA proposal)
Source: REIDCAMPBELL, 2011

1.2 Director-General's Requirements (DGR's)

The Director-General, along with the RMS, Transport for NSW and Liverpool City Council are interested in understanding the potential impact of the proposed SIMTA proposal at Moorebank. These authorities have outlined their concerns in their responses to the Director-General's Requirements (DGRs). The DGRs for the Concept Plan Application of SIMTA proposal were issued on the 24th of December 2010 and are summarised as follows:

(1) Transport and Access – including but not limited to:

(a)·a Transport and Accessibility Impact Assessment demonstrating how the project will facilitate freight transport objectives, meet freight infrastructure requirements and address impacts to local and regional transport networks;

(b) access to and from the project (including rail access to the Southern Sydney Freight Line), and interaction and integration with existing and planned transport infrastructure and services; and details of internal transport and logistic requirements to minimise external transport impacts and access to public transport for employees;

(c)·the number of train and truck movements, origin and destination, types of road transport likely to be used (for example B-Doubles) and the capacity of existing and proposed road and rail routes to handle predicted increases in traffic, based on appropriate empirical analysis and strategic and project modelling; and identification of whether any road and rail infrastructure upgrades are required;

(d)·cumulative impacts, particularly with regard to existing and proposed freight distribution facilities in the locality and potential cumulative mitigation measures; and

(e) taking into account the Guide to Traffic Generating Developments (RMS) and the Integrating Land Use and Transport Package.

Hyder has prepared this report to address the DGR's and examine the traffic and transport issues associated with the proposed development. Hyder has consulted the various state and local government planning policies and instruments that may apply to this study. Throughout the study, Hyder consultants met with officers from the following agencies to discuss traffic issues, modelling assumptions and other matters in relation to the above DGR's:

- RMS consultation meeting on 27 July 2010;
- RMS consultation meeting on 12 August 2010;
- RMS consultation meeting on 3 March 2011;
- Transport NSW (TfNSW) consultation meeting on 10 May 2011;
- Planning focus meeting with Department of Planning and Infrastructure (DoPI) on 13 December 2010;
- Moorebank Project Office (MPO) consultation meeting on 6 May 2011; and
- Transurban/Interlink consultation meeting on 4 May 2011.

In June/July 2011, Hyder submitted the following five technical notes to the RMS and TfNSW outlining key modelling assumptions in association with SIMTA trip generation, trip distribution; SIMTA needs analysis and existing road network capacity issues. In June/July 2011, Halcrow also undertook an audit of the Hyder Paramics modelling for the core study area. At that time Halcrow provided comment on the modelling assumptions documented in Technical Notes 3 and 4. Following Halcrow's review, minor adjustments were undertaken to the core area Paramics network and the relevant Technical Notes 3 and 4 were updated in line with the Halcrow review. The Halcrow review comments have been included in **Appendix E.**

- Technical Note 1 – Strategic Freight Demand.
- Technical Note 2 – Needs Assessment for MIFT (by PWC).
- Technical Note 3 – Traffic Generation.
- Technical Note 4 – Existing Road Network Capacity.
- Technical Note 5 – Strategic Modelling – Future Base Case Network Assumptions.

Following the comments received from TfNSW and RMS additional consultation was undertaken in April and May 2013 discussing road issues.

A compliance table has been included in Section 10 showing areas where additional traffic investigations were undertaken by Hyder addressing RMS's issues identified in their response.

1.3 Road Network

The SIMTA site is located in the Liverpool Local Government Area (LGA), forming part of the South-West Subregion. It is 27 kilometres west of the Sydney CBD, 16 kilometres south of the Parramatta CBD, 5 kilometres east of the M5/M7 Interchange, 2 kilometres from the main north-south rail line and future Southern Sydney Freight Line, and 0.6 kilometres from the M5 South-West Motorway (M5). The SIMTA site is well positioned and presents a strategic location for an Intermodal Terminal Facility within the Liverpool LGA. Due to the large size of the proposed development, it is anticipated that potential traffic impacts from this development will not be confined to the immediate access points on Moorebank Avenue, but will extend to the wider road network including the M5 South-West Motorway, Hume Highway and Heathcote Road. Figure 1-2 shows the SIMTA site in the context of road network and key proposed access points at Moorebank Avenue. The RMS has been investigating the upgrade of the M5 South-West Motorway to three lanes each way between Camden Valley Way at Casula and King Georges Road at Beverly Hills. The extent of the proposed M5 West Widening project is also shown in Figure 1-2.

Figure 1-2 Proposed SIMTA Site Access in the Context of Wider Road Network, 2011

1.4 Study Objectives

The purpose of the traffic study is to assess existing traffic patterns, undertake traffic projections for the study area and to assess the traffic implications of the proposed SIMTA development on the surrounding road network. More specifically the investigation seeks to:

- Address the Director-General's Requirements (DGRs) specifically for Traffic and Transport.
- Assess the impact on road networks from regional traffic growth in the absence of the SIMTA development.
- Assess the overall impact of SIMTA generated truck and employee trip making on the road network. Consider traffic data at all relevant vehicular traffic routes and intersections.
- Analyse public transport services. Define public transport options to achieve a favourable mode share for travel to and from the site once developed.
- Identify constraints and opportunities to achieving a favourable public transport outcome for the development proposal.
- Identify key access points for the proposed development.
- Determine the capacity of key intersections providing access to and from the proposed development.
- Estimate additional road based SIMTA generated traffic based on first principles approach. Data from Sydney Strategic Travel Model (STM) was used. The STM model data was sourced from Bureau of Transport Statistics (BTS). The RMS's Guide to Traffic Generating Developments (2002) was used.
- To quantify the future background growth and impact from the SIMTA proposal, Hyder used both strategic and micro-simulation models. To assess the existing and future intersection performance, Hyder used Paramics micro-simulation software. For strategic modelling Hyder used TransCAD software.
- Analyse the cumulative traffic impact considering other proposed developments assumed in the "base case" network and STM trip tables.
- Prepare a network improvement plan for the SIMTA development. A Travel Demand Management (TDM) approach involving the application of strategies and initiatives to change employee and visitor travel behaviour and reduce travel demand is recommended for the development site.

1.5 Approach to Traffic Investigation

Future traffic conditions on the regional road network in the vicinity of the SIMTA proposal have been determined having regard for a number of key drivers:

- The South-West Subregion[1] of Sydney is expected to experience the cities highest level of growth. By 2036, the population of the South-West Subregion is forecast to increase by 113% when compared to the 2006 population. Between 2001 and 2006, the job growth in the South-West Subregion was around 12%. The Subregional Strategies identified significant job growth in Western Sydney and South-West Subregions. The Liverpool CBD was identified as a key employment growth centre. The population and employment forecast was a key input to BTS's STM model[2].
- Currently, the M5 South-West Motorway carries a significant amount of regional traffic. In the future the predicted population and employment growth in the South-West Subregion will have a significant impact on traffic operations on the M5 South-West Motorway, its ramps and signalised intersections/interchanges. This means that the background and cumulative traffic growth will have implications for the road based access strategy adopted for the SIMTA proposal.
- The proposed M5 West Widening to three lanes each way (3/3) between Camden Valley Way at Casula to King Georges Road at Beverly Hills will have a redistribution effect in changing future traffic conditions on alternative parallel roads.
- Due to the complexity of future travel patterns within the corridor, Hyder used data from BTS's STM model for assessing SIMTA's traffic impact on the road network.

Hyder's Sydney Strategic Traffic Model (SSTM) is based on the BTS STM 2006 travel zone system. The basic network is based on the RMS's Strategic Model (Emme2). Future year models were developed using STM trip tables obtained from BTS. In consultation with the RMS and Transport for NSW, the future "base case" network was developed. For modelling purposes, the "base network" assumed key future road improvement projects were identified as "committed" schemes. The future "base case" network was used as the basis upon which to determine the impact attributable to the SIMTA development.

Model outputs reaffirm that the road network impact from the SIMTA proposal will decline with greater distance from the site. Therefore, Hyder has adopted a three-tiered approach to the assessment of road network impacts:

1 "Core" area.

2 "Inner" area.

3 "Wider" area.

The "core" area, defined below, was modelled in Paramics to determine the SIMTA road network impacts in the immediate vicinity of the site. The analysis found that the impact of the

---

[1] Metropolitan Strategy Review, Sydney towards 2036, NSW Government, March 2010. South-West Subregion includes Wollondilly, Campbelltown, Liverpool, Camden and South-West Growth Centre.

[2] The land use assumptions in BTS Strategic Travel Model (STM) are based on recent population and employment forecasts (October 2009 Release). The forecasts are compatible with Department of Planning (now Department of Planning and Infrastructure) 2008 Release Population Projections and the 2010 Metropolitan Plan. Hyder's SSTM model used future STM trip tables (based on October 2009 land use Release) obtained from BTS in December 2010.

SIMTA proposal would be largely confined within the boundary of the core area. Mitigation measures were identified and reported within this report based on the core area Paramics modelling results. In general, the core area is bounded by the following roads:

- M5 Motorway between Hume Highway and Heathcote Road (east and west);
- Hume Highway (north and south);
- Moorebank Avenue between Newbridge Road and Cambridge Avenue (north and south); and
- Anzac Road (east).

The "inner" area boundary was largely determined from Hyder's strategic modelling investigation and network capacity issues identified in the Halcrow traffic and transport report prepared for the proposed M5 West Widening Project (M5 West widening, Environmental Assessment, September 2010, Roads and Traffic Authority). The strategic modelling analysis shows a low impact from the SIMTA proposal within the inner area. The SIMTA impact in the "inner" area is likely to be more homogeneous, restricted to higher order arterial roads only (e.g. Hume Highway, M5 Motorway and M7 Motorway).

A strategic transport modelling assessment was undertaken for the "wider" area impact assessment. Results from the strategic modelling investigation are included in this report.

Figure 1-3 below shows the location of core and inner area in the context of SIMTA site for modelling purpose.

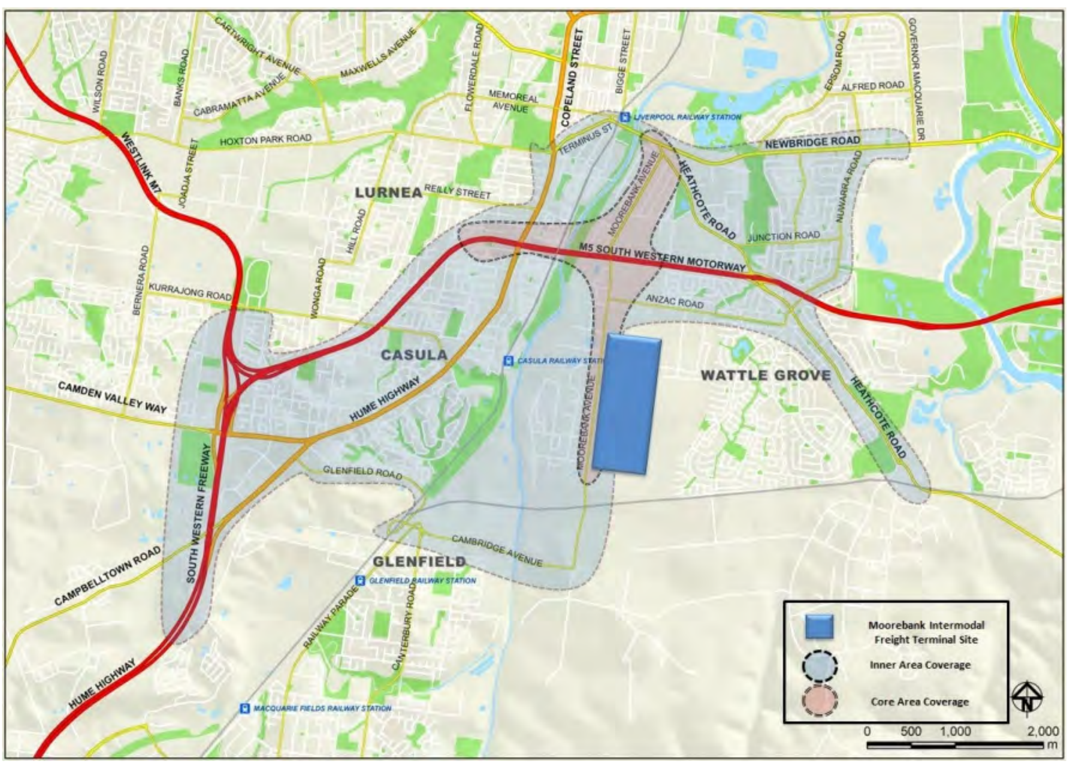


Figure 1-3 Core and Inner Area Road Network

1.6 Report Structure

The Traffic and Transport report is produced in two volumes.

1.6.1 Volume 1 - Executive summary and report

The Main Report "Transport and Accessibility Impact Assessment" contains the following ten chapters providing an assessment of the traffic and transport issues relating to the proposed SIMTA development.

- Section 1 provides an overview of the project, background information, study objectives, an upper level approach to traffic investigation.
- Section 2 provides the regional and local transport context within which the assessment has taken place. This section provides an overview of key transport indicators and also provides an overview of existing travel patterns in the study area as well as existing public transport, pedestrian and cycle provisions.

  PricewaterhouseCoopers (PwC) has undertaken the needs assessment for the SIMTA proposal. The findings and recommendations from the PwCs report were summarised in Strategic Needs for Intermodal Terminal (IMT) and Freight Demand Report, Hyder Consulting, June 2013.
- Section 3 establishes the existing transport network performance in the wider study area of the development site. Results from traffic surveys are summarised in this section. An assessment of existing network capacity has been undertaken, summarising network deficiency at key roads and intersections.
- Section 4 provides an overview of the strategic traffic model. Its purpose, model network assumptions, trip table development and analysis are included. Strategic model calibration and validation results are included. The Paramics model development, its use and purpose is also included within this section.
- Section 5 investigates future land use forecasts and base case traffic assumptions. This section establishes the base case traffic model (without the SIMTA development) which forms the basis for evaluating any road traffic impacts assessment from the proposal. The section also outlines the future transport network issues in terms of potential growth and road network upgrades required to cater for future background growth.
- Section 6 evaluates the impact of the SIMTA development on key roads and intersections. This section provides a detailed overview of the Concept Plan in terms of land uses, expected staging, road hierarchy and the like. Trip generation and distribution to and from the Site is also documented.
- Section 7 outlines the TMAP for the Site. This chapter provides a snapshot of the proposed Sustainable Travel Strategy as well as public and active transport initiatives that would assist in the reduction of car dependency as a result of the proposed development.
- Section 8 documents network improvements and mitigation measures.
- Section 9 summarises the key findings.
- Section 10 provides a summary table showing compliance of Director-General's Requirements for Part 3A Concept Plan Study. This section also shows a summary table showing compliance of RMS's issues raised in their response submission.

1.6.2 Volume 2 – Technical papers

Volume 2 contains the appendices as follows:

- **Appendix A** Public Transport Assessment (Urbanhorizon Pty Ltd);
- **Appendix B** Technical Note 4 Existing Road Network Capacity. The Core Area and Inner Area Paramics Calibration and Validation is included in Technical Note 4;
- **Appendix C** Strategic Modelling Assumption, Calibration/Validation and Forecasting Results. The Technical Note 5 Strategic Modelling – Future Base Case Network Assumptions are also included in this Appendix;
- **Appendix D** Technical Note 3 Traffic Generation;
- **Appendix E** Paramics (Traffic) Model Audit, Halcrow, July 2011; and
- **Appendix F** Sketch Plan of Proposed Upgrade.

2 REGIONAL AND LOCAL TRANSPORT CONTEXT

The existing traffic and transport conditions in the study area are described within this chapter. The chapter provides the regional and local transport context within which the assessment has been undertaken.

2.1 Road Hierarchy

The Roads and Maritime Services (RMS) defines the functional road hierarchy in an urban area to establish a consistent basis for traffic management and planning. 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 comprises the primary network of principal traffic carrying and linking routes for the movement of people and goods within the urban centres of Sydney, Newcastle, Wollongong and Central Coast, and throughout the State. 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 SIMTA study area is summarised in Table 2-1. The classification criteria are sourced from *NSW Road Classification Review Panel – Final Report 2007.*

Table 2-1 Existing Road Network Characteristics, 2011

Road Names	Road Hierarchy	Characteristics
M5 South-West Motorway	Freeway / Motorway	The M5 corridor has been established as a vital part of the Sydney and State Road network that extends from Campbelltown to Sydney Airport. The M5 South Motorway is a 21 kilometre tolled road with generally two lanes in each direction between Camden Valley Way and King Georges Road. The Motorway currently caters for longer distance trips and commercial traffic. The Motorway plays a vital role as a freight route connecting Sydney Airport and Port Botany.
Hume Highway	State Road	Hume Highway is a main traffic route from the south-west to the north-east of Sydney. The study area includes the Hume Highway interchange with the M5 motorway. This interchange provides access to M5 eastbound (on ramp) and can be accessed through M5 westbound (off ramp). The interchange does not provide access to the M5 westbound and cannot be accessed through the M5 eastbound.

Road Names	Road Hierarchy	Characteristics
Moorebank Avenue	State Road[1]/Local Road	Moorebank Avenue is currently a two lane undivided road (one lane on each direction) between Cambridge Avenue and M5 and four lane undivided road (two lane on each direction) between M5 and Newbridge Road. This road provides a north-south link between Liverpool and Glenfield. It also forms a grade separated crossing (Single Point Diamond interchange) with M5. The core study area includes the section between Newbridge Road and Chatham Avenue.
Heathcote Road	State Road	In the study area, Heathcote Road is generally a four-lane arterial road and runs north-south between Moorebank and Heathcote. It connects the M5 South-West Motorway to the north and the Southern Freeway F6 to the south. To the south of M5, Heathcote Road is generally a two lane arterial road. Overtaking lanes are provided in both directions. The study area includes Heathcote Road intersection with Moorebank Avenue.
Anzac Road	Local Road	Anzac Road is an east-west local road that connects Moorebank Avenue and Heathcote Road. It provides access to Moorebank Business Park and the residential area of Wattle Grove. This is generally a two-lane undivided road. The study area includes the section between Yulong Close and Moorebank Avenue.
Newbridge Road / Milperra Road / Canterbury Road	State	This is a major east-west link between Liverpool and Sydney CBD as an alternative route of M5 Motorway. It generally has six lanes from Liverpool to Revesby with three lanes in each direction.

(1)= North of M5 Motorway, the road is classified as a state road. South of M5 Motorway, Moorebank Avenue is owned by the Department of Defence.

Figure 2-1 below shows key road hierarchy for the study area network.

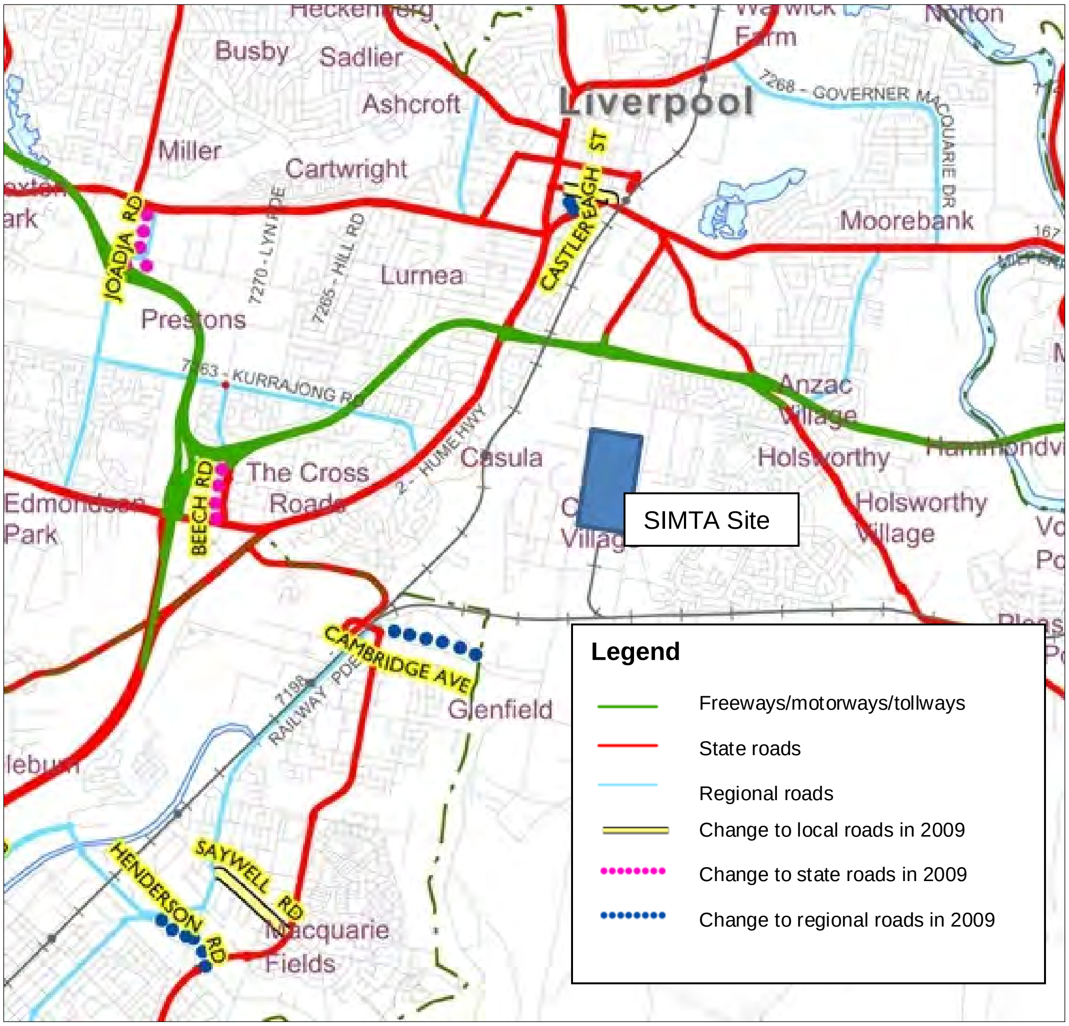


Figure 2-1 Road Hierarchy for the Study Area Network

Source: RMS May 2009 – Review Panel Final Report Map – Sydney Outer Area

2.2 Key Transport Indicators

2.2.1 Historical Traffic Growth

In general, the RMS collects traffic volume data at key count locations across the NSW road network. Historical traffic data from 2002 to 2009 was obtained from the RMS. Table 2-2 shows historical traffic volume on key roads within the study area measured in average annual daily traffic (AADT). Daily traffic volumes for 2010 are also included in Table 2-2. Table 2-3 shows historical average growth rate per annum.

The information in Tables 2-2 and 2-3 indicates:

- In 2009, M5 over Georges River carried about 113,000 vehicles per day. Between 2005 and 2009, traffic on the M5 at this location has grown by 3.7% per annum, significantly higher than growth data observed on the M5 at Hammondville Toll Plaza (between 1.5% and 1.7% per annum)[3]. The growth difference on the M5 is driven by the actual capacity available at different sections of the M5. For instance, over the Georges River, the M5 provides 8 lane traffic capacity compared to Hammondville Toll Plaza where in general the M5 provides 4 lane traffic capacity. The lower growth rate on the M5 (at Hammondville Toll Plaza) also suggests the peak period capacity constraints and in general the South-West Motorway is reaching its ultimate capacity.
- In 2010, Moorebank Avenue carried about 16,500 vehicles per day. During the last 7 years, traffic volumes on Moorebank Avenue have been found steady in the order of 14,000 and 16,000 vehicles per day. In recent years traffic growth on Moorebank Avenue has decreased slightly.

On average for key roads, the historical traffic growth in the study area was found to be around 1.2% per annum. The growth was consistent with regional growth of 1% to 2% per annum observed on other arterial roads.

Table 2-2 Traffic Trends (in AADT) at RMS's Count Stations, 2002-2010

Road Location	RMS Count Station	Data Type	AADT 2002	AADT 2005	AADT 2009	ADT [(1)] 2010
M5 - at bridge over Georges River	60.002	Vehicle	91,849	98,194	113,759	128,500
M5 ramp - East of Hume Hwy	60.003	Axle Pair	26,828	30,902	29,809	
Moorebank Ave - East Hills Railway overbridge	62.138	Axle Pair	14,348	15,903	14,098	16,500
Glenfield Rd - North of Cambridge Ave bridge	84.126	Axle Pair	12,424	12,232	12,841	

Note: *(1) ADT on M5 is estimated from peak hour counts in July/August 2010 as part of this project. The 2010 data on M5 is estimate based on short period sample counts and should not be compared with AADT data for growth calculation.*

[3] M5 West Widening, Environmental Assessment, September 2010, Roads and Traffic Authority.

Table 2-3 Annual Traffic Growth on the Key Roads, 2002-2009

Road	RMS Count station	Annual Average Growth		
		Between 2002-2005	Between 2005-2009	Between 2002-2009
M5 - at bridge over Georges River	60.002	▲ 2.3 %	▲ 3.7 %	▲ 3.1 %
M5 ramp - East of Hume Hwy	60.003	▲ 4.8 %	▼ 0.9 %	▲ 1.5 %
Moorebank Ave - East Hills Railway overbridge	62.138	▲ 3.5 %	▼ 3.0 %	▼ 0.3 %
Glenfield Rd - North of Cambridge Ave bridge	84.126	▼ 0.5 %	▲ 1.2 %	▲ 0.5 %
Average for Study Area (last 7 years)				▲ 1.2 %

2.2.2 Crash Data

This assessment is based on the crash data supplied by the RMS for the five-year period from 2004 to 2009 inclusive. This crash data was recorded on key roads close to the Moorebank Intermodal site. The data covers crashes reported to the Police, and includes fatal, injury or vehicle damage only accidents. A total of 559 accidents were recorded in the five year period. Of these, three (0.5%) crashes resulted in fatalities and 246 (44%) in injuries. Two fatal crashes occurred on Cambridge Avenue and one fatal crash occurred on the M5 Motorway near to the Hume Highway Interchange. Figure 2-2 to Figure 2-4 show the crash locations along the key roads around the study area by severity. The Figures show that crashes occurred along all the key roads but were more concentrated at intersections and motorway interchanges. Some particular crash locations include:

- M5 Motorway;
- M5 Motorway / Heathcote Road Interchange;
- M5 Motorway / Moorebank Avenue Interchange;
- M5 Motorway / Hume Highway Interchange;
- Moorebank Avenue / Newbridge Road intersection.

From the analysis of above crash data between 2004 and 2009, the following results appear to be most significant:

- The majority of crashes were rear-end (36.5%) and are concentrated on M5 Motorway.
- There were 26 crashes (4.7%) involving articulated vehicles with the majority occurring on the M5 Motorway. None occurred in Moorebank Avenue in front of the Intermodal site.
- Approximately 59 accidents (10.4%) involved heavy vehicles including articulated trucks while approximately 106 crashes (19%) involved light commercial vehicles. Over 93% of accidents involved private cars. Note that the total percentage is over 100% because a crash could involve more than one type of vehicle.
- A relatively low proportion of all crashes occurred at Moorebank Avenue, south of M5 interchange.

- A relatively high proportion of head-on collision crashes occurred on Moorebank Avenue (a two lane two way road without central median).

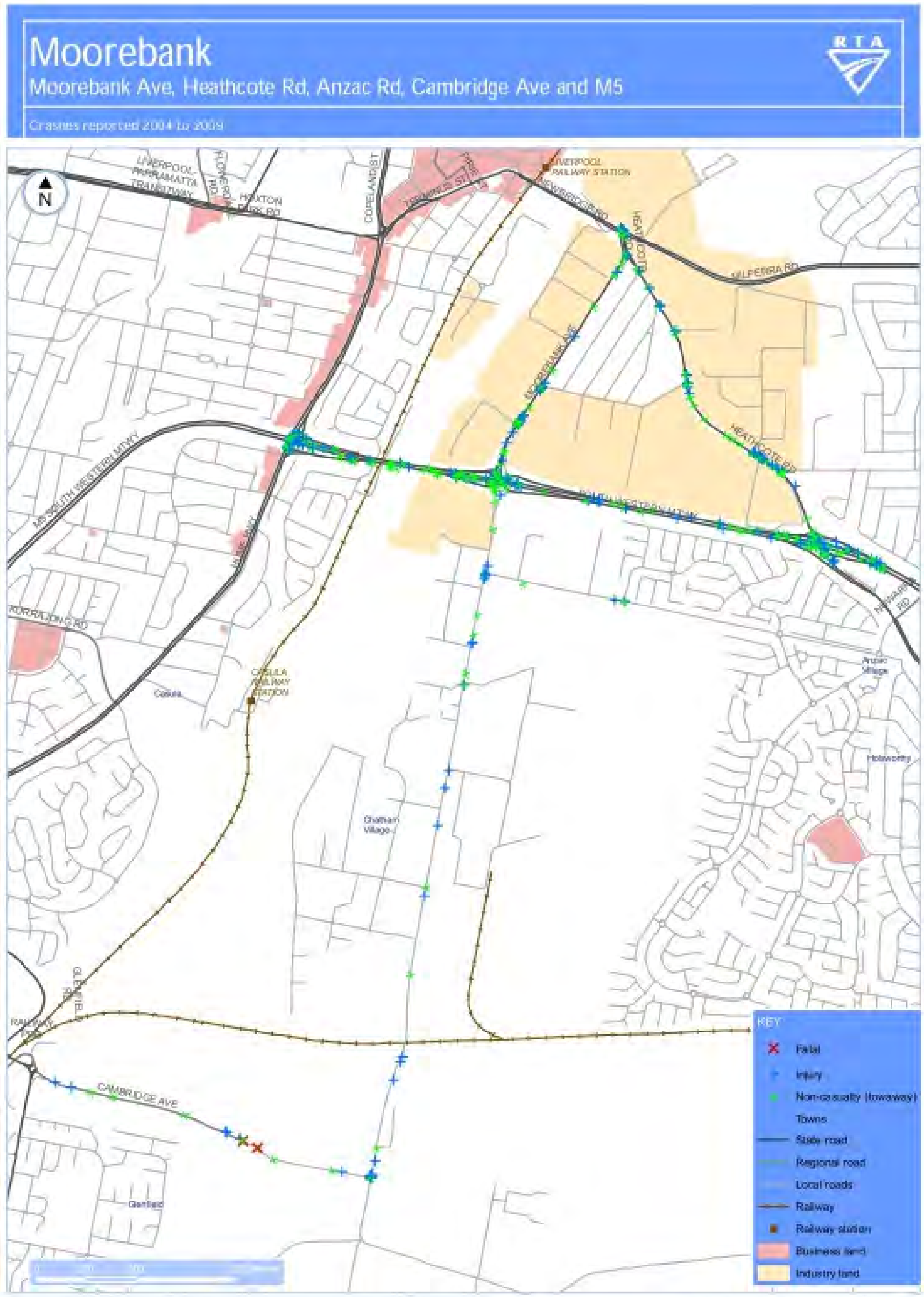


Figure 2-2 Spatial distribution of crashes – Degree of Crash, 2004-2009

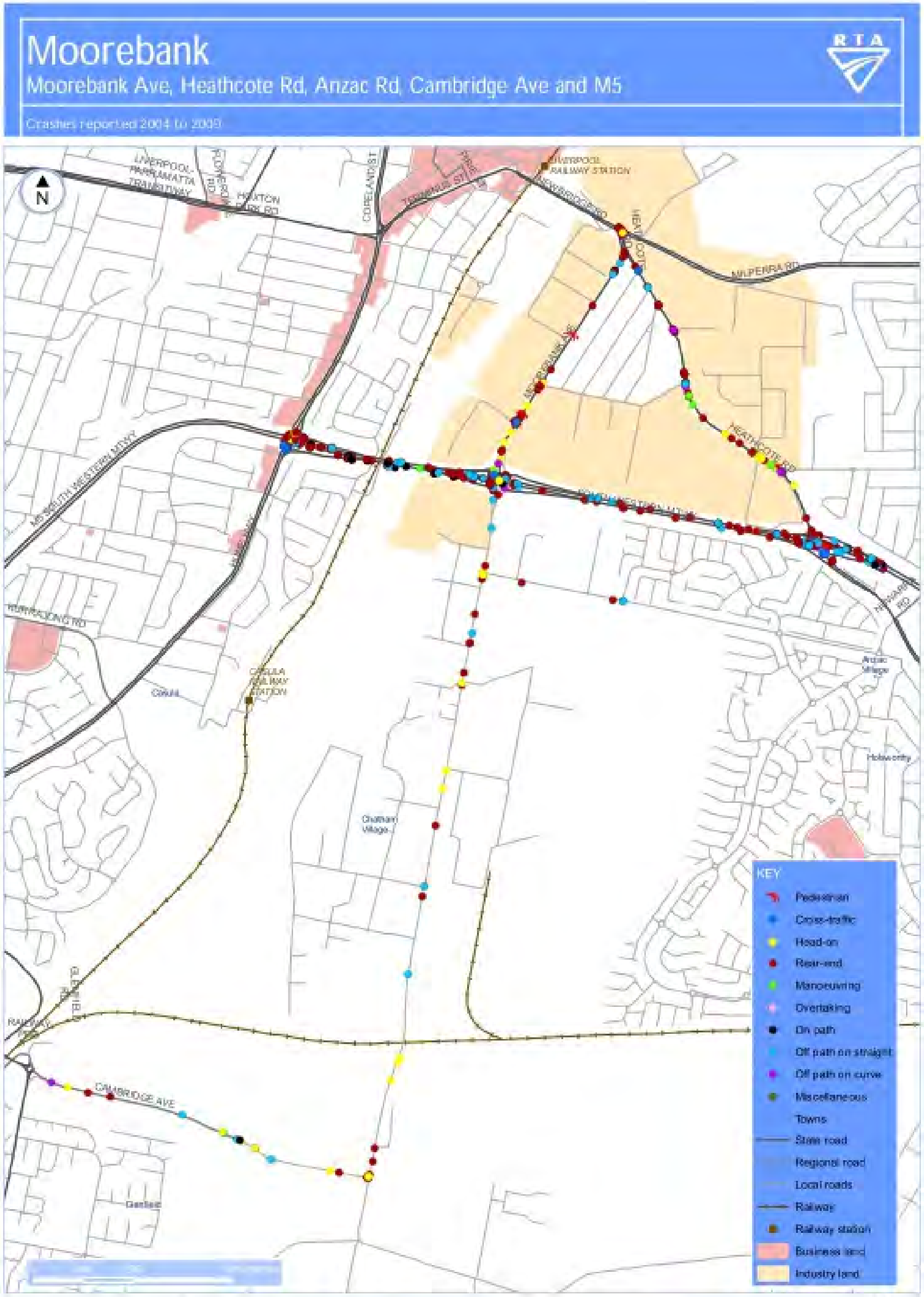


Figure 2-3 Spatial distribution of crashes – Crash Types, 2004-2009

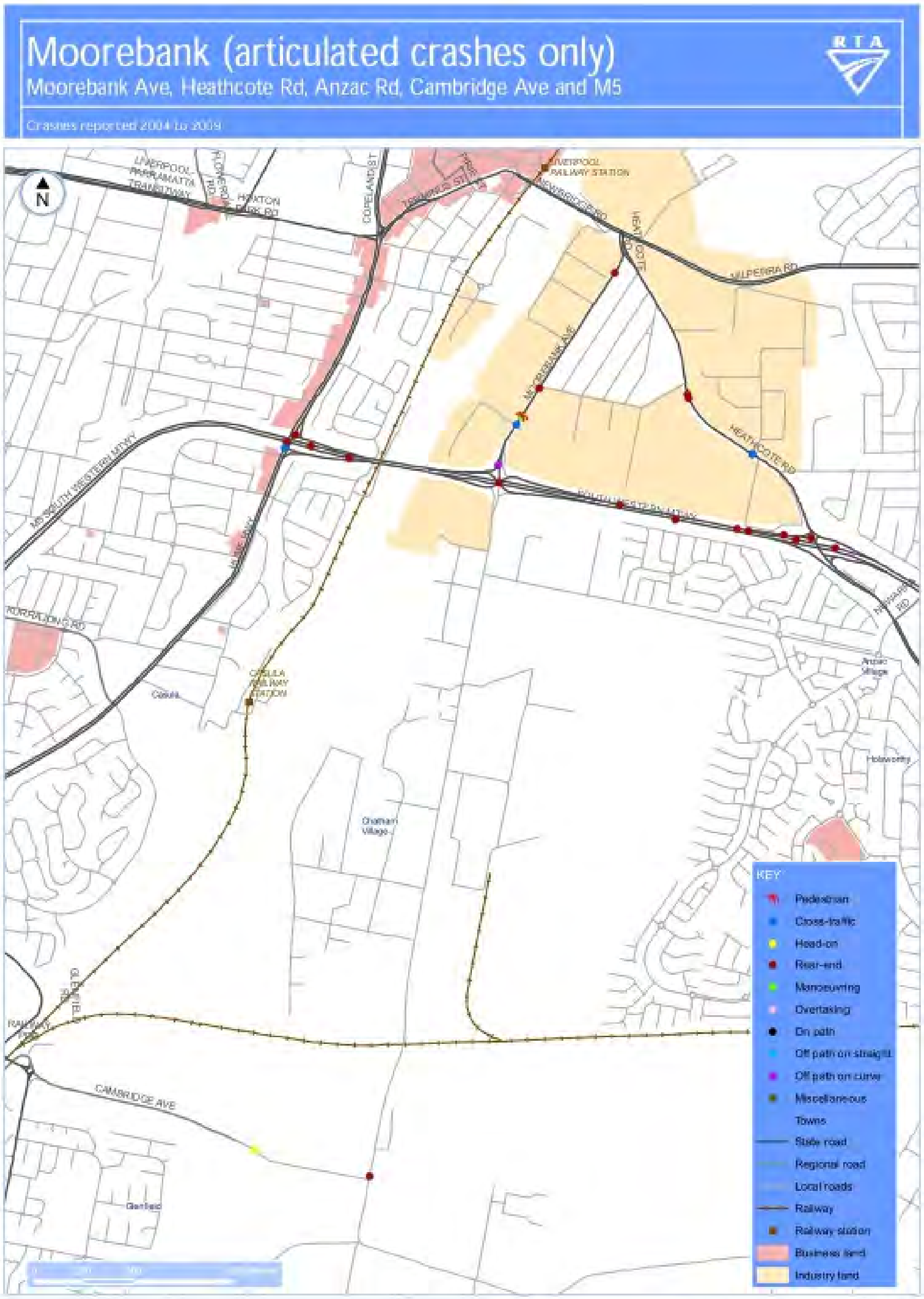


Figure 2-4 Spatial distribution of crashes – Articulated Vehicles, 2004-2009

2.2.3 Transport Mode Share (Liverpool LGA)

The Bureau of Transport Statistics (BTS) provided journey to work (JTW) data for the Sydney General Metropolitan Area (GMA) which provided a comprehensive sample of commuter travel, collected during the 2006 Census. Work trip origin and destinations are coded to the 2006 travel zones.

Table 2-4 summarises some of the key transport indicators for the Liverpool LGA and the Sydney Statistical Division sourced from the Bureau of Statistics (BTS) Household Travel Survey. Generally, Liverpool's residents exhibit higher trip making and car based mode shares than the average for Sydney. Total travel per person (km) and VKT's per person are both above the Sydney average. Mode choice in Liverpool is dominated by the car which is more than 10 percentage points higher than the Sydney Average (80% vs. 68.3%).

Table 2-4 Transport Indicators, Liverpool LGA & Sydney SD, 2008-2009

Indicator	Sydney	Liverpool
Population	4,269,000	171,000
Households	1,626,000	55,000
Trips per person	3.76	3.4
Total travel per person (km)	31.1	33.9
Model of travel (%):		
- Car Driver	47%	56%
- Car passenger	21.3%	24%
Car combined	68.3%	80%
- Train	5.2%	3%
- Bus	5.8%	4%
- Walk	18.3%	12%
Vehicles per Household	1.51	1.72
Ave. trip length [km]	8.3	10.1
VKT per person	17.8	22.6
Ave. work trips (mins)	34	34
Daily travel time (per person)	81	75

Source: BTS HTS, 2011

There are, however, some potentially positive travel characteristics across Liverpool that may be targeted in the development of a public transport plan for the subject development site. The use of the existing rail network combined with an enhanced public transport bus system would be advantageous to the development and reduce the number of vehicle trips being undertaken by employees of the terminal development.

Train is used by about 3% of Liverpool residents for journey to work trips which, although below that applying across Sydney (3% vs. 5.2%), does provide a reasonable base upon which to develop a favourable public transport mode share for the future employees on the terminal site. The propensity to use heavy rail for JTW trips suggests that future workers on the development site may use rail in reasonable numbers providing links between the site and the rail stations are satisfactory.

Similarly, the mode share for bus use across Liverpool (4%) is also below the 5.8% average for Sydney. The review of travel patterns and mode shares at the Travel Zone (TZ) level shows that in the immediate area, current bus and rail mode shares are well below this LGA average, with only about 1% of (all purpose) trips in the AM peak from the locality currently taking place on bus. A successful public transport plan for the terminal site will need to target bus mode shares better than this current Liverpool LGA average.

The average trip lengths and travel times suggest that a high proportion of trips occur within the Liverpool LGA or to nearby areas. This propensity to 'local' travel suggests that the employment uses proposed for the site will attract workers from within or nearby the Liverpool LGA. This will assist in reducing overall trip lengths; travel times and increasing the likelihood that appropriately targeted bus services will be used for journey to work trips at the terminal site.

2.2.4 Transport Mode Share (Moorebank Catchment Area)

Transport mode share data was further investigated for the Moorebank catchment area and identified for the proposed SIMTA development. The JTW data relates to trips to places of employment within travel zones 1108, 1110, 1113 and 1120 in Moorebank. The zones are comprised of employment areas along Moorebank Avenue, including the Intermodal site. The travel zone boundaries for Moorebank catchment area are shown in Figure 2-5.

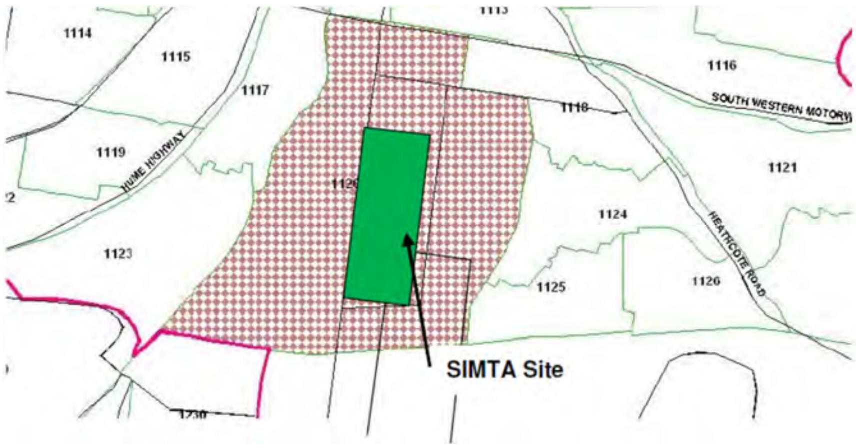


Figure 2-5 Extent of Travel Zone in Study Area

Analysis of the Journey-to-Work data, shown in Table 2-5 indicate around 85% of people surveyed travelled to work by private vehicle (driver and passenger), while 3% of workers travelled by public transport. The remainder were walk/cycle trips (5%), indicating that a proportion of employees live locally. The remainder worked from home, did not travel, or not stated (8%).

Table 2-5 Daily Work Trip Model Share to and from Moorebank Catchment Area

Travel Mode	Study Area as Workplace (Inbound trips)	% Study Area as Workplace
Car Driver	5,444	78%
Car Passenger	466	7%
Public Transport	213	3%
Others (walk, cycle, etc)	328	5%
Work at home, did not travel, or not stated	534	8%
Total	6,985	100%

Source: JTW 2006 Census. TZ06: 1108, 1110, 1113 and 1120

The low public transport usage (3%) is due to the fact that the site is poorly serviced by public transport. Longer distance trips to the DNSDC site are served by rail, with the site located near Liverpool, Casula and Holsworthy train stations. Liverpool and Casula are served by the South and Inner West Lines. The Bankstown and Cumberland Lines start and terminate at Liverpool, while Holsworthy station is located on the Airport and East Hills Line. Liverpool Station is approximately 3 kilometres north-west of the SIMTA site with the Route 901 bus service providing a connection between them. Casula Station is approximately 1 kilometre west of the SIMTA site. There is currently no direct connection. Holsworthy Station is approximately 3.4 kilometres south-east of the SIMTA site. The SIMTA site is linked by the Route 901 bus service on Anzac Road. There is a significant scope for improving public transport services to Moorebank as part of the SIMTA proposal. A Transport Management and Accessibility Plan (TMAP) have been prepared for the site which outlines the measures required to increase the public transport mode share (see Section 8).

2.3 Strategic & Policy Context

Urbis has undertaken an environmental assessment of the SIMTA proposal. The findings and recommendations from relevant key "Strategic Policy Documents" which have implications for the SIMTA proposal can be found in the Environmental Assessment Report, June 2013, Urbis.

2.4 Public Transport Services

2.4.1 State Plan Targets

The NSW 2021 A Plan to Make NSW Number One describes the previous NSW Government's plans for service delivery across a range of areas. The Plan provides public transport related targets which serve as a useful base upon which to measure aspects of the development as proposed. The State Plan targets are as follows:

Improve the public transport system.

Increase the share of commute trips made by public transport:

- To and from the Sydney CBD during peak hours by 80% by 2016.
- To and from the Parramatta CBD during peak hours by 50% by 2016.
- To and from the Liverpool CBD during peak hours by 20% by 2016.

Increase the proportion of total journeys to work by public transport in the Sydney Metropolitan Region to 28% by 2016.

Provide reliable public transport.

- Trains – 92% of CityRail trains run on time across the network.
- Buses – 95% of Sydney buses run on time across the network.
- Ferries – 98.5% of ferries run on time.

Improve the road network.

- Improve the efficiency of the road network during peak times as measured by travel speeds and volumes of Sydney's road corridors.
- Reduce fatalities to 4.3 per 100,000 population by 2016
- Double the proportion of container freight movement by rail through NSW Port by 2020.

Increase walking and cycling.

- Increase the mode share of bicycle trips made in the greater Sydney Region, at a local and district level, to 25% by 2016.

Increase the number of jobs closer to home.

Increase the percentage of the population living within 30 minutes by public transport of a city or major centre in Metropolitan Sydney.

2.4.2 Local Plans - Growing Liverpool 2021

Liverpool Council is developing a ten year community strategic plan called Growing Liverpool 2021. The purpose is to provide direction for the planning of the LGA in response to the anticipated increase in population from about 182,000 (2009) people to more than 220,000 people by 2021. The State of the city Liverpool 2010 document provides a summary of some of the challenges facing the LGA. The document highlights the following travel and related statistics:

- Liverpool has grown from about 12,600 people in 1947 to about 182,000 in 2009. By 2036 a population of about 325,000 people is anticipated.
- By 2036 about 50,000 of this estimated 325,000 population will be over 65 years of age.
- Residents make an average of 3.4 trips per person on an average weekday.
- The average travel time for residents is about 34 minutes.
- Most trips are made by car, in 2006 about 62% of people in Liverpool drove to work compared with 54% for people in Sydney.
- Slightly more than 11% of people in Liverpool used public transport to travel to work compared to 18% for Sydney.
- By train in the peak hour, it takes about 54 minutes to get to Central station compared to about 40 minutes from Blacktown and 28 minutes from Parramatta.

The document highlights the following challenges:

- To maintain flexible planning controls that allow for changes in residential demand and traffic patterns.
- Continue to grow and develop Liverpool as a regional city for south-western Sydney with major facilities and improved transport.
- To increase services and infrastructure in line with population growth.

2.4.3 Bus Services

Presently only one bus route, Route service 901 operated by Veolia, services the area in the vicinity of the site via Moorebank Avenue. The Route 901 buses travel via Anzac Avenue to the north of the site with only one AM and one PM service accessing the site (south of Anzac Avenue to the existing DNSDC site). This is shown as a dotted line in Figure 2-6. These buses connect the area to Liverpool Station and then access Wattle Grove en route to Holsworthy rail station which is located about 3 kilometres south-east of the site. The first Route 901 bus leaves Liverpool station at 5:30am each weekday and the last bus returns to Liverpool station at 8:50pm on weekday evenings. The weekday average peak frequencies are about 30 minutes and 60 minutes in the off peak.

The NSW Government has introduced a number of high frequency cross regional bus services across the Sydney metropolitan area. The network comprises 13 routes operating seven days a week departing every ten minutes during peak periods. Services operate every 15 minutes during the weekday and every 20 minutes during the weekend until 8:30pm. Some services operate after 8:30pm at a frequency between 30 and 60 minutes. On weekends the buses run every twenty minutes between 7:30am and 7:30pm. The Metro services are operated by both STA and private operators.

Metro Bus M90 runs between Liverpool and Burwood via Milperra and Newbridge Road. The M90 route does not service the proposed SIMTA site. However, Milperra and Newbridge roads are located approximately two kilometres north of the proposed SIMTA site.

Table 2-6 Bus Services (Routes 901, 902 & M90), 2011

Time	No. of Services per day					
	901		902		M90	
	NB	SB	NB	SB	WB	EB
Weekday AM	9	10	12	10	35	33
Weekday PM	15	14	13	13	45	39
Saturday AM	5	5	6	6	15	15
Saturday PM	7	7	7	7	26	27
Sunday AM	4	4	4	3	15	15
Sunday PM	7	6	5	7	26	27

Source: Urbanhorizon Pty Ltd

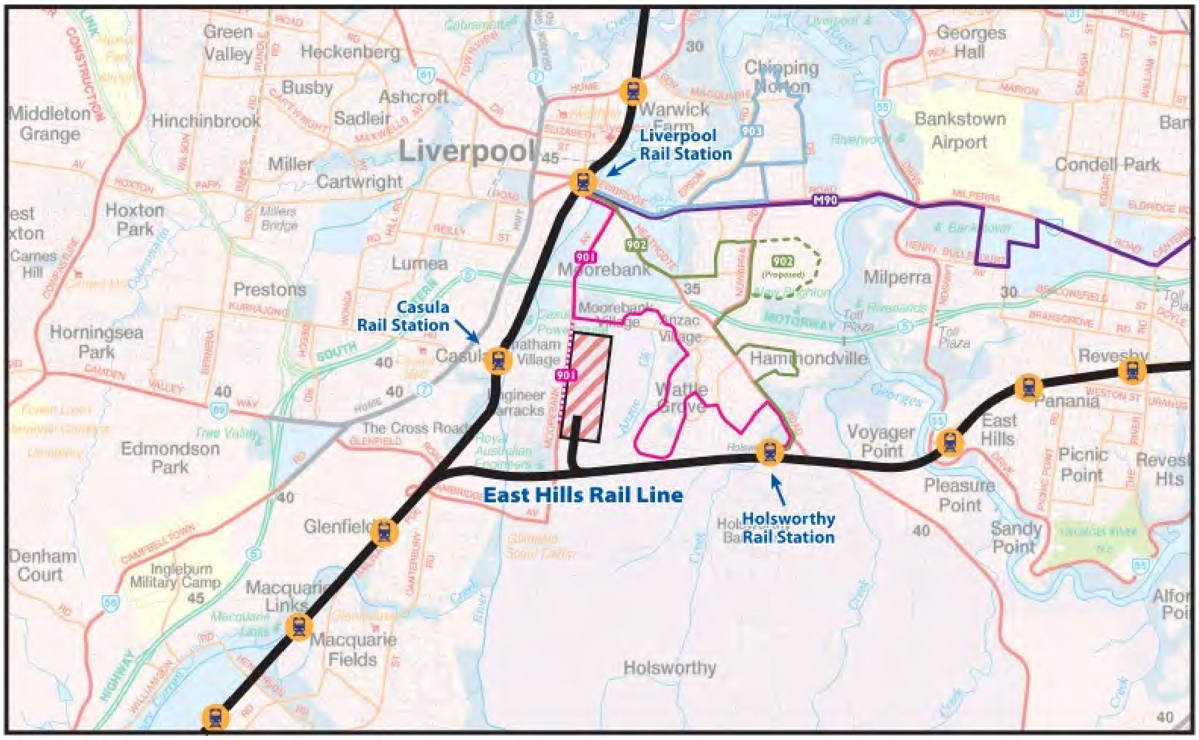


Figure 2-6 Existing Bus Routes and Passenger Rail Network

Source: Urbanhorizon Pty Ltd

Table 2-6 shows the numbers of bus services across the average weekday and weekend day. Routes 901 and 902 provide a limited service on weekends. Route M90, although remote from the site, operates on both weekdays and weekends at much better frequencies.

2.4.4 Rail Services

The site is located near the junction of the Southern and East Hills rail lines. Three rail stations are located within a 3-4 kilometre radius of the site, these being Liverpool Station (Southern Line) to the north, Casula Station (Southern Line) to the west and Holsworthy Station (East Hills

Line) to the south-east. The Georges River is located between the site and Casula Station. The Georges River and the existing arrangement of the road network means that Casula Station is not as accessible to the site as the other two rail stations.

Table 2-7 shows the 2009 weekday Station entries and exits at each of the three stations. By way of comparison, the number 1 ranked station in the network was Central station with AM (6:00-9:30am) entries and exits of 8,260 and 37,720, respectively. Twenty-four hour entries and exits were 85,260 pax/day. This compares with the 8,570 and 2,840 entries and exits at Liverpool and Holsworthy stations, respectively.

Table 2-7 2009 Weekly Station Entries / Exits

Station	2:00-6:00		6:00-9:30		9:30-15:00		15:00-18:30		18:30-2:00		24 Hours		Rank
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	
Liverpool	160	80	2710	2250	2500	2230	2600	2890	600	1110	8570	8570	27
Holsworthy	20	30	2280	190	330	260	170	1640	40	730	2840	2840	81
Casula	0	0	100	20	40	40	30	90	10	30	180	180	233

Source: RailCorp, 2010

Vehicular access between the development site and the two nearest stations is as follows:

- Liverpool Station: Moorebank Avenue - Newbridge Road - Speed Street - Bigge Street - Moore Street.
- Holsworthy Station: Anzac Road - Wattle Grove Dr - Heathcote Road – Macarthur Dr - right into station car parking area.

2.5 Cycling and Pedestrian Network

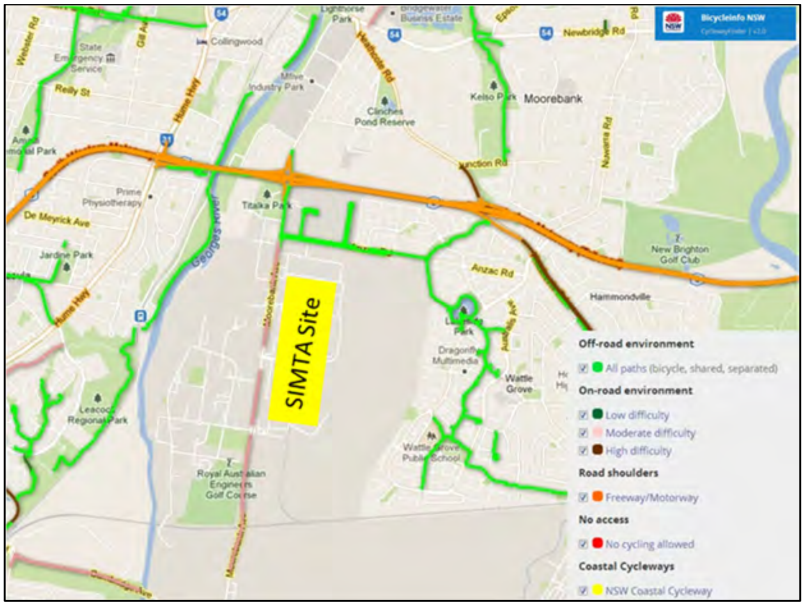


Figure 2-7 Existing Bikeways in Liverpool near to Moorebank Intermodal

Source: NSW Bicycleinfo

Existing bikeways in Liverpool are located as shown in Figure 2-7. The NSW BikePlan published in June 2010 promotes bike use in the Sydney metropolitan area. It is a comprehensive plan to encourage the safe use of bicycles for all travel purposes across NSW. The NSW BikePlan is intended to support the State Plan target of increasing the number of bicycle trips made in the Greater Sydney region at a local and district level to 5% by 2016.

The Plan has identified additional bike routes around Liverpool in Moorebank Avenue, Heathcote Road and Newbridge Road as shown in red on Figure 2-8**.**

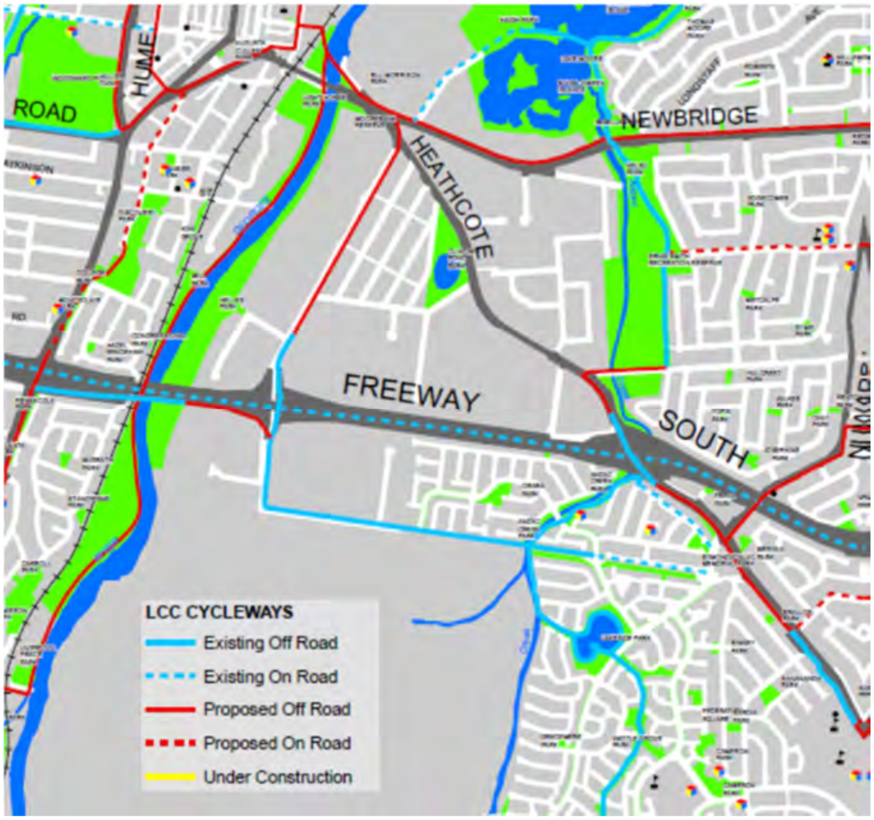


Figure 2-8 Bike Plan – Liverpool Subregional Bike Network

Source: Liverpool Council

2.6 Schools

The location of existing schools in proximity to the SIMTA site was assessed. The location of public and private schools in the Wattle Grove and Liverpool areas is shown in Figure 2-9. The Figure indicates that there is a well distributed network of public and private schools in and around Moorebank. It is proposed that a local area traffic management initiative (LATM) be developed as the development progresses to encourage heavy vehicles to use the major arterial road network. The local area traffic management measures can be utilised to reinforce the characteristics of local roads around schools. With LATM measures in place, it is unlikely that trucks originating from or destined to the SIMTA site will adversely impact the local amenities around schools. It is expected that heavy vehicles travelling to and from the SIMTA site will use appropriate routes and be prevented from accessing school areas. Chapter 9 describes further mitigation measures.

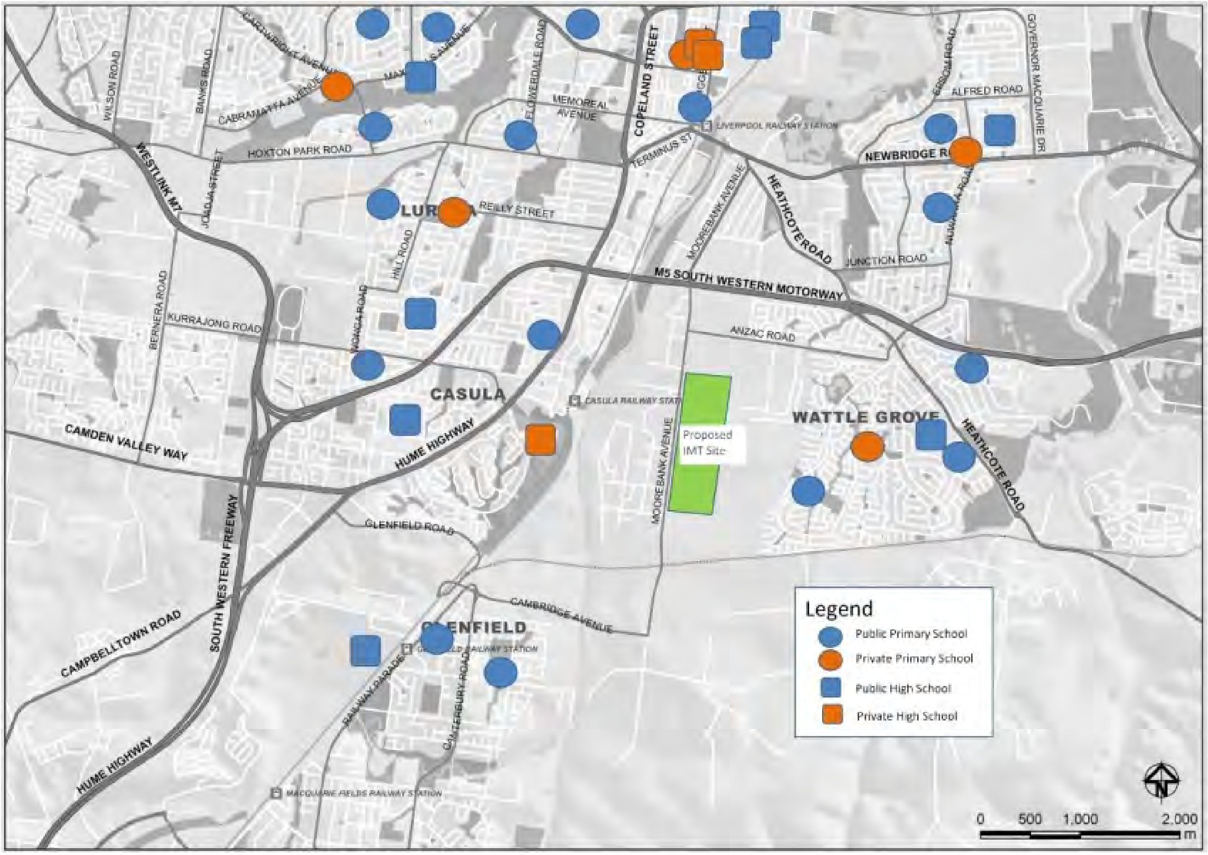


Figure 2-9 Schools in proximity to the SIMTA development site

2.7 Strategic Needs for Intermodal Terminal (IMT) and Freight Demand

PricewaterhouseCoopers (PwC) has undertaken the needs assessment that evaluates likely demand for the proposed SIMTA proposal and how the objectives for this facility relate to the NSW Government's Freight Strategy and Port Botany's Rail Strategy. The findings and recommendations from the PwC report were summarised in June 2013 Strategic Needs for Intermodal Terminal (IMT) and Freight Demand Report prepared by Hyder.

3 EXISTING ROAD NETWORK PERFORMANCE

Chapter 3 establishes the existing transport network performance in the wider study area around the development site. Results from traffic surveys are summarised in this section. An assessment of existing network capacity has been undertaken indicating network deficiencies at key roads and intersections.

3.1 Traffic Data Service

To satisfy the RMS's requirements identified in the DGR's, Hyder undertook an extensive data collection exercise involving key roads and intersections in the wider study area. Traffic surveys were undertaken as an input into:

- Strategic model calibration and validation.
- Micro-simulation model calibration and validation.
- Intersection capacity analysis to determine level of service.
- Traffic input to noise, air quality, master planning and community consultations on a needs basis.

Four types of survey were undertaken to satisfy the needs and purpose of the project. They are:

1. Intersection turning movement counts for the critical peak periods.
2. Daily automatic traffic counts for a one week period.
3. Queue length surveys at critical intersections.
4. Origin destination (OD) survey.

Surveys were undertaken in two stages as follows:

1. Stage 1: Survey for the Core area. This survey was undertaken prior to DGRs being issued. The survey was undertaken by Austraffic in July/August 2010.
2. Stage 2: Survey for the inner/wider area. This survey was undertaken after DGRs were issued. The supplementary survey was undertaken by Austraffic in May 2011.

Table 3-1 below summarises traffic survey undertaken during Stage 1 and Stage 2 investigation.

Table 3-1 Summary of Traffic Survey Undertaken for Moorebank, 2010 – 2011

Core Area **Stage 1 (July/August 2010)**	**Inner/Wider Area** **Stage 2 (May 2011)**
▪ Mid-block tube counts for the period of one week for three mid-block locations. ▪ Mid-block video counts during morning and afternoon peak periods on M5. ▪ Intersection turning counts during morning and afternoon peak periods for 12 intersections. ▪ Queue length surveys for five key intersections. ▪ Origin-destination (OD) survey of the M5 eastbound weaving section.	▪ Mid-block video counts during morning and afternoon peak periods on M5, M7 and Hume Highway for three locations. ▪ Intersection turning counts during morning and afternoon peak periods for 21 intersections. ▪ Queue length surveys for six key intersections.

All count data was used to calibrate the model. Intersection queue data was used for further model validation.

Figure 3-1 shows traffic survey locations for the study area.

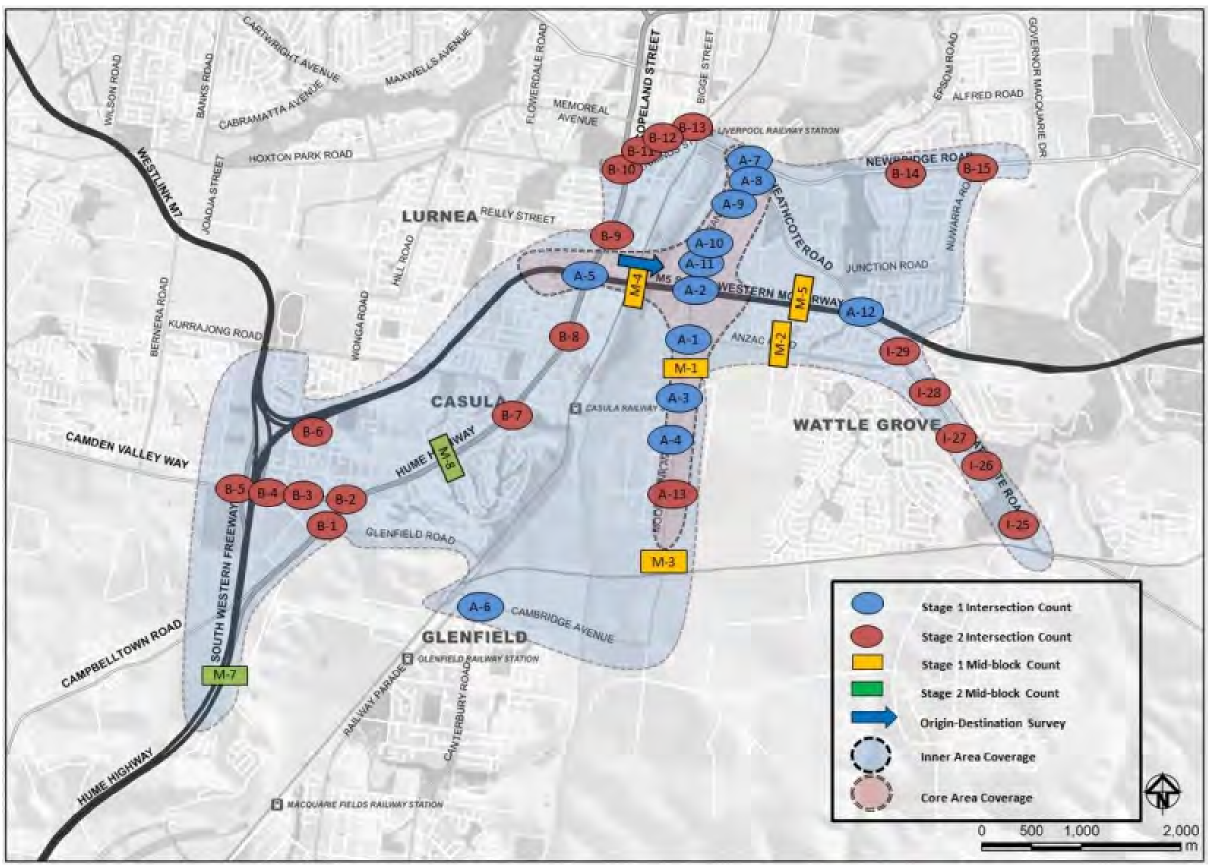


Figure 3-1 Mid-Block and Intersection count locations for study area

3.1.1 Intersection Counts

Stage 1 Investigation

Morning AM and Evening PM peak period intersection turning movement counts were undertaken by Austraffic for 12 intersections covering the following key roads:

- Moorebank Avenue and Cambridge Avenue from Newbridge Road to Canterbury Road.
- M5 Motorway from Hume Highway to Heathcote Road.

Intersections turning movement counts were undertaken for 2.5 hours in the AM (7am to 9.30am) and 3 hours in the PM (4pm to 7pm) using video.

Stage 2 Investigation

Morning AM and Evening PM peak period intersection turning movement counts were undertaken by Austraffic for 21 intersections covering the following key roads:

- Hume Highway and Campbelltown Road from Macquarie Street to Glenfield Road.
- Camden Valley Way from M5/M7 Interchange to Hume Highway. The intersection of M5 off-ramp and Beech Road is also included.
- Macquarie Street, Terminus Street and Newbridge Road from Hume Highway to Nuwarra Road.
- Heathcote Road from Nuwarra Road to Macarthur Drive.

Intersection turning movement data was collected for 3 hours in the AM (6am to 9am) and 3 hours in the PM (3pm-6pm) using the video.

3.1.2 Mid-block Counts

Stage 1 Investigation

During the same survey period (July/August 2010), daily automatic traffic counts (ATC) were conducted by Austraffic for continuous seven-day period at following three mid-block locations:

- M-1 Moorebank Avenue, South of Anzac Road.
- M-2 Anzac Road, East of Moorebank Avenue.
- M-3 Moorebank Avenue, South of Jacquinot Road.

Peak period (7am to 9.30am and 4pm to 7pm) data was collected by Austraffic:

- M-4 M5 Motorway, West of Moorebank Avenue.
- M-5 M5 Motorway, East of Moorebank Avenue.

The ATC survey data was collected as per twelve Austroads standard vehicle classes. The AM and PM peak period data was collected for light vehicles, medium trucks, heavy trucks and articulated vehicles.

Stage 2 Investigation

In May 2011, traffic was counted by Austraffic for peak periods (6am to 9am and 3pm to 6pm) at the following three mid-block locations:

- M-6 M7 Motorway, North of Kurrajong Road bridge.
- M-7 M5 Motorway, South of Campbelltown Road.
- M-8 Hume Highway, between Myall Road and Pine Road.

The data was collected for cars and trucks.

3.1.3 Travel Speed and Time

Hyder purchased travel time data from the RMS for routes relevant to SIMTA site. Figure 3-2 shows the RMS routes in the study area. Supplementary travel time data on M5 South-West Motorway was sourced from the Preferred Project Report of M5 West Widening Study, Addendum Traffic and Transport Report May 2011.

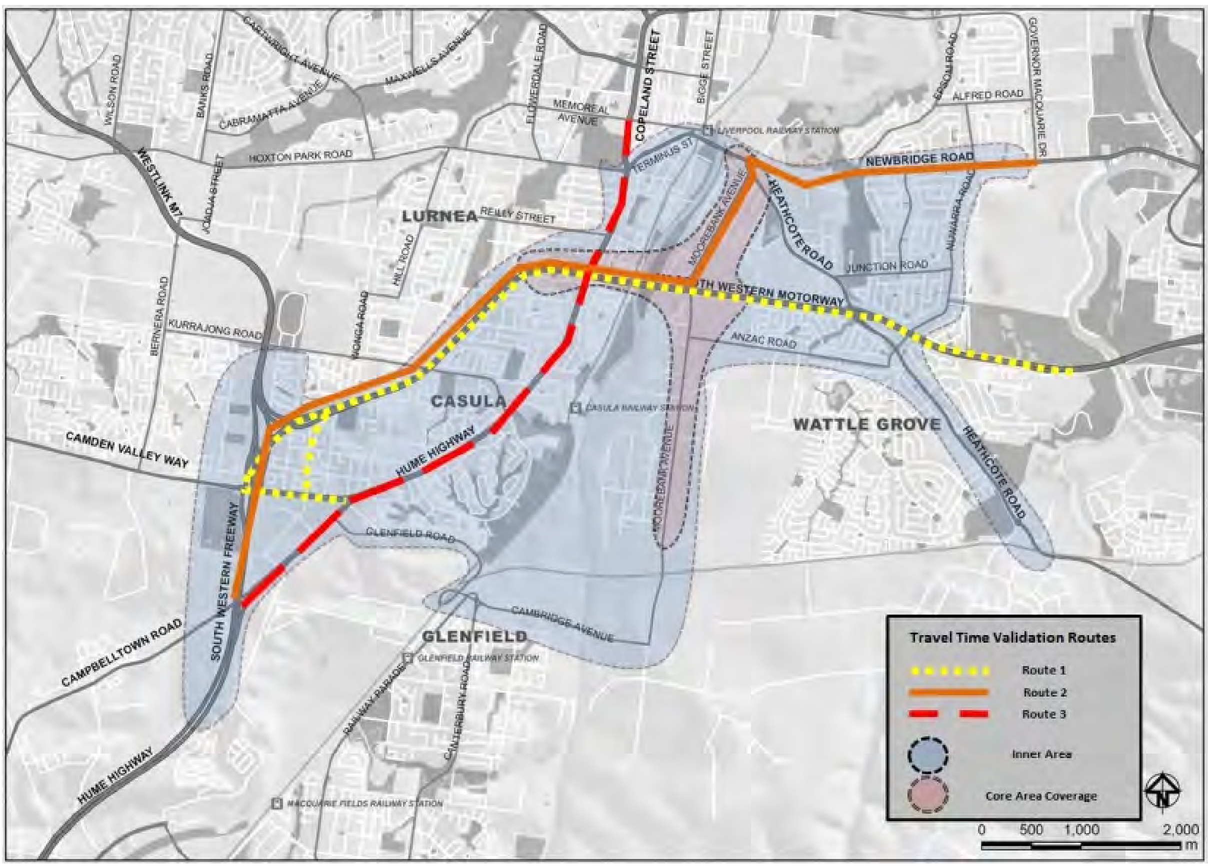


Figure 3-2 Road sections covered by RMS travel time routes

The following sections summarise results from traffic data used to assess the network performance and explains how data was used in the transport model calibration and validation process

3.2 Traffic Results

This section quantifies the daily and peak hour traffic flows on key roads and intersections within the study area. The intersection turning movement data was used to estimate current capacity problems at key intersections. The traffic data also provides a basis to consider likely traffic changes that would result from future growth and network road upgrade. The results are based on survey data recorded from key roads and intersections within 2010 and 2011.

3.2.1 Daily Traffic Volumes

Table 3-2 summarises the current traffic volumes at key roads near the SIMTA site. The results show that:

- Moorebank Avenue near the SIMTA site carries about 17,500 vehicles per day. The heavy vehicle proportion is about 5% of total traffic.
- Traffic volumes on Anzac Road are low, in the order of 9,500 vehicles per day.
- The M5 Motorway over the Georges River carries approximately about 128,500 vehicles per day. The heavy vehicle proportion on the M5 is about 10%.

Table 3-2 Traffic volumes on key roads in year 2010/2011

ID	Roads/Locations	Daily Traffic	Heavy vehicle percentage (%)
Stage 1 – July / August 2010			
M-1	Moorebank Avenue - South of Anzac Road	17,500	5%
M-2	Anzac Road - East of Moorebank Avenue	9,500	6%
M-3	Moorebank Avenue – South of Jacquinot Road	16,500	4%
M-4	M5 Motorway - West of Moorebank Avenue [1]	128,500[1]	10%
M-5	M5 Motorway – East of Moorebank Avenue [1]	110,000[1]	10%
Stage 2 – May 2011			
M-7	M5 Motorway, South of Campbelltown Road [1]	98,500[1]	15%
M-8	Hume Highway, between Myall Road and Pine Road [1]	50,500	5%

Note: 1 =Daily traffic was estimated from peak hour counts undertaken for this study. Peak to daily factors were estimated from BTS data. The count data has been rounded. RTA/RMS has permanent station counters on the F6, south of Brooks Road. In 2008, RTA/RMS data shown that the F6 carried about 85,000 vehicles per day. Further north, Hyder estimated daily traffic on M5 Motorway south of Campbelltown Road to be about 98,000 vehicles per day.

3.2.2 Traffic Flow Profiles

Figure 3-3 shows the variation of the traffic profile over the one week survey period for Moorebank Avenue and Anzac Road. The traffic volumes at three mid-block locations are presented on the charts with the same scale.

The results in Figure 3-3 show the general profile of traffic for Moorebank Avenue and Anzac Road:

- Traffic is relatively constant across the weekdays from Monday to Friday.

- Weekend traffic volumes are lower than weekday traffic volumes.
- Traffic levels for both AM and PM peak periods across weekdays show similar profiles.

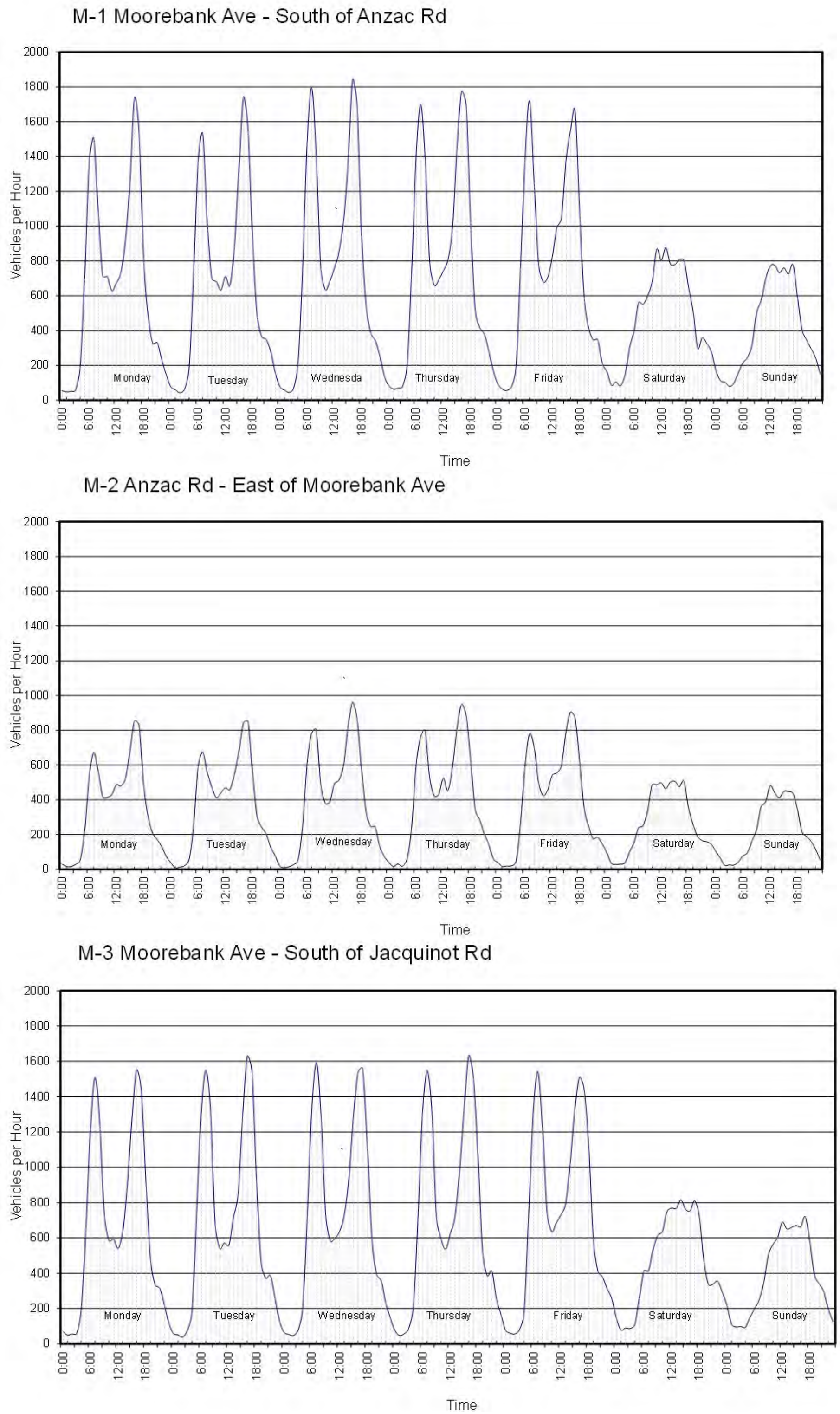


Figure 3-3 Daily Traffic Profiles on Key Roads

The data presented in Figure 3-4 was used to establish the AM and PM peak and off peak travel on Moorebank Avenue and Anzac Road. Table 3-3 shows AM and PM peak traffic volume.

- In general AM peak period begins at 6:00am at most locations. The PM peak period begins around 15:00.
- Moorebank Avenue showed contra flow traffic distribution. The northbound traffic showed the highest peaks in the AM. The reverse distribution is observed in the southbound direction. In the future, SIMTA site traffic will counterbalance traffic flows on Moorebank Avenue. It is expected that in the morning SIMTA employee cars will be dominant in the southbound direction, as they will be destined for the site
- The directional flows on Anzac Road are very similar during the AM and PM peaks.

The M5 Motorway observed the highest morning and evening peak hour flows between the Hume Highway and Moorebank Avenue, in the order of 4,000 to 5,500 vehicles per hour in either eastbound or westbound direction. There is a significant volume of traffic entering and leaving the M5 at the Moorebank, Hume Highway and Heathcote Road interchanges.

Table 3-3 Peak Hour Traffic on Key Roads

		AM Peak		PM Peak	
Site ID	**Locations**	**NB/EB(1)**	**SB/WB(1)**	**NB/EB(1)**	**SB/WB(1)**
M-1	Moorebank Ave, South of Anzac Rd	1,110	620	550	1,170
M-2	Anzac Rd, East of Moorebank Rd	350	460	450	480
M-3	Moorebank Ave, South of Jacquinot Rd	1,100	370	380	1,190
M-4	M5 Motorway, In between Moorebank Ave and Hume Hwy	5,250	4,390	4,480	5,480
M-5	M5 Motorway, In between Moorebank Ave and Heathcote Rd	4,070	4,210	4,110	4,370
M-6	M-7 Motorway, North of Kurrajong Rd bridge	2,590	2,330	2,310	2,620
M-7	M5 Motorway, South of Campbelltown Rd	4,440	3,080	3,870	3,660
M-8	Hume Highway, In between Myall Rd and Pine Rd	2,580	1,250	1,440	2,600

Note: (1) Northbound (NB), Eastbound (EB), Southbound (SB), Westbound (WB)

(2) Peak 1 hour traffic is estimated from AM peak 2 hour and PM peak 3 hour traffic. Traffic data in the above table represents 1 hour traffic.

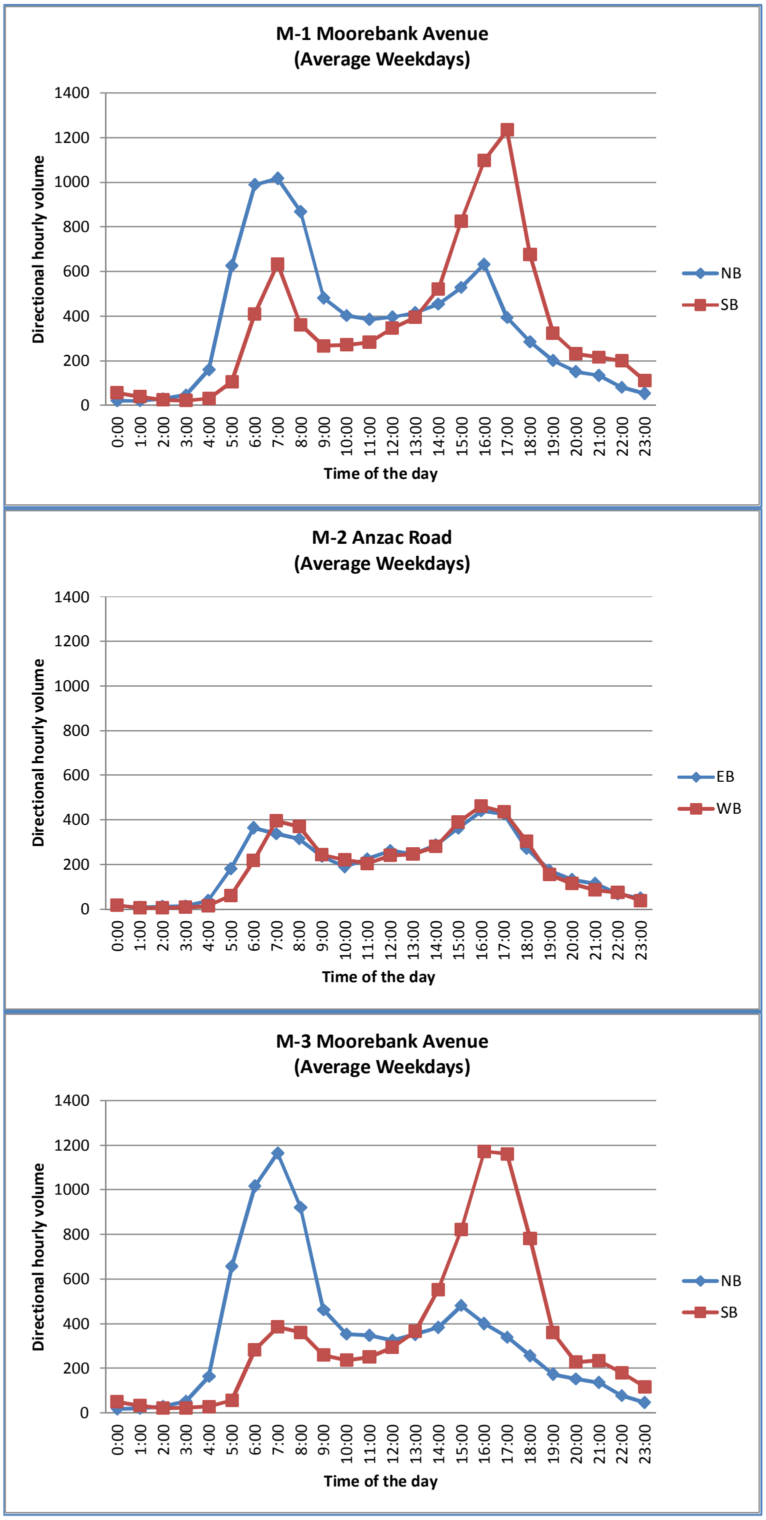


Figure 3-4 Hourly Traffic Profiles on Moorebank Avenue and Anzac Road

3.3 Existing Network Performance

In general, the road network impacts of the SIMTA proposal will decline with greater distance from the site. Therefore, Hyder has adopted a three-tiered approach to the assessment of road network impacts:

1 “Core” area.

2 “Inner” area.

3 “Wider” area.

The “core” area, defined below, was modelled in Paramics and determined the SIMTA impact immediately to the surrounding road network. In general, the core area is bounded by the following roads:

- M5 Motorway between Hume Highway and Heathcote Road (east and west);
- Hume Highway (north and south);
- Moorebank Avenue between Newbridge Road and Cambridge Avenue (north and south);
- Anzac Road (east).

Within the core area, traffic assessment was undertaken for 12 intersections covering key roads including Moorebank Avenue and Cambridge Avenue from Newbridge Road to Canterbury Road, M5 Motorway from Hume Highway to Heathcote Road. Previous Figure 3-1 showed roads and intersections that were surveyed and assessed within the core area. The 12 intersections within core are listed below:

- A-1 Moorebank Ave / Anzac Road;
- A-2 Moorebank / M5 Motorway;
- A-3 Moorebank Ave / Car Park;
- A-4 Moorebank Ave / Car Park;
- A-5 M5 Motorway / Hume Highway
- A-7 Moorebank Ave / Newbridge Road;
- A-8 Moorebank Ave / Heathcote Road;
- A-9 Moorebank Ave / M5 Industrial Park Access Road;
- A-10 Moorebank Ave / Church Road;
- A-11 Moorebank Ave / Helles Ave;
- A-12 Moorebank Ave / Chatham Ave; and
- A-13 Moorebank Ave / M5 Industrial Park Access Road.

The inner area boundary was largely determined from Hyder’s strategic modelling investigation and network capacity issues identified in the Halcrow’s traffic and transport report prepared for the proposed M5 West Widening Project (M5 West widening, Environmental Assessment, September 2010, Roads and Traffic Authority). The SIMTA impact in the “inner area” is likely to be more homogeneous, travelling along the primary routes only (e.g. Hume Highway, M5 Motorway and M7 Motorway). The network operational impact from SIMTA in the “inner area” is expected to be low. The Paramics model was expanded further should impact from the SIMTA proposal extends beyond the core area.

Within the inner area, traffic assessment was undertaken for 21 intersections covering the roads as follows:

- Hume Highway and Campbelltown Road from Macquarie Street to Glenfield Road.
- Camden Valley Way from M5/M7 Interchange to Hume Highway. The intersection of M5 off-ramp and Beech Road is also included.
- Macquarie Street, Terminus Street and Newbridge Road from Hume Highway to Nuwarra Road.
- Heathcote Road from Nuwarra Road to Macarthur Drive.

The 21 intersections within the inner area are listed below:

- A-1 Moorebank Ave / Anzac Road;
- A-2 Moorebank / M5 Motorway;
- A-3 Moorebank Ave / Car Park;
- A-4 Moorebank Ave / Car Park;
- A-5 M5 Motorway / Hume Highway
- A-7 Moorebank Ave / Newbridge Road;
- A-8 Moorebank Ave / Heathcote Road;
- A-9 Moorebank Ave / M5 Industrial Park Access Road;
- A-10 Moorebank Ave / Church Road;
- A-11 Moorebank Ave / Helles Ave;
- A-12 Moorebank Ave / Chatham Ave;
- A-13 Moorebank Ave / M5 Industrial Park Access Road;
- B-2 Hume Highway / Camden Valley Way / Campbelltown Road;
- B-8 Hume Highway / De Meyrick Avenue;
- B-9 Hume Highway / Congressional Place / Reilly Street;
- B-10 Hume Highway / Hoxton Park Road / Macquarie Street;
- B-13 Newbridge Road / Speed Street;
- B-14 Newbridge Road / Stockton Avenue;
- B-15 Newbridge Road / Nuwarra Road;
- I-29 Heathcote Road and Nuwarra Road and
- I-36 M5 Motorway / Heathcote Road.

Figure 3-5 below shows the location of core and inner areas around the SIMTA site for modelling purpose.

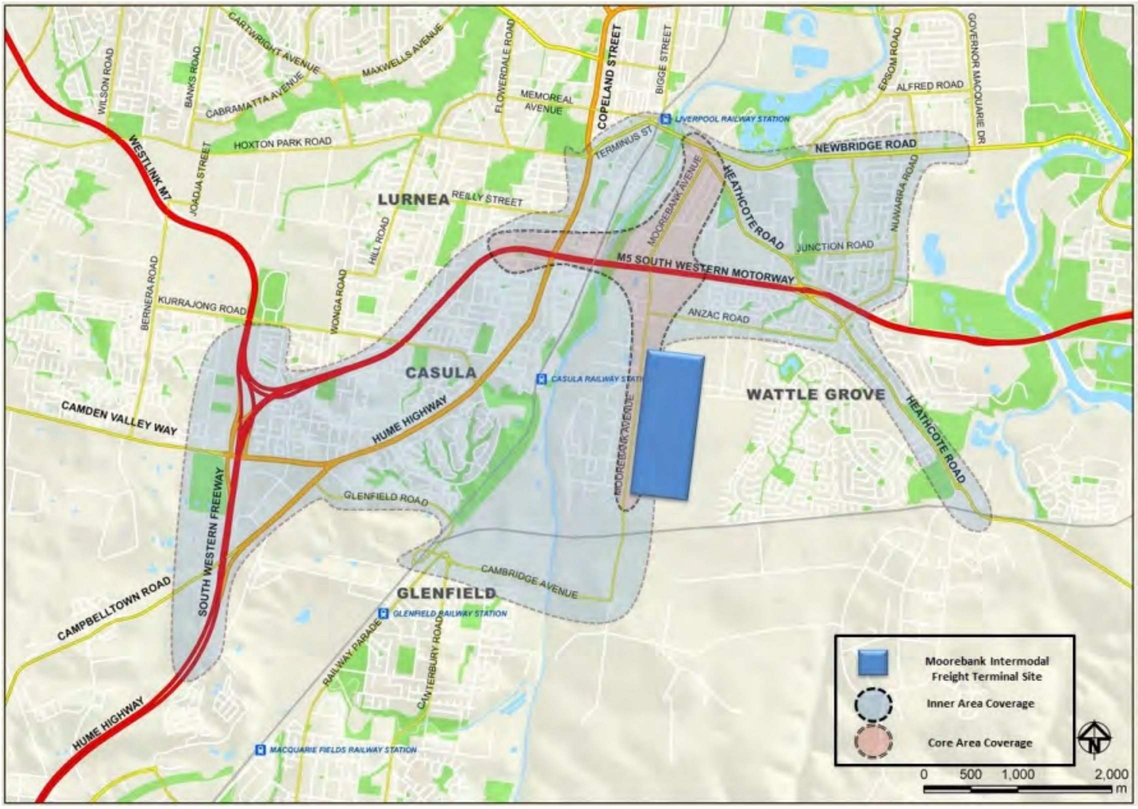


Figure 3-5 Core and Inner Area Road Network

A strategic transport modelling assessment was undertaken for the "wider" area impact assessment. The wider area that includes the strategic road network comprises Sydney Metropolitan area. Figure 4-1 in Section 4.1 shows network coverage of the wider area.

The following Sections 3.3.2 and 3.3.3 summarise the road network capacity and operational issues identified within the core study area. These issues have been determined through the development of a micro-simulation Paramics model of the core study area. The findings were also based on field observations and traffic survey data. Detailed Paramics model calibration and validation are documented in Section 4.2.

3.3.1 Core Area

Hyder has developed the concept of the "core area" which aims to report traffic impact in those parts of the network that are of critical significance to the project. Within the local vicinity of the SIMTA site it is important to assess intersection capacities and network connectivity in some detail. This will enable a robust assessment of the impact of traffic movements to and from the SIMTA site on the immediate road network. Hyder has undertaken a detailed micro-simulation modelling assessment of the "core area of impact". This forms the base-line for this level of assessment. The approximate core area is shown in Figure 3-6. The concept of the core area in micro-simulation modelling has also been supported by RMS in a recent Traffic Modelling Guideline published by RMS in February 2013.

Figure 3-6 "Core" Area of Impact and Modelled Roads and Intersections

3.3.2 Existing Level of Service (LoS)

Intersection Levels of Service (LoS) was assessed using the standard NSW Level of Service criteria for intersections (see Table 3-4 below).

Table 3-4 LoS Criteria for intersection capacity analysis

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

Source: RMS Guide to Traffic Generating Developments

Tables 3-5 and 3-6 show AM and PM peak LoS results from Paramics model for the following five key intersections where operational issues were identified. The intersections are:

- Moorebank Avenue / Anzac Road;
- M5 Motorway / Moorebank Avenue;
- M5 Motorway / Hume Highway;
- Moorebank Avenue / Heathcote Road;
- Newbridge Road / Moorebank Avenue;

In Paramics, LoS value can be adversely affected by the effects of queue spill-back through upstream intersections. The length of approach over which the delay is measured can be limited to the distance between signalised intersections. This condition was found in particular on the northern section of Moorebank Avenue near Heathcote Road and Newbridge Road. In both Tables 3-5 and 3-6, the LoS values are shown for all approaches to determine the operational issues for particular movements.

The analysis determined LoS between B and E for key intersections. The modelling result indicates that some movements at these five intersections are operating close to or at capacity level with low LoS between D and F. Regular overflow queues are observed on Moorebank Avenue (north of M5) and Newbridge Road. The following Section 3.3.3 assessed detailed network operational issues identified for these five key intersections.

Table 3-5 Level of Service Summary AM Peak

Model :2010 AM					
Intersection	**Approach**	**Average Delay**	**LoS (Delay)**	**Average Delay**	**LoS**
Moorebank Avenue-Anzac Road (Signal)	North	33	C	24	B
	East	26	B		
	South	22	B		
	North - Slip Lane	3	A		
M5 Motorway-Moorebank Avenue[1] (Signal)	North - Right Turn	28	B	24	B
	North - Through	26	B		
	East	21	B		
	South - Right Turn	29	C		
	South - Through	28	B		
	West	24	B		
	North - Slip Lane	17	B		
	East - Slip Lane	14	A		
	South - Slip Lane	11	A		
M5 Motorway-Hume Highway (Signal)	North	37	C	33	C
	East - Right Turn	69	E		
	South - Right Turn	61	E		
	South - Through	14	A		
	East - Left Turn	30	C		
	North - Slip Lane	63	E		
Moorebank Avenue-Heathcote Road[2] (Signal)	North	17	B	67	E
	East	45	D		
	South - Right Turn	102	F		
	South - Through	86	F		
Moorebank Avenue-Newbridge Road[3] (Signal)	East - Through	87	F	34	C
	East - Left Turn	24	B		
	South - Right Turn	31	C		
	South - Left Turn	11	A		
	West - Right Turn	50	D		
	West - Through	26	B		

1. Halcrow traffic and transport report prepared for the proposed M5 West Widening Project indicates LoS B
2. Halcrow traffic and transport report prepared for the proposed M5 West Widening Project indicates LoS F
3. Halcrow traffic and transport report prepared for the proposed M5 West Widening Project indicates LoS D

Paramics Model Code: 2010 AM_TZ019_BC_RevL Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\0- Pre DGR Base Models\1- 2010 AM\2010 AM_TZ019_BC_RevL

Table 3-6 Level of Service Summary PM Peak

Model :2010 AM					
Intersection	**Approach**	**Average Delay**	**LoS (Delay)**	**Average Delay**	**LoS**
Moorebank Avenue-Anzac Road (Signal)	North	24	B	22	B
	East	32	C		
	South	16	B		
	North - Slip Lane	2	A		
M5 Motorway-Moorebank Avenue¹ (Signal)	North - Right Turn	27	B	26	B
	North - Through	30	C		
	East	28	B		
	South - Right Turn	35	C		
	South - Through	33	C		
	West	30	C		
	North - Slip Lane	16	B		
	East - Slip Lane	14	A		
	South - Slip Lane	14	A		
M5 Motorway-Hume Highway (Signal)	North	23	B	40	C
	East - Right Turn	132	F		
	South - Right Turn	58	E		
	South - Through	7	A		
	East - Left Turn	57	E		
	North - Slip Lane	66	E		
Moorebank Avenue-Heathcote Road² (Signal)	North	12	A	50	D
	East	62	E		
	South - Right Turn	83	F		
	South - Through	117	F		
Moorebank Avenue-Newbridge Road³ (Signal)	East - Through	39	C	39	C
	East - Left Turn	36	C		
	South - Right Turn	89	F		
	South - Left Turn	15	B		
	West - Right Turn	65	E		
	West - Through	6	A		

1. Halcrow traffic and transport report prepared for the proposed M5 West Widening Project indicates LoS B
2. Halcrow traffic and transport report prepared for the proposed M5 West Widening Project indicates LoS F
3. Halcrow traffic and transport report prepared for the proposed M5 West Widening Project indicates LoS D

Paramics Model Code: 2010 PM_TZ019_BC_RevL Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\0- Pre DGR Base Models\2- 2010 PM\2010 PM_TZ019_BC_RevL

3.3.3 Existing Network Operational Issues

Further network operational analysis indicated ten intersection-related issues within the “core” area. While some of these issues do not necessarily reflect an overcapacity situation for the entire intersection, any further increase on demand from both future background and SIMTA traffic at these intersections should be investigated thoroughly. The identified intersection operational issues are summarised in Figure 3-7.

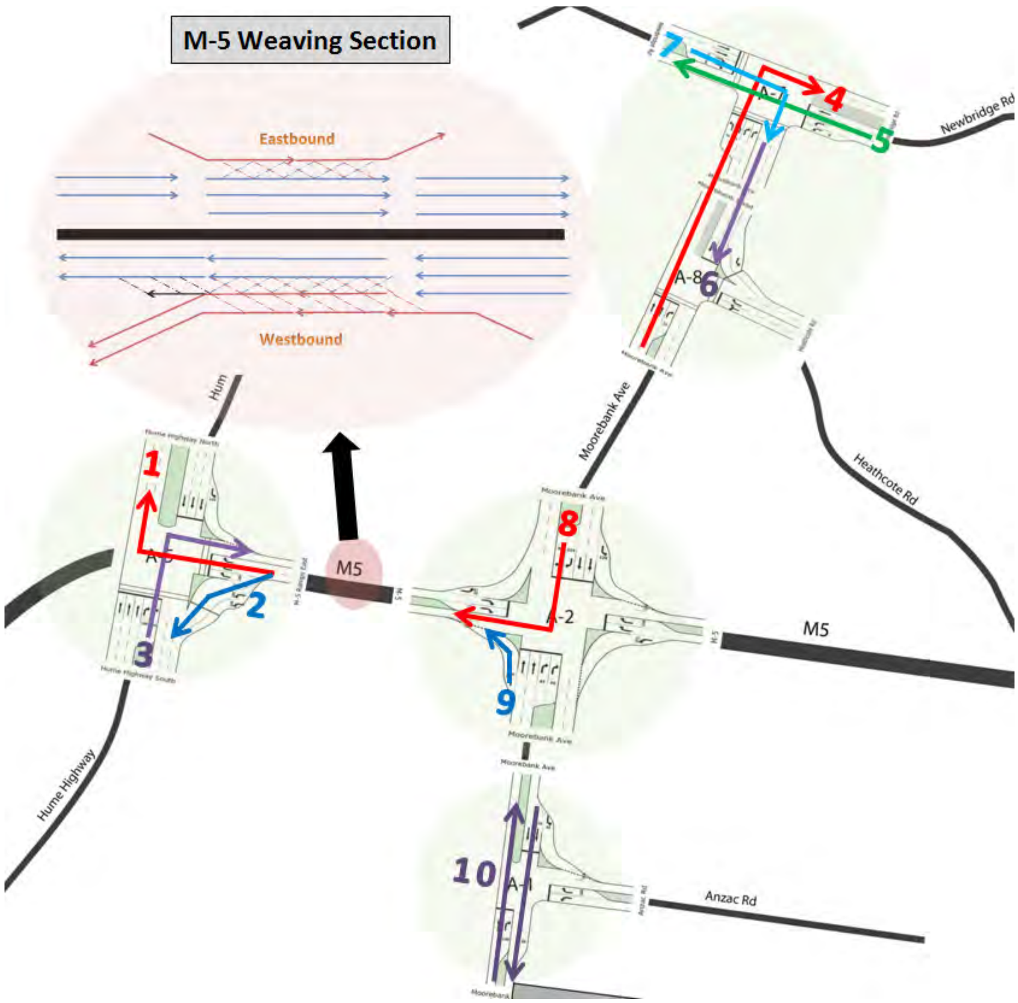
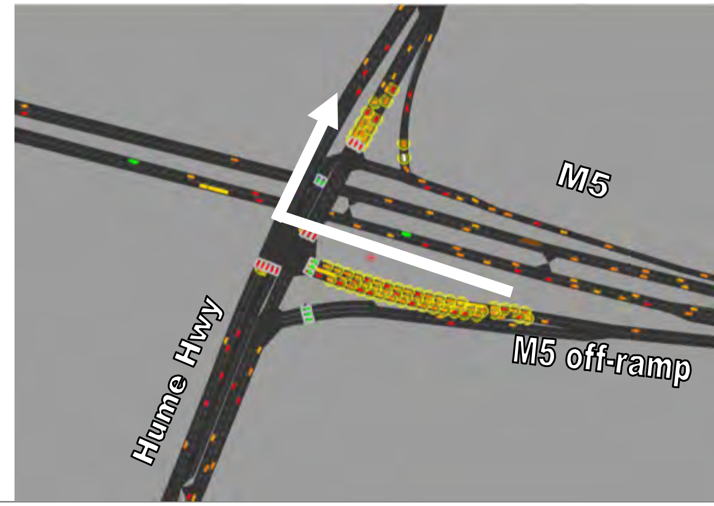
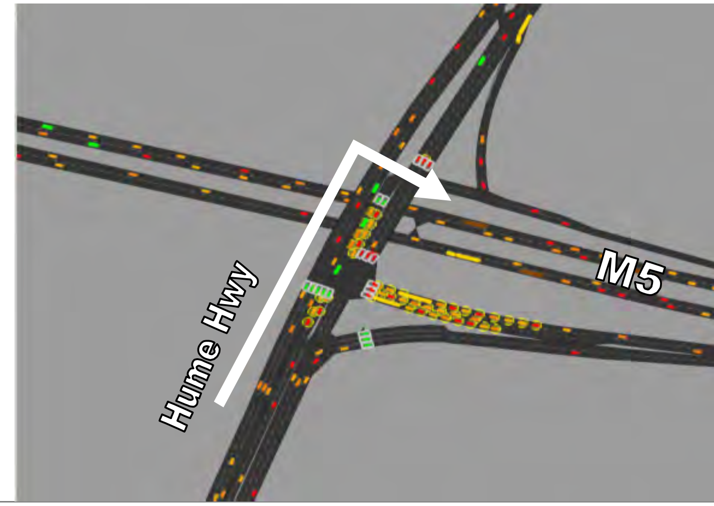
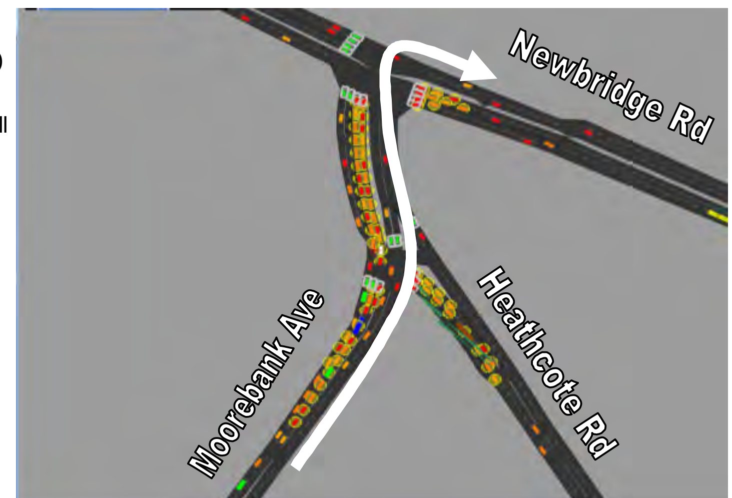


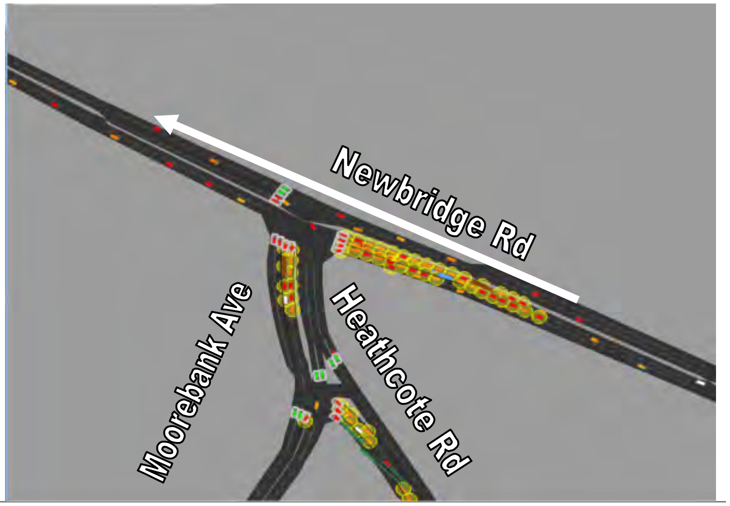
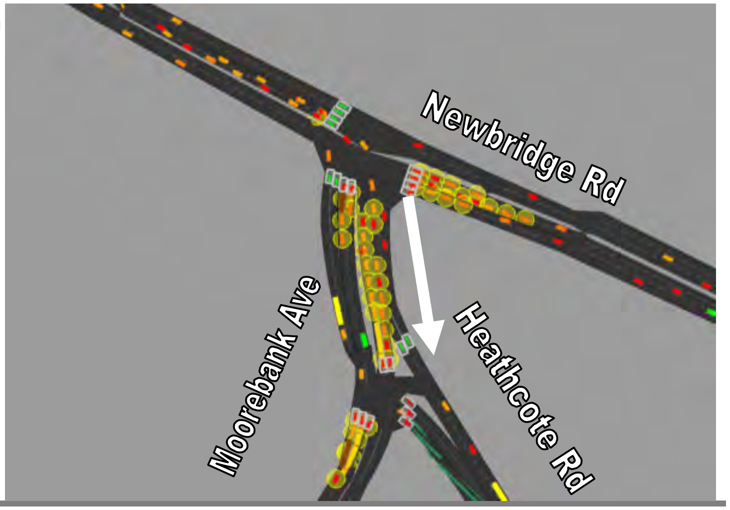
Figure 3-7 Existing Network Operational Issues Identified in Core Area

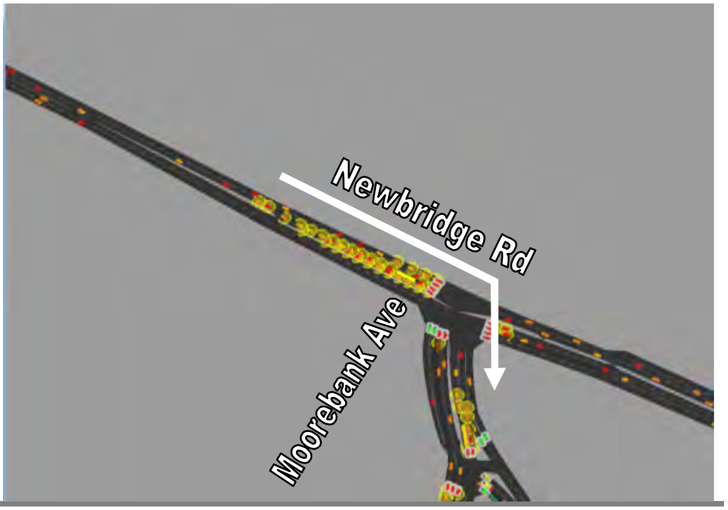
Screenshots from the Paramics models are shown in Table 3-7 to illustrate the location and nature of each of the “core” area issues. Vehicles highlighted in yellow are vehicles experiencing queue / delay condition at the mentioned intersection(s). The turning volumes for AM and PM peak hour are shown as stick diagram and included in **Appendix B**.

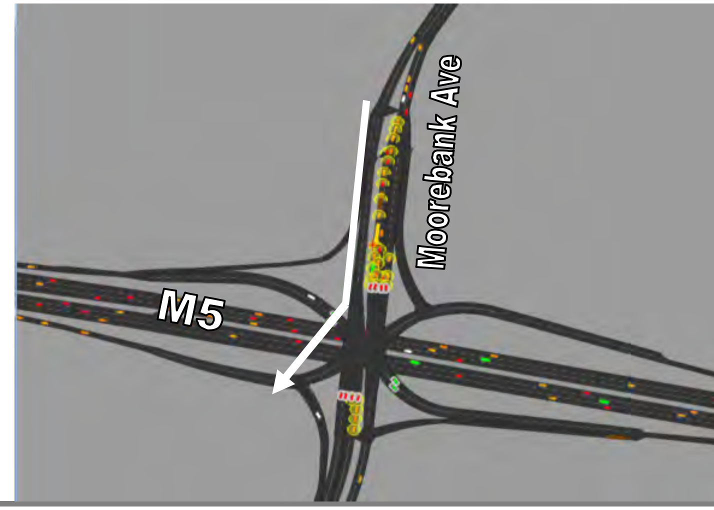
Table 3-7 Core Area Road Network Operational Issues, 2011

Intersection	Network operational issue	Paramics snapshot
M5 Motorway/Hume Highway Interchange	In general, north-south through movement demand on Hume Highway (4,800 veh/hr, two way, AM and PM Peak) is the highest. A major portion of green time is allocated for the major north-south movement. Model predicts higher delays to the following movements: 1) Right turn from westbound M5 off-ramp experiencing higher delays during both AM and PM Peak (LoS=E/F), however no queue spills back from the off-ramp onto the M5 Motorway.	
	2) Left turn from westbound M5 off-ramp experience slightly higher delays during PM Peak (LoS=E), however no queue spills back from the off-ramp onto the M-5 Motorway.	

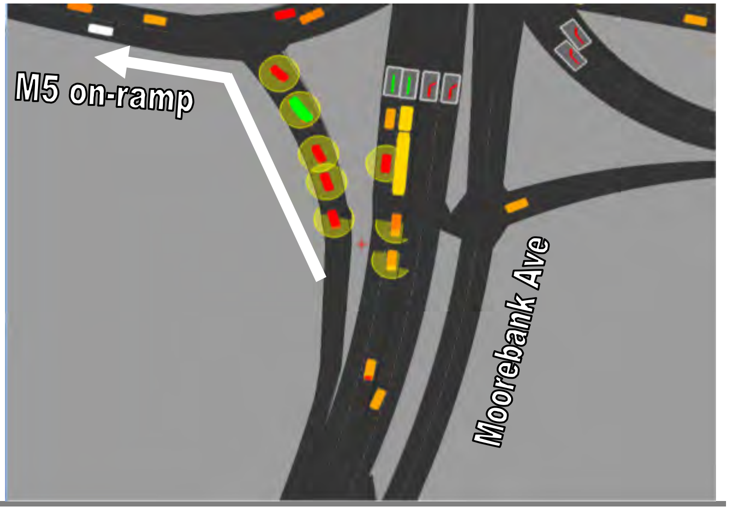
Intersection	Network operational issue	Paramics snapshot
M5 Motorway/Hume Highway Interchange	3) Right turn from Hume Highway south to M-5 eastbound on-ramp experiencing higher delays during AM and PM Peak (LoS=E), however queue lengths exceeding the right turn bay was not observed.	
Moorebank Avenue intersections with Heathcote Road and Newbridge Road	4) High turning traffic is observed at Newbridge Road/Moorebank Avenue (1,200 veh/hr turning right and 1,100 veh/hr turning left during AM peak) intersection. Model indicates extensive delays to right turn movements from Moorebank Avenue to Newbridge Road. Model shows queuing spill back and affecting the operation of adjacent Moorebank Avenue/Heathcote Road intersection (high delays to upstream northbound through movement with LoS F).	

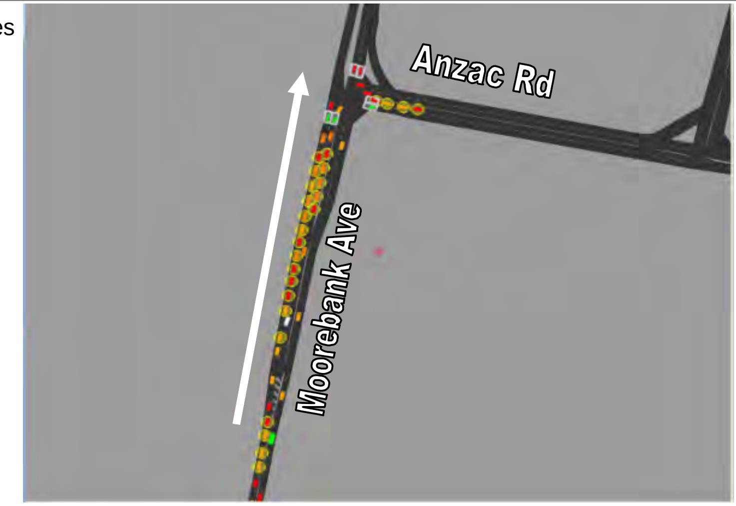
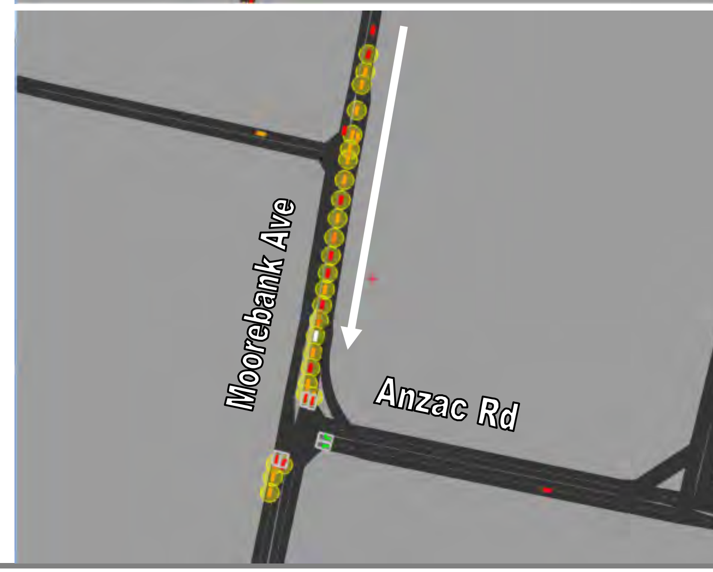
Intersection	Network operational issue	Paramics snapshot
Moorebank Avenue intersections with Heathcote Road and Newbridge Road	5) Westbound through movement on Newbridge Road shows higher delays during AM and PM peak periods (LoS=C/F).	
	6) Southbound queues on Moorebank Avenue/Heathcote Road intersection affect the upstream operation of Moorebank Avenue/Newbridge Road intersection.	

Intersection	Network operational issue	Paramics snapshot
Moorebank Avenue intersections with Heathcote Road and Newbridge Road	7) Right turn movement from Newbridge Road west to Moorebank Avenue experiences higher delays particularly during PM peak period (LoS=E). The queue occasionally spills back from the right turn bay onto the main stream affecting the eastbound through movement.	

Intersection	Network operational issue	Paramics snapshot
M5 Motorway/Moorebank Avenue Interchange	8) High right turn volumes from Moorebank Avenue north onto M5 westbound on-ramp (1,200 veh/hr in PM peak) affect surface intersection performance. Model shows long queues during PM peak period. The queue occasionally spills back from right turn bay onto the main stream affecting the southbound through traffic movement on Moorebank Ave. Following Halcrow's audit report, this issue was further investigated. Reported links for LoS are amended[4].	

[4] In June/July 2011 Halcrow conducted a Paramics model audit for the core area. Based on Halcrow's audit report, Hyder revised core area Paramics network. The revised modelling results show minor change in LoS result.

Intersection	Network operational issue	Paramics snapshot
M5 Motorway/Moorebank Avenue Interchange	9) Left turn movement (Give-way slip lane) from Moorebank Avenue south onto the M5 westbound on-ramp shows occasional queues. The queue was caused by high volume right turn demand from Moorebank Avenue north onto the M5 westbound on-ramp. This issue alone is not critical for existing conditions. In the future, this movement is expected to have an impact from the SIMTA traffic.	

Intersection	Network operational issue	Paramics snapshot
Moorebank Avenue/Anzac Road	10) Through movement along Moorebank Avenue shows occasional queues in northbound and southbound direction during AM peak and PM peak periods respectively. However, these queues are clearing during each cycle time and the model does not indicate any residual queues.	 

Paramics Model Code: 2010 AM_TZ019_BC_RevL, 2010 PM_TZ019_BC_RevL

3.3.4 Modelling Results on Moorebank Avenue between Helles Avenue and High Lane (Existing)

To address road infrastructure issues raised by TfNSW and RMS in their responses, Hyder has undertaken additional modelling for three key intersections on Moorebank Avenue between Helles Avenue and High Lane. The intersections are:

- Moorebank Avenue / Helles Avenue, priority controlled T-junction. Currently, Helles Avenue provides local access to Industry Park west of Moorebank Avenue;
- Moorebank Avenue / Church Road, priority controlled T-junction. Church Road provides connection between Moorebank Avenue and Heathcote Road through mixed residential and industrial areas east of Moorebank Avenue; and
- Moorebank Avenue / Industrial Access signal controlled T-junction. This intersection provides access to Industry Park west of Moorebank Avenue.

Currently, there are two through lanes in each direction on Moorebank Avenue between Helles Avenue and High Lane. The 2010 traffic data showed that Moorebank Avenue, at this section, carried between 2,000 and 2,400 vehicles per hour (two-way) in AM Peak and PM peak periods. The northbound traffic showed the highest peak in the morning, in the order of 1,300 to 1,800 vehicles per hour. This pattern is mirrored in the afternoon peak, with similar volume heading southbound towards M5 Motorway. For priority controlled intersections level of service results are reported based on the worst movement performance.

Table 3-8 and Table 3-9 show AM and PM peak LoS results sourced from Paramics model for existing 2010 traffic condition. The modelling results predicted LoS between A and C in AM peak. Similar to AM peak, model showed LoS between A and C in PM peak for Moorebank Avenue/Church Road and Moorebank Avenue/Industrial Access intersections. The right turn volumes out of Hells Avenue (60 veh/hr) into Moorebank Road in the southbound direction incurred longer delays that resulted LoS E in the PM peak.

Currently right turn volumes (1,200 veh/h in PM) out of Moorebank Avenue into M5 Motorway in the westbound direction occasionally exceeds provided right turns bay thus adversely impact the southbound through traffic on Moorebank Avenue. This has potential to impact traffic volumes out of nearby Helles Avenue particularly in the PM peak.

Table 3-8 LoS on Moorebank Avenue between Helles Avenue and High Lane – 2010 AM

Model :2010 AM					
Intersection	**Approach**	**Average Delay**	**LoS (Delay)**	**Average Delay**	**LoS**
Moorebank Avenue-Helles Avenue (Priority)	North	4	A	29	C
	South	2	A		
	West	29	C		
Moorebank Avenue-Church Road (Priority)	North	1	A	8	A
	East	8	A		
	South	3	A		
Moorebank Avenue-Industrial access (Signal)	North	9	A	14	A
	South	14	A		
	West	38	C		

Paramics Model Code: 2010 AM_TZ019_BC_RevL Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\0- Pre DGR Base Models\1- 2010 AM\2010 AM_TZ019_BC_RevL

Table 3-9 LoS on Moorebank Avenue between Helles Avenue and High Lane – 2010 PM

Model :2010 PM					
Interection	**Approach**	**Average Delay**	**LoS (Delay)**	**Average Delay**	**LoS**
Moorebank Avenue-Helles Avenue (Priority)	North	10	A	68	E
	South	1	A		
	West	68	E		
Moorebank Avenue-Church Road (Priority)	North	3	A	35	C
	East	35	C		
	South	4	A		
Moorebank Avenue-Industrial access (Signal)	North	7	A	10	A
	South	10	A		
	West	27	B		

Paramics Model Code: 2010 PM_TZ019_BC_RevL Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\0- Pre DGR Base Models\2- 2010 PM\2010 PM_TZ019_BC_RevL

3.3.5 Weaving Analysis for M5 Eastbound Traffic

The core study area includes the M5 motorway between Moorebank Avenue and Hume Highway. These grade separated intersections are only separated by about 1km, resulting in a very limited weaving (traffic moving between lanes to access Motorway exits) section for M5 traffic joining and leaving the M5. Previous Figure 3-8 shows the lane configuration through the section.

In order to quantify the volume of weaving movements in the eastbound direction, an origin-destination survey was undertaken on the M5 between Moorebank Avenue and the Hume Highway. The survey was used in the development of the micro-simulation model, which was interrogated to understand weaving behaviour through this section. Figure 3-8 shows a Paramics model screenshot of the M5 motorway eastbound weaving section during AM peak period. Vehicles highlighted in purple are attempting to make a lane change, but are being obstructed by other vehicles in an adjacent lane.

To quantify the performance of the M5 between Moorebank Avenue and the Hume Highway, weaving section speed (km/h), density (passenger car/km/lane) and weaving flow ratio (VR, or volume ratio) were determined from the Paramics models.

A weaving analysis using the US Highway Capacity Manual (HCM2000) method was undertaken to independently verify the findings from the Paramics model. The HCM2000 approach defines level of service (LoS) based on passenger car density, but also predicts weaving segment travel speed. The speed from the HCM analysis was compared to the Paramics model results. Overall the Paramics model showed weaving speeds that were reasonably consistent with the HCM2000 predictions.

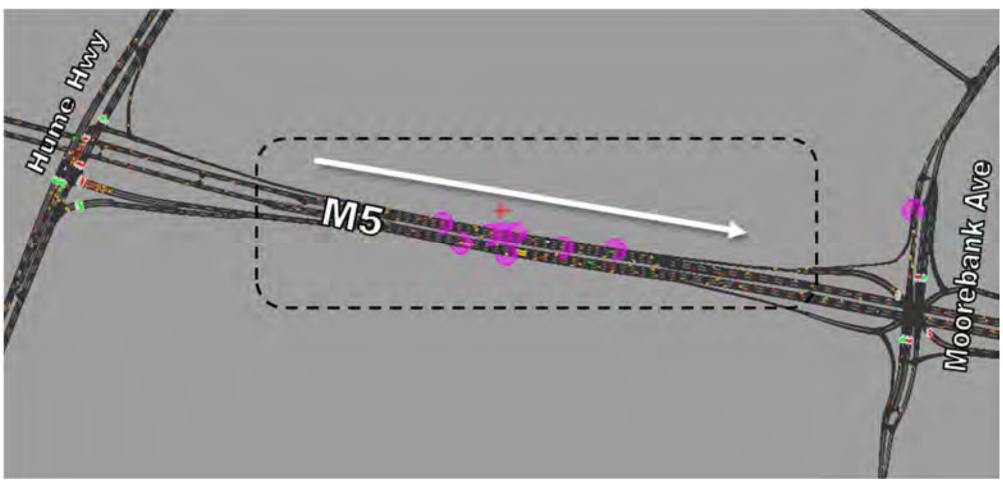


Figure 3-8 Paramics Screenshot: M5 Eastbound Weaving Section

The weaving analysis based on the HCM2000 method and Paramics model outputs indicated low LoS E and a travel speed of approximately between 50 and 60km/h for eastbound traffic, compared with a sign-posted speed limit of 100km/h. In the PM peak, the model predicts a LoS C with travel speeds between 70 and 75km/h.

Based on the modelling analysis, there appears to be an existing weaving problem on the M5 for the eastbound traffic during AM Peak.

3.3.6 Weaving Analysis for M5 Westbound Traffic

To address road infrastructure issues raised by TfNSW and RMS in their responses to the Concept Plan application, Hyder has undertaken additional modelling on M5 Motorway between Moorebank Avenue and Hume Highway in the westbound direction. RMS has requested to undertake weaving analysis for westbound traffic on the M5 Motorway, Hyder analysis has found that westbound traffic on this section is influenced by a combination of merging and weaving manoeuvres. In PM peak, a merging problem was identified on M5 westbound due to high volumes of M5 westbound and westbound on-ramp traffic. Currently the westbound on-ramp from Moorebank Avenue carries high traffic volume (1,500 veh/hr) merging onto M5 westbound traffic (4,000 veh/hr on mainline). The model shows that the merging traffic occasionally slows down traffic on both M5 motorway and westbound on-ramp in the PM peak. Merging problem was not observed on M5 eastbound direction.

Figure 3-9 shows a Paramics model screenshot of the M5 Motorway merging section in PM peak period.

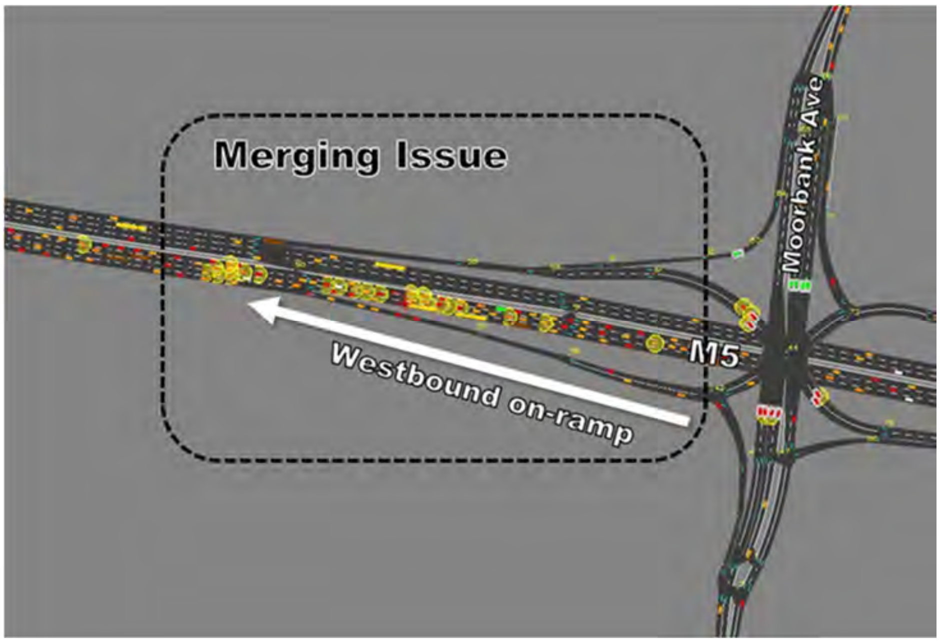


Figure 3-9 Paramics Screenshot: M5 Merging Section

A similar weaving issue was also observed on the M5 Motorway in the westbound direction in the heavy PM peak. Figure 3-10 shows a Paramics model screenshot of the M5 motorway westbound weaving section during PM peak period. The model has predicted a low LoS E with travel speeds between 50 and 60km/h, compared to a sign-posted speed limit of 100km/h. In the AM peak, model predicts a LoS C in the westbound direction with travel speed between 60 and 70km/h.

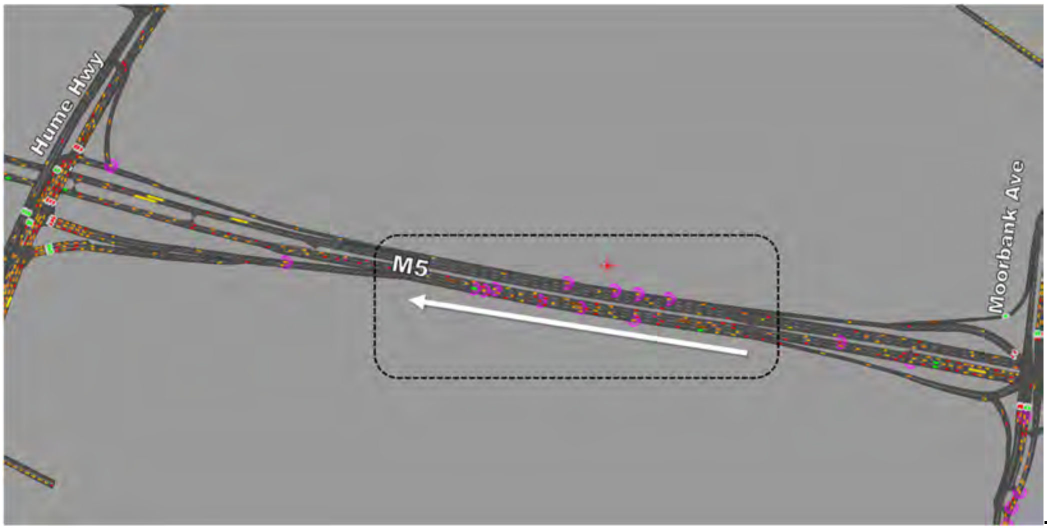


Figure 3-10 Paramics Screenshot: M5 Westbound Merging Section

3.4 Existing Network Capacity Outside the Core Area

Similar to the traffic assessment undertaken for the core area reported in previous sections, modelling was undertaken for key intersections outside the core area. The existing network performance on RMS's State Road was undertaken at eight key locations outside core area. Level of service for AM and PM peak hours was estimated for eight key intersections outside the core area. The intersections are:

- Hume Highway / Camden Valley Way;
- Hume Highway / Kurrajong Road;
- Hume Highway / De Meyrick Avenue;
- Hume Highway / Hoxton Park Road / Macquarie Street;
- Newbridge Road / Speed Street;
- Newbridge Road / Nuwarra Road;
- Heathcote Road / Nuwarra Road; and
- M5 Motorway / Heathcote Road.

Hyder's inner area Paramics model was used as a basis to determine level of service for eight key intersections outside the core. Details of Hyder's "inner" area Paramics model can be found in **Appendix B**.

Table 3-10 summarises LoS results in AM and PM peak hours for eight intersections assessed on RMS's State Road. Detailed network capacity issues identified for these eight intersections are included in **Appendix B**.

The analysis determined LoS between B and F for key intersections assessed outside the core area. The LoS results suggest that currently there are network capacity issues on the regional road network outside the core area.

In particular, the model forecasts poor LoS E or F either in the AM or PM peak hours at following three intersections:

- Hume Highway / Hoxton Park Road / Macquarie Street;
- Newbridge Road / Nuwarra Road; and
- M5 Motorway / Heathcote Road.

Currently the traffic signals at Hume Highway / Hoxton Park Road / Macquarie Street intersections all operate over the capacity level, resulting in a poor LoS E and F in both peak periods. Extensive queues are observed on Macquarie Street back to upstream intersections on Terminus Street. Significant queues and extensive delays are also observed on Hume Highway and Hoxton Park Road approaches in both peak periods.

Newbridge Road / Nuwarra Road traffic signals operate above capacity level resulting in a poor LoS E in PM peak. Significant queues and extensive delays are observed on Newbridge Road in westbound direction.

Two surface road traffic signals on Heathcote Road with M5 Motorway interchange operate over the capacity level. LoS is predicted E during PM peak due to high southbound traffic on the Heathcote Road. Long queues are observed on Heathcote Road southbound.

Traffic models indicate a queue on right turn traffic from M5 eastbound off-ramp onto Heathcote road in both peak periods. However, these queues clear at every cycle time.

Table 3-10 Current road network capacity – Outside Core Area

Intersection Level of Service (LoS) – Outside Core Area				
Intersection	AM Peak		PM Peak	
	Overall Average Delay	LoS	Overall Average Delay	LoS
Hume Highway / Camden Valley Way	47	D	31	C
Hume Highway / Kurrajong Road	45	D	50	D
Hume Highway / De Meyrick Avenue	21	B	20	B
Hume Highway / Hoxton Park Road / Macquarie Street	95	F	69	E
Terminus Street / Speed Street	17	B	29	C
Newbridge Road / Nuwarra Road	41	C	70	E
Heathcote Road / Nuwarra Road	39	C	39	C
M5 Motorway / Heathcote Road	37	C	59	E

Paramics Model Code: 2010 PM_TZ67_PDBC_RevC, Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\3- Spreadsheets\1 LoS\Report\2010

4 ROAD TRAFFIC FORECASTING MODEL

A strategic road traffic model was developed for the specific purpose of investigating traffic impact from the SIMTA proposal. The demand is based on the Sydney-wide Strategic Travel Model (STM) developed by the Bureau of Transport Statistics (BTS).

A Paramics model was developed to assess the network capacity with and without the SIMTA proposal.

Appendix C includes detailed calibration and validation outcomes from strategic model.

4.1 Overview of Strategic Traffic Modelling Approach

Hyder has produced the overall strategic traffic forecasting model for the SIMTA proposal with inputs from STM model. Consistent with the STM travel zones, 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 Department of Planning (now call Department of Planning and Infrastructure) 2008 Release Population Projections and the 2010 Metropolitan Plan.

Hyder's Sydney Strategic Traffic Modelling (SSTM) process comprises the following key elements:

- A representation of the physical road network/system. The basic network in Hyder's model was sourced from the RMS's Strategic Model (Emme2).
- A representation of the trips that take place on that system. Trip tables (also known as demand matrices) are used to quantify the demand for travel across the entire model area between each small geographic area (travel zone or TZ). Vehicle demand for existing and future years was obtained from BTS's STM model. Future year travel demand matrices represent the government's forecast of future land use development in Sydney.
- A software package that can assign the demand to the network in a way which accurately reflects the constraints of the network, economic and behavioural decisions made by motorists. The demand model is a multi-class highway assignment model. The model has been developed by Hyder using TransCAD modelling software.

For validation/calibration purposes, the model was constructed for a "current" year for which widespread traffic count data on Sydney's network was available (2008/2010). This was the year used for Hyder's model calibration/validation purpose:

The 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 an average weekday traffic.

- AM 7:00 am to 9:00 am; and
- PM 3:00 pm to 6:00 pm.

The calibration/validation results are included in **Appendix C**. The results demonstrate that Hyder's SSTM model has been calibrated and validated appropriately in accordance with accepted industry practice. A robust calibration and validation has been achieved for both AM and PM peak period strategic models, providing confidence that network traffic models are appropriate for assessing the SIMTA development and associated road improvement options and strategies for the site.

Figure 4-1 shows the base case road network in the context of SIMTA development and surrounding M5 corridor.

Figure 4-1 Existing Base Case Road Network

4.2 Paramics Modelling

A core area Paramics model has been developed to facilitate a more in-depth analysis of the major operational impacts of the SIMTA proposal. Paramics models were calibrated and validated according to the RMS's Paramics modelling guidelines. The models represented 2010 traffic conditions for both AM peak and PM peak periods:

- AM peak period between 7:00 and 9:00, and
- PM peak period between 16:00 and 18:00

Hyder developed an analytical model based on HCM2000 methods to assess the performance of the M5 weaving section in AM and PM peak periods. The results of the HCM2000 modelling were compared with micro-simulation outputs to serve as an independent check of the model's ability to replicate weaving behaviour. Detailed model calibration and validations for core area Paramics are documented in **Appendix B**.

The core area Paramics modelling results documented in **Appendix B** confirmed that both AM and PM peak were calibrated and validated adequately and the model is fit for this study purpose.

In July 2011, Halcrow undertook a Paramics model audit for core area. Halcrow concludes that the audited base models provide a reasonable representation of the existing road network conditions. Some minor network issues were identified by the Halcrow. These have been incorporated in Hyder's core Paramics model. Based on the Halcrow audit, Hyder has updated the core area model incorporating the following changes:

- The coding for the eastbound off-ramp at the M5/Moorebank intersection was amended to incorporate traffic signals for the left turn slip lane. This left turn slip lane signal is controlled by a pedestrian push button. Vehicles do not need to stop until the pedestrian push button is active. The survey shows "no vehicle queue" for this movement. Changing the existing give way control to signals has virtually no effect in intersection delays reported.
- Update sum of vehicle proportion to 100 per cent. Unlikely to have impact to intersection performance.
- Update node height for 118. Unlikely to have impact to intersection performance.

The core area model and associated results were updated in line with the above changes.

5 FUTURE TRAFFIC PROJECTIONS

This chapter presents future traffic volumes in the study area network for year 2031 without the proposed SIMTA development. The findings of the strategic analysis of future traffic flows at key roads and intersections are based on the output from the Hyder's strategic traffic model.

5.1 Land use forecasts

Forecasts of resident population and employment levels were obtained from the BTS for each time step years – 2016, 2026 and 2031. Table 5-1 shows NSW Government's population and employment forecast in the region sourced from BTS. The forecast growth data are presented at statistical subdivision (SSD). Near the SIMTA development, the growth data are shown in a smaller geographic level, local government area (LGA) for Liverpool, South-Western Sydney. These forecasts are used as inputs into BTS's travel model and have formed the basis for estimating the future traffic growth at key roads and intersections in the Moorebank study area.

Figures 5-1 to 5-2 show population and employment growth between 2006 and 2031 at travel zones in a wider network in the context of the SIMTA Site. The following points are noted from population and employment growth data shown in Table 5-1, Figures 5-1 and 5-2:

- Over the next 25 years Sydney's population is predicted to grow by a further 33% to about 6.72 million people by 2031. During the same period, the employment is predicted to grow about 29%.
- Total travel is likely to increase significantly to accommodate higher populations and employment growth of the region. A significant population growth is forecast to the west of M5 corridor, in South-West Sydney. By 2031, population is forecast to grow in the order of 108%. Camden, Liverpool, Campbelltown are forecast as major high growth areas. This growth would increase background traffic growth higher than historical growth depending on locations.
- Over the next 25 years (between 2006 and 2031), population in Liverpool LGA is forecast to grow further to about 66%. In the same time period, employment in the Liverpool LGA is projected to grow to about 62%. This growth did not include anticipated employment from SIMTA Site.

Table 5-1 Population and Employment Forecasts between 2006 and 2036

Statistic Sub-Division (SSD)	Population (Occupied Dwellings)									Employment (Jobs)								
	2006	2016		2026		2031		2036		2006	2016		2026		2031		2036	
	No.	No.	%growth	No.	%growth	No.	%growth	No.	%growth	No.	No.	%growth	No.	%growth	No.	%growth	No.	%growth
Blacktown	277,972	327,304	18%	404,881	46%	441,223	59%	475,240	71%	94,643	115,157	22%	143,664	52%	156,421	65%	167,207	77%
Canterbury-Bankstown	309,601	332,737	7%	352,359	14%	364,001	18%	376,687	22%	100,271	108,309	8%	116,490	16%	118,836	19%	122,383	22%
Central Northern Sydney	421,373	477,975	13%	533,414	27%	553,437	31%	570,393	35%	146,493	161,031	10%	181,814	24%	188,753	29%	197,039	35%
Central Western Sydney	308,566	375,931	22%	402,918	31%	416,567	35%	431,415	40%	195,038	208,805	7%	230,077	18%	237,212	22%	247,097	27%
Eastern Suburbs	237,350	253,739	7%	262,511	11%	267,358	13%	272,925	15%	85,087	88,934	5%	96,881	14%	99,395	17%	103,435	22%
Fairfield-Liverpool	**354,750**	**394,362**	**11%**	**461,578**	**30%**	**495,536**	**40%**	**544,427**	**53%**	**85,087**	**88,934**	**5%**	**96,881**	**14%**	**99,395**	**17%**	**103,435**	**22%**
Fairfield LGA	*185,811*	*194,663*	*5%*	*205,459*	*11%*	*214,734*	*16%*	*224,658*	*21%*	*56,203*	*66,657*	*19%*	*77,902*	*39%*	*81,862*	*46%*	*87,038*	*55%*
Liverpool LGA	*168,939*	*199,699*	*18%*	*256,119*	*52%*	*280,802*	*66%*	*319,769*	*89%*	*59,156*	*72,498*	*23%*	*89,133*	*51%*	*95,825*	*62%*	*103,524*	*75%*
Gosford-Wyong	300,969	326,082	8%	370,008	23%	393,316	31%	417,899	39%	103,952	118,645	14%	137,118	32%	143,751	38%	151,418	46%
Illawarra SD Bal	102,546	117,416	15%	131,819	29%	138,408	35%	144,207	41%	31,599	35,647	13%	40,495	28%	42,372	34%	44,768	42%
Inner Sydney	320,152	371,102	16%	406,513	27%	423,866	32%	442,487	38%	529,245	591,596	12%	654,897	24%	677,077	28%	696,411	32%
Inner Western Sydney	172,049	203,977	19%	222,978	30%	232,263	35%	242,240	41%	77,610	84,220	9%	91,682	18%	93,951	21%	97,205	25%
Lower Northern Sydney	296,484	323,337	9%	345,755	17%	356,587	20%	368,434	24%	238,039	257,557	8%	276,099	16%	281,267	18%	289,384	22%
Newcastle	508,728	563,053	11%	615,230	21%	638,933	26%	660,280	30%	219,619	239,537	9%	268,815	22%	279,150	27%	289,632	32%
Northern Beaches	231,568	246,537	6%	259,129	12%	265,100	14%	271,797	17%	88,471	96,389	9%	105,647	19%	108,427	23%	111,959	27%
Nowra-Bomaderry	31,758	35,129	11%	38,326	21%	39,683	25%	40,806	28%	18,763	20,242	8%	22,480	20%	23,234	24%	24,168	29%
Outer South Western Sydney	**237,617**	**309,401**	**30%**	**427,305**	**80%**	**494,905**	**108%**	**544,449**	**129%**	**85,087**	**88,934**	**5%**	**96,881**	**14%**	**99,395**	**17%**	**103,435**	**22%**
Camden LGA	*50,526*	*95,518*	*89%*	*170,733*	*238%*	*217,587*	*331%*	*247,118*	*389%*	*17,318*	*24,252*	*40%*	*34,845*	*101%*	*40,899*	*136%*	*44,982*	*160%*
Campbelltown LGA	*146,034*	*165,824*	*14%*	*199,389*	*37%*	*215,581*	*48%*	*230,829*	*58%*	*45,926*	*54,342*	*18%*	*64,958*	*41%*	*69,567*	*51%*	*75,083*	*63%*
Wollondilly LGA	*41,057*	*48,060*	*17%*	*57,183*	*39%*	*61,736*	*50%*	*66,502*	*62%*	*10,920*	*11,973*	*10%*	*13,479*	*23%*	*14,076*	*29%*	*14,879*	*36%*
Outer Western Sydney	310,868	336,475	8%	371,310	19%	391,205	26%	407,888	31%	108,379	125,069	15%	145,784	35%	155,022	43%	164,964	52%
St George-Sutherland	**436,074**	**465,097**	**7%**	**480,183**	**10%**	**487,870**	**12%**	**496,796**	**14%**	**85,087**	**88,934**	**5%**	**96,881**	**14%**	**99,395**	**17%**	**103,435**	**22%**
Hurstville LGA	*75,815*	*82,421*	*9%*	*84,977*	*12%*	*86,087*	*14%*	*87,393*	*15%*	*23,723*	*25,250*	*6%*	*27,017*	*14%*	*27,478*	*16%*	*28,195*	*19%*
Kogarah LGA	*54,329*	*58,029*	*7%*	*60,003*	*10%*	*60,869*	*12%*	*61,872*	*14%*	*18,905*	*21,194*	*12%*	*23,769*	*26%*	*24,652*	*30%*	*25,735*	*36%*
Rockdale LGA	*94,866*	*104,270*	*10%*	*107,567*	*13%*	*109,414*	*15%*	*111,552*	*18%*	*26,772*	*34,107*	*27%*	*39,119*	*46%*	*41,134*	*54%*	*43,395*	*62%*
Sutherland Shire LGA	*211,064*	*220,378*	*4%*	*227,636*	*8%*	*231,499*	*10%*	*235,979*	*12%*	*66,076*	*71,235*	*8%*	*77,689*	*18%*	*79,619*	*20%*	*82,262*	*24%*
Wollongong	274,459	295,386	8%	315,447	15%	324,561	18%	332,676	21%	104,793	113,352	8%	125,147	19%	129,022	23%	133,837	28%
Grand Total	**5.13 M**	**5.76 M**	**12%**	**6.40 M**	**26%**	**6.72 M**	**33%**	**7.04 M**	**40%**	**2.47 M**	**2.75 M**	**11%**	**3.09 M**	**24%**	**3.21 M**	**29%**	**3.35 M**	**34%**

Source: BTS October 2009 release land use forecasts

F:\AA003695\D-Calculations\Traffic and Modelling\Calculations\Trip Table\[Trip Table Growth Summary_Adj2.xlsx]Traffic Growth by LGA&SSD

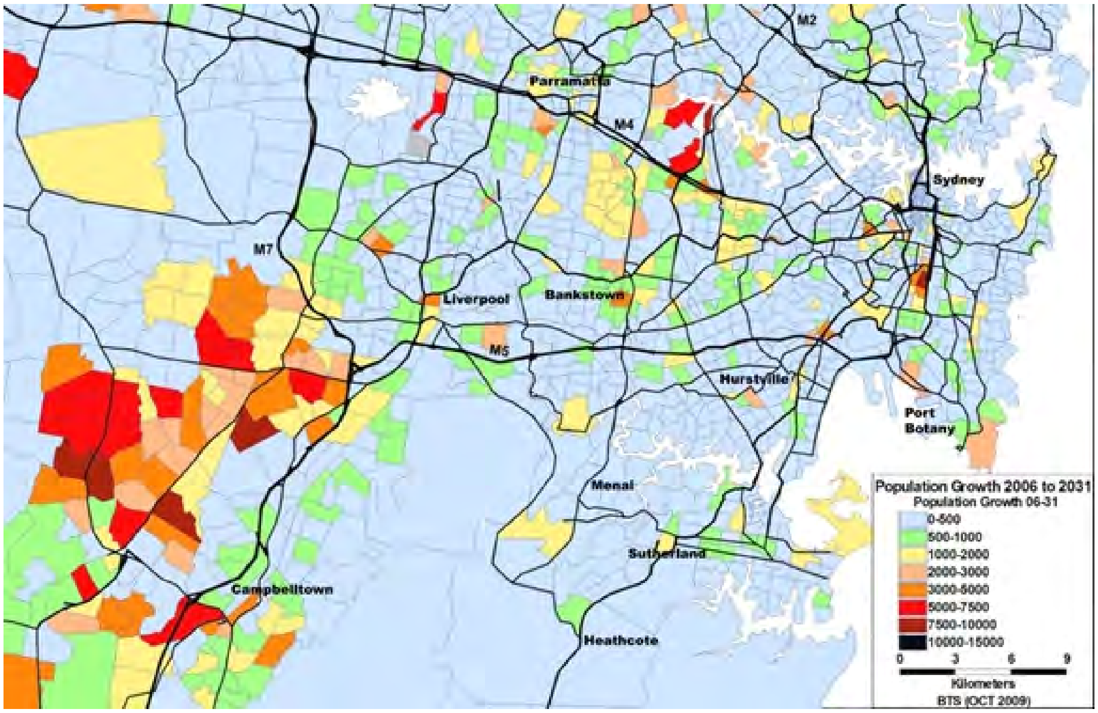


Figure 5-1 Projected Population Change between 2006 and 2031

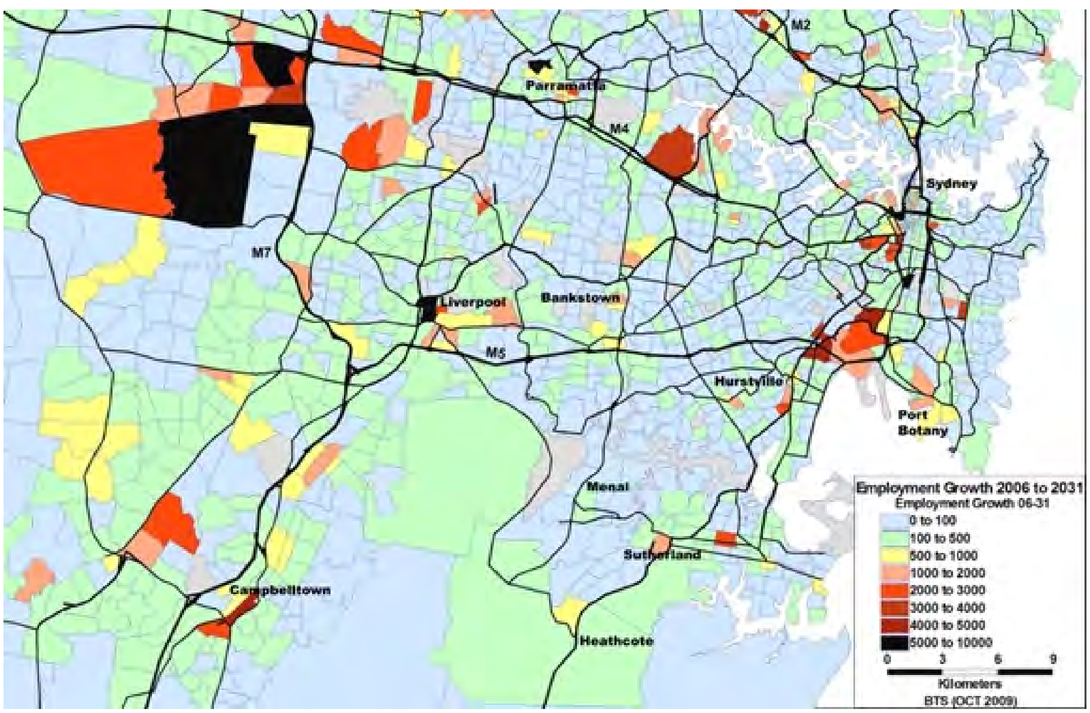


Figure 5-2 Projected Employment Change between 2006 and 2031

5.2 Growth in BTS Trip Table

Traffic increases forecast over the next 25-year period would clearly place significant demands on the existing network in the vicinity of SIMTA site and the M5 Corridor. An indication of this demand can be seen from an examination of the 2031 traffic demand from BTS land use growth on the base case network. The October 2009 release land use forecasts were provided by BTS in December 2010. This land use data was the basis of future year traffic demand forecast without proposed SIMTA development.

Table 5-2 shows traffic demand for Sydney Metropolitan Area from BTS trip tables for base year 2008 and future year 2031. By 2031 peak hour total vehicle growth is forecast to increase between 37% and 49% in line with Sydney's population growth (see previous Table 5-1). Between 2008 and 2031, car traffic is forecast to grow between 1.5% and 2% per annum. Truck growth is predicted almost double than car. The average truck growth is forecast up to 3% per annum. The vehicle growth data in Table 5-2 are in line with growth assumptions documented shown in M5 West Widening Project[5].

Table 5-2 Predicted Traffic Demand in BTS Trip Table, 2008-2031

Trip Matrix	AM			PM		
	Car	Truck	Total	Car	Truck	Total
2008	513,574	18,659	532,233	490,191	12,562	502,753
2031	699,965	31,602	731,567	726,006	21,020	747,027
%Growth (23yrs)	36%	69%	37%	48%	67%	49%
%Growth per Annum	1.6%	3.0%	1.6%	2.1%	2.9%	2.1%

Note: One hour trips for Sydney Metropolitan Area Hyder (SSTM). 2008 figures are interpolated from 2006 and 2011 figures. Truck growth is as per FMM forecast. Trip tables are unadjusted.

The 2031 future year BTS trip table has been adjusted by Hyder taking into account the calibration adjustment to the base year. Further adjustments to BTS trip table were made in the following areas:

- Sydney Airport. The growth was based on passenger throughput prediction contained in the Airport Master Plan[6].
- Port Botany. The truck traffic growth was based on predicted container annual throughput TEU's (twenty foot equivalent units) and rail mode share. Truck trip table was adjusted in line with SIMTA freight demand documented in June 2013 Strategic Needs for Intermodal Terminal (IMT) and Freight Demand Report prepared by Hyder.

Table 5-3 below shows predicted traffic demand used in Hyder's SSTM for 2008 and 2031.

[5] Tables B-9, B-10, M5 West Widening Project, Environmental Assessment, RTA/RMS, September 2010.

[6] Sydney Airport Master Plan, 2009, SACL, Sydney Airport, 2006 Airport Ground Travel Plan, Sydney Airport Master Plan, 2003/04, 2023/24, SACL.

Table 5-3 Predicted Traffic Demand in SSTM Trip Table, 2008-2031

Trip Matrix	AM			PM		
	Car	Truck	Total	Car	Truck	Total
2008	479,480	19,561	499,041	492,453	10,570	503,023
2031	630,026	31,894	661,920	704,141	19,190	723,331
%Growth (23yrs)	31%	63%	33%	43%	82%	44%
%Growth per Annum	1.4%	2.7%	1.4%	1.9%	3.5%	1.9%

Note: One hour trips for Sydney Metropolitan Area Hyder (SSTM). Trip tables are adjusted.

Between 2008 and 2031, car is predicted to grow between 1.4% and 1.9%. Truck growth is forecast to almost double the car. The growth projections used in SSTM models are in line with STM trip table.

Relevant to the SIMTA development, peak hour origin/destination traffic growth was further cross checked for nearby LGA's including Liverpool, Camden and Campbelltown. The future traffic demand for these LGA's was consistent with the population and employment growth shown in previous Table 5-1.

5.3 Future Base Case Network

The future road improvement projects used in the base case network were identified from the following key sources:

- Sydney Strategic Travel Model (STM), Bureau of Transport Statistics (BTS);
- M5 West Widening Project, Environmental Assessment, RTA/RMS, September 2010;
- M5 West Widening Project, Preferred Project Report, RTA/RMS, May 2011; and
- Infrastructure Statement 2010-2011, RTA/RMS.

Appendix C includes the future road improvement projects and time frames used for modelling. The assumed timing of road improvement projects were agreed with RMS and TfNSW for modelling purpose[7].

5.4 Future Background Traffic Growth

The current road network in and around the SIMTA site provides a number of route choices. This implies that motorists (car and truck) will have a number of options on how they will access the SIMTA site. Key roads include the M5 Motorway, Moorebank Avenue, Cambridge Avenue, Newbridge Road and Hume Highway and carry a significant volume of regional and local traffic. By 2031, the population and employment growth predicted in Liverpool LGA and South-West Sub-region will impact traffic operations on these roads and associated intersections.

The proposed widening of M5 South-West Motorway will involve a further traffic redistribution impact on these roads. This means future traffic on the Moorebank Ave and M5 Motorway will be influenced not only by the traffic generated from the SIMTA development, but background

[7] In June/July 2011, the future network assumption was submitted to the RMS and TfNSW (Technical Note 5) Strategic Modelling – Future Base Case Network Assumptions. Noting that, previously these network assumptions were agreed with the RMS/TfNSW for another unrelated development proposal in West Menai.

growth and redistribution traffic effect from proposed M5 South-West Motorway will also impact future corridor flows.

The strategic modelling undertaken predicted peak hour growth in the core study area between 1.7% and 1.9% per annum until 2031. With proposed M5 West widening the growth on M5 Motorway is forecast to increase between 2.7% and 3% per annum. The Environmental Assessment Report for the proposed M5 West Widening Project indicated that with proposed widening, the growth on M5 Motorway is forecast to increase between 2.5% and 3.1% per annum in the peak directions[8]. The traffic growth predicted by the strategic model in the SIMTA project is in line with growth rates predicted in M5 West Widening project. The future unconstrained demand (trip table) estimated via the strategic model has formed the basis of demand used in Hyder's Paramics model. The future unconstrained demand has resulted in unreleased trip issues in Paramics. The existing congestion around Liverpool CBD areas, Newbridge Road, Heathcote Road (between Newbridge and M5), Hume Highway between M5 and Terminus St has resulted in future unrealised trips (without SIMTA) within the Paramics model area. The future base year trip tables in 2031 (without SIMTA) were adjusted in Paramics.

The following Section 5.5 shows the impact of background traffic growth on key intersection performance in the core area for year 2031.

[8] Tables 8-4 to 8-7, Growth figure represent between 2006 and 2026 for AM and PM peak hour. M5 West Widening, Environmental Assessment, September 2010, Roads and Traffic Authority

5.5 Impact on Core Area Network without SIMTA

Prior to assessing the impact of the SIMTA proposal, future base case network performance has been analysed. Future network capacity is estimated for five key intersections for 2031 for both the AM and PM peak hours. Intersection geometry and lane configurations for future core area network are based on the existing intersection layout. For the M5 Motorway, the proposed widening was coded in Paramics as per the Concept Plan shown in the Environmental Assessment Report for the proposed M5 West Widening Project.

Table 5-4 and 5-5 show the forecast intersection LoS results for 2031 without SIMTA proposal for the AM and PM peaks, respectively. Background growth by 2031 is expected to reduce the level of service (LoS) on those intersections currently being identified as problematic (see previous Sections 3.3.2, 3.3.3 and 3.3.4). The proposed M5 South-West Motorway widening is forecast to redistribute traffic on key alternative routes including the Hume Highway and Newbridge Road. Near Moorebank, the proposed M5 widening is expected to reduce peak hour traffic volumes on both Hume Highway and Newbridge Road. However, the projected population and employment growth by 2031 in South-West Subregion including Liverpool are expected to offset the positive effect from M5 widening on these alternative roads. The model forecasts low level of service for critical movements at the following key intersections including:

- M5 Motorway/Hume Highway;
- Moorebank Avenue/Heathcote Road;
- Moorebank Avenue/ Newbridge Road.

The results show that background growth in traffic to 2031 would result in the above three intersections operating at poor LoS F either in the AM or PM peak hours, regardless of any SIMTA development. The M5 Motorway/Moorebank Avenue interchange is forecast to be operating with LoS D in the PM peak. The southbound right turn movement out of Moorebank Avenue into M5 Motorway onto the westbound direction is forecast poor LoS F.

In the future, background traffic growth alone is expected to deteriorate the weaving and merging problem on the M5 Motorway/Moorebank Avenue interchange for eastbound and westbound traffic.

The southbound right turn movement out of Moorebank Avenue (into M5 in westbound direction) would continue to suffer regardless of SIMTA. This would have potential to adversely impact other nearby intersections with Moorebank Avenue at Helles Avenue and Church Road. The future network operational issues contributed by background traffic growth alone are summarised in Table 5-6.

Hyder's analysis found that in 2031 the following three intersections would require upgrading regardless of the SIMTA development.

- Moorebank Avenue/Heathcote Road;
- Moorebank Avenue/Newbridge Road;
- M5 Motorway/Hume Highway.

Table 5-4 Level of Service Summary AM Peak (2031 Future Base Case without SIMTA)

Model : 2031 Base AM					
Intersection	Approach	Average Delay	LoS (Delay)	Average Delay	LoS
Moorebank Avenue-Anzac Road (Signal)	North	35	C	49	D
	East	83	F		
	South	34	C		
	North - Slip Lane	4	A		
M5 Motorway-Moorebank Avenue (Signal)	North - Right Turn	28	B	30	C
	North - Through	26	B		
	East	22	B		
	South - Right Turn	32	C		
	South - Through	27	B		
	West	26	B		
	North - Slip Lane	13	A		
	East - Slip Lane	14	A		
	South - Slip Lane	41	C		
M5 Motorway-Hume Highway (Signal)	North	37	C	120	F
	East - Right Turn	225	F		
	South - Right Turn	167	F		
	South - Through	123	F		
	East - Left Turn	55	D		
	North - Slip Lane	39	C		
Moorebank Avenue-Heathcote Road (Signal)	North	16	B	103	F
	East	260	F		
	South - Right Turn	90	F		
	South - Through	28	B		
Moorebank Avenue-Newbridge Road (Signal)	East - Through	>300	F	144	F
	East - Left Turn	>300	F		
	South - Right Turn	30	C		
	South - Left Turn	16	B		
	West - Right Turn	116	F		
	West - Through	52	E		

Note: Minor adjustment in trip table was made in future year trip tables due to unreleased trips. The adjustments were made to both "with" and "without" SIMTA cases.

Paramics model code: 2031 AM_TZ67_PDBC_29052013_1

Link: F:\AA003760\T-Traffic Modelling\Amended Concept Application_April13\Paramics Model\Models Run_May 2013\Re-Run 2031 BC Models

Table 5-5 Level of Service Summary PM Peak (2031 Future Base Case without SIMTA)

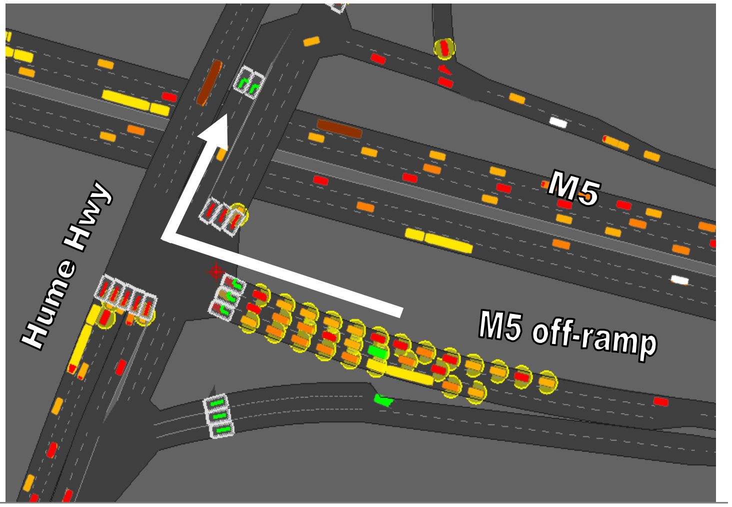
Model : 2031 Base PM					
Intersection	**Approach**	**Average Delay**	**LoS (Delay)**	**Average Delay**	**LoS**
Moorebank Avenue-Anzac Road (Signal)	North	31	C	37	C
	East	65	E		
	South	20	B		
	North - Slip Lane	2	A		
M5 Motorway-Moorebank Avenue (Signal)	North - Right Turn	45	D	44	D
	North - Through	26	B		
	East	29	C		
	South - Right Turn	37	C		
	South - Through	34	C		
	West	32	C		
	North - Slip Lane	15	B		
	East - Slip Lane	27	B		
	South - Slip Lane	131	F		
M5 Motorway-Hume Highway (Signal)	North	66	E	75	F
	East - Right Turn	106	F		
	South - Right Turn	122	F		
	South - Through	29	C		
	East - Left Turn	60	E		
	North - Slip Lane	98	F		
Moorebank Avenue-Heathcote Road (Signal)	North	15	B	205	F
	East	>300	F		
	South - Right Turn	124	F		
	South - Through	247	F		
Moorebank Avenue-Newbridge Road (Signal)	East - Through	149	F	124	F
	East - Left Turn	115	F		
	South - Right Turn	73	F		
	South - Left Turn	99	F		
	West - Right Turn	190	F		
	West - Through	65	E		

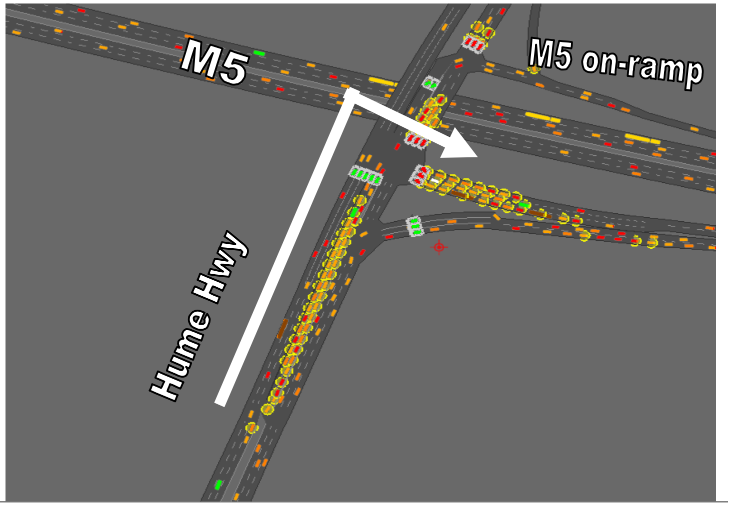
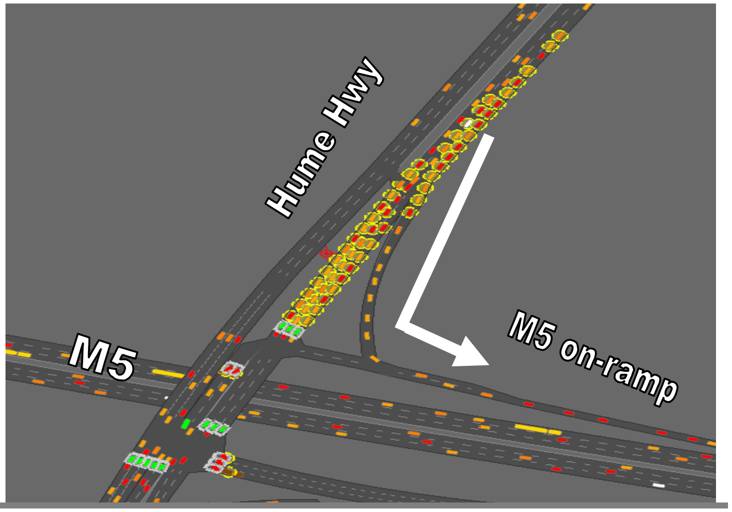
Note: Minor adjustment was done in Future Base Case due to unreleased trips.

Paramics model code: 2031 PM_TZ67_PDBC_29052013_1

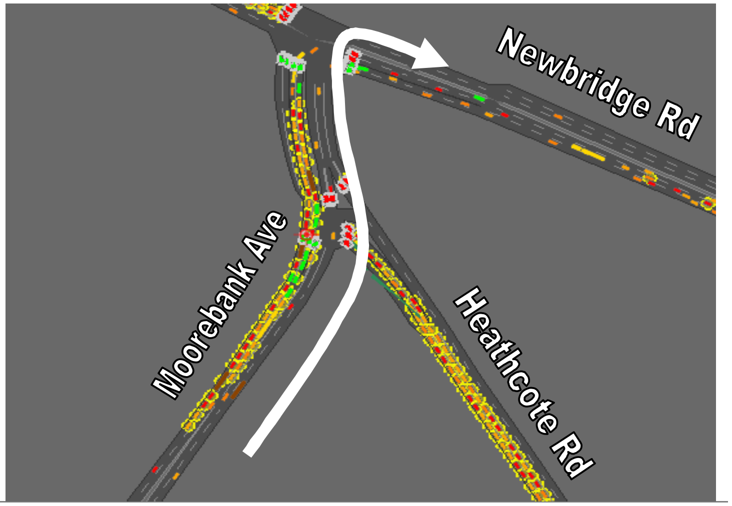
Link: F:\AA003760\T-Traffic Modelling\Amended Concept Application_April13\Paramics Model\Models Run_May 2013\Re-Run 2031 BC Models

Table 5-6 Core Area Network Operational issue for 2031 Future Base Case without SIMTA

Intersection	Network operational issue	Paramics Snapshot
M5 Motorway/Hume Highway Interchange	1) By 2031, background growth is forecast to increase delays for right turn movement from the M5 westbound off-ramp to the Hume Highway (north) during both AM and PM peak. Low LoS F is forecast. The model however does not suggest queue spills back from the off-ramp onto the M5 Motorway.	
	2) Compared to the existing situation, minor increase in delay is forecast to the left turn traffic from the M5 westbound off-ramp to the Hume Highway (south). The LoS for PM peak is forecast E. No queue spills back from the off-ramp onto the M5 Motorway is observed in the model.	

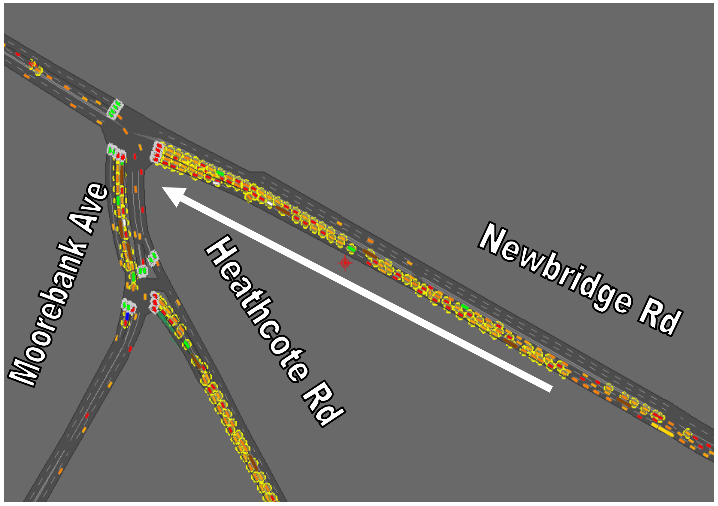
M5 Motorway/Hume Highway Interchange	3) The right turn movement from the Hume Highway (south) to the M5 eastbound on-ramp is forecast to increase in delays during both the AM and PM peak. In 2031, the model forecasts low LoS F. The model has suggested extended queues and potential to spill back onto the main stream.	
	3A) Model forecasts increase delays for left turn movement from the Hume Highway (north) to the M5 eastbound on-ramp during PM peak period (LoS F). The model has suggested occasional queue spill back onto the main stream from the left turn slip lane.	

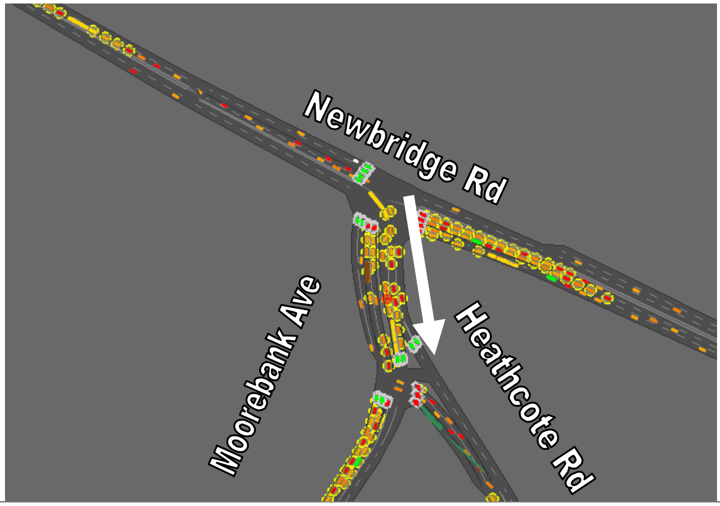
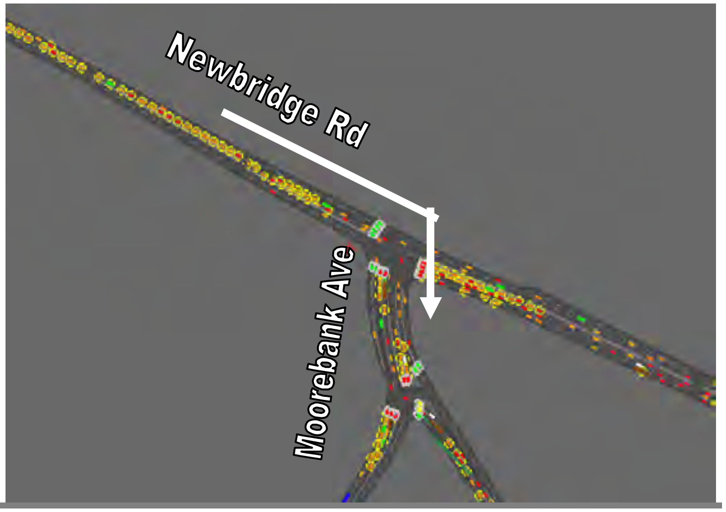
4) In the future, background growth is forecast to increase delays and queues through Newbridge Road/Heathcote Road and Moorebank Avenue (north of M5) areas. The model forecasts low LoS F regardless of any development at the SIMTA site. Future model shows queue spill back, affecting the operation of the adjacent Moorebank Avenue/Heathcote Road signal. This will cause an increase in delays to the northbound through movement at the Moorebank Avenue/Heathcote Road intersection (LoS F).

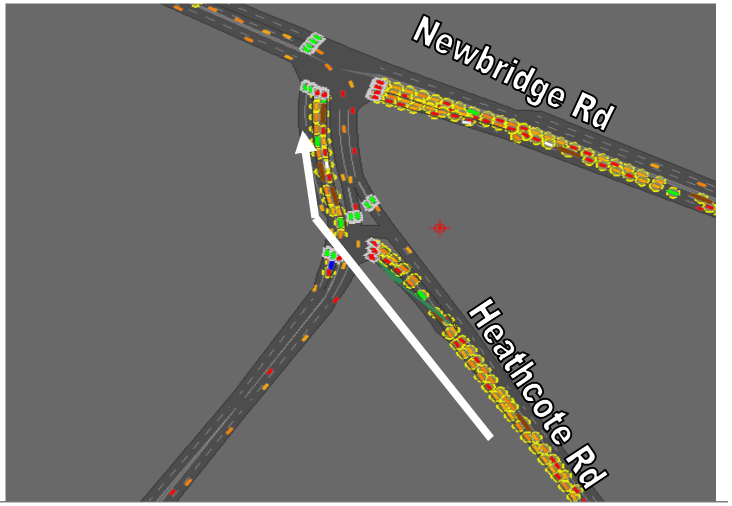
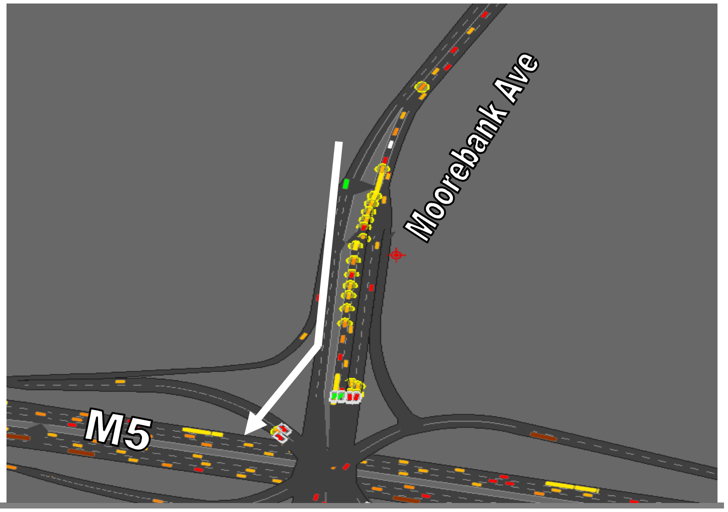


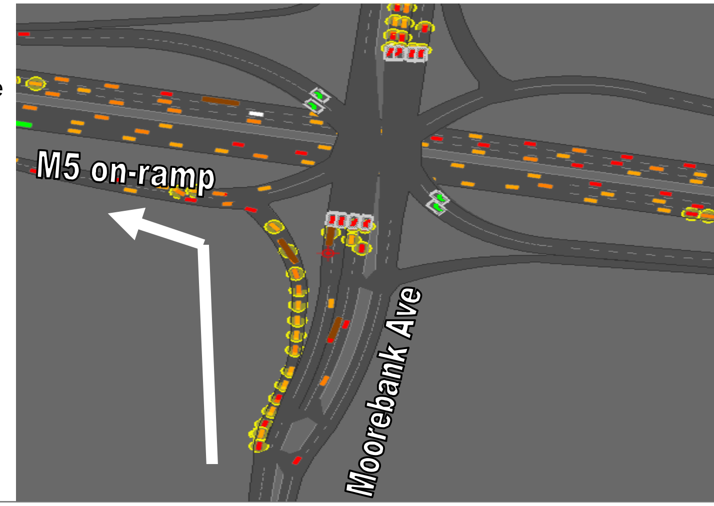
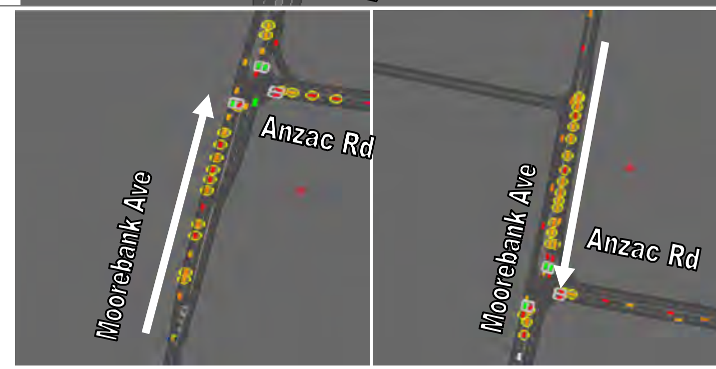
Moorebank Avenue intersections with Heathcote Road and Newbridge Road

5) The future case traffic model forecasts a low LoS F for westbound through movements on Newbridge Road. The model has predicted significant queues during both the AM and PM peak period, regardless of any SIMTA proposal.



Moorebank Avenue intersections with Heathcote Road and Newbridge Road	6) Similar to issues 4 and 5 above, background growth is forecast to increase delays and queues through the Moorebank Ave/Heathcote Road area. The model forecasts low LoS F into the right turn movement from Newbridge Road to Moorebank Avenue regardless of any development at the SIMTA site.	
	7) Similar to issue 6 above, background growth is forecast to increase delays and queues through the Moorebank Ave/Newbridge Road area. The model forecasts a low LoS F to right turn movements from Newbridge Road into Moorebank Avenue. The model has showed queue spill back from the right turn bay onto the main stream affecting eastbound through traffic.	

Moorebank Avenue intersections with Heathcote Road and Newbridge Road	7A) Right turn from Heathcote Road into Moorebank Avenue would experience high delays in both the AM and PM peak periods. The model has forecast long and frequent queues for right turning vehicles with a LoS F.	
M5 Motorway/ Moorebank Avenue Interchange	8) The model showed increased delays and longer queues for the right turn movement from Moorebank Avenue (north) into the M5 westbound on-ramp during PM peak period (LoS F), regardless of any development at the SIMTA site. Frequent queues are observed and likely to spill back from the right turn bay onto the main stream affecting the southbound through traffic movement on Moorebank Avenue.	

M5 Motorway/ Moorebank Avenue Interchange	9) In the future, background traffic growth has minor impact on the operation of left turn movements (Give-way slip lane) from Moorebank Avenue south onto the M5 westbound on-ramp. The model shows some occasional queues on the Moorebank Avenue northbound. The occasional queue was caused by high volume right turn demand from Moorebank Avenue (north) onto the M5 westbound on-ramp.	
Moorebank Avenue / Anzac Road	10) In the future, background traffic growth has minor impact on the operation of through movements along Moorebank Avenue. At the Anzac Road signalised intersection, the model showed occasional queues in the northbound and southbound direction. Longer queues are more noticeable during PM peaks in the southbound direction.	

Paramics Model Code: 2031 AM_TZ019_BC_RevD, 2031 PM_TZ019_BC_RevC. Note: The Paramics result indicates that in 2031 the predicted background growth has resulted up to 9% unreleased trips in the entire Core Paramics area. The percentage of unrealised trips on M5 Motorway was found higher between 17 % and 26% in the peak direction. In 2031, the predicted LoS in Table 6-7 can be higher for some movements given the unrealised trips in the network.

5.6 Impact Outside Core Area Network without SIMTA

The eight key intersections on RMS's State Road outside the core area were reanalysed for 2031 for both AM and PM peak. Table 5-7 summarises the forecast intersection level of service without SIMTA for AM and PM peak hours. Detailed future network capacity issues identified at eight intersections without the SIMTA development are included in **Appendix B**.

Results from Table 5-7 showed that background growth alone (to 2031) would adversely impact level of service of eight intersections assessed outside the core area. Model predicted poor level of service (LoS E or F) either in AM or PM peak regardless of any SIMTA development.

Table 5-7 Impact on road network without SIMTA – Outside Core Area

Forecast Intersection Level of Service (LoS) for 2031 Future Base Case without SIMTA – Outside Core Area				
Intersection	AM Peak		PM Peak	
	Overall Average Delay	LoS	Overall Average Delay	LoS
Hume Highway / Camden Valley Way	68	E	63	E
Hume Highway / Kurrajong Road	239	F	71	F
Hume Highway / De Meyrick Avenue	189	F	22	B
Hume Highway / Hoxton Park Road / Macquarie Street	96	F	108	F
Terminus Street / Speed Street	39	C	122	F
Newbridge Road / Nuwarra Road	42	D	373	F
Heathcote Road / Nuwarra Road	103	F	73	E
M5 Motorway / Heathcote Road	52	D	108	F

Paramics model code: 2031 AM_TZ67_PDBC_29052013_1

Link: F:\AA003760\T-Traffic Modelling\Amended Concept Application_April13\Paramics Model\Models Run_May 2013\Re-Run 2031 BC Models

Paramics model code: 2031 PM_TZ67_PDBC_29052013_1

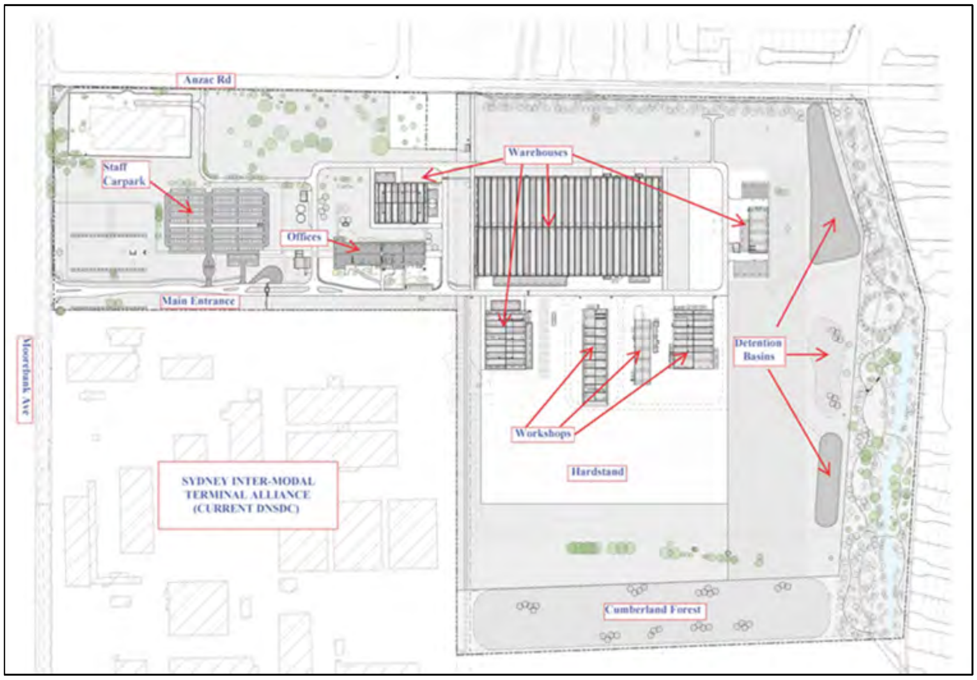
Link: F:\AA003760\T-Traffic Modelling\Amended Concept Application_April13\Paramics Model\Models Run_May 2013\Re-Run 2031 BC Models

5.7 Impact of DNSDC Relocation

In responding to the TfNSW and RMS's road issues, the impact from the Defence National Storage and Distribution Centre (DNSDC) relocation was assessed.

The Department of Defence proposed to relocate DNSDC to the northern site south of Anzac Road as part of the Defence Logistic Transformation Program works in Moorebank[9]. As part of the DNSDC relocation, a new signalised intersection on Moorebank Avenue approximately 300 metres south of existing traffic signal at Anzac Road was proposed. Figure 5-3 shows location of the proposed access for new DNSDC on Moorebank Avenue.

Hyder has updated the traffic model incorporating a new access being proposed for the DNSDC site. Hyder's modelling investigation indicates that the proposed new signalised intersection on Moorebank Avenue south of Anzac Road as part of DNSDC relocation would not change the intersection level of service results reported in previous Sections 5.5 and 5.6.



Source: Department of Defence website (http://www.defence.gov.au/jlc/infrastructure/sites/moorebank.html), accessed on 28 May 2013.

Figure 5-3 Proposed Access for DNSDC relocation

[9] Defence Logistics Transformation Program works in Moorebank, Department of Defence website (http://www.defence.gov.au/jlc/infrastructure/sites/moorebank.html), accessed on 28 May 2013.

6 THE IMPACT OF SIMTA PROPOSAL

6.1 Proposed Site Access

The SIMTA site has a frontage onto Moorebank Avenue. The eastern boundary abuts Greenhills Road, which is unformed in front of the site. Moorebank Avenue is owned by the Department of Defence and will provide the primary access points to and from the site. In general, currently Moorebank Avenue consists of one through lane in each direction with auxiliary turning lanes at key intersections. The following accesses are proposed in the Concept Plan for the ultimate SIMTA development.

1. The **Northern Access** will provide an entry and exit for the terminal. It will service both trucks and cars to the warehousing and distribution areas on the eastern side of the terminal. As part of the DNSDC relocation, there will be a new traffic signal approximately 300 metres south of the existing traffic signal at Anzac Road providing access to new DNSDC facilities. Figure 5-3 in previous section shows the location of the proposed new intersection. SIMTA proposes to share the new traffic signal with DNSDC. The northern access traffic signal will provide full access permitting all movements. Further discussion will be held with DNSDC on potential access share arrangements. This access arrangement has been assumed for modelling purposes. If the shared access with DNSDC was not the approved layout, then other options would need to be investigated, including the use of the **Central Access** as the main entry and exit point, or another access at least 150m south of the intersection currently labelled as **Northern Access.**
2. The **Central Access** will provide an entry and exit for the terminal. The location is at the existing traffic signal that provides access to current DNSDC facility. The existing traffic signals will be retained. The central access will provide full access permitting all movements. It will service mainly trucks to the terminal. The access will also be used for trucks and cars to the warehouse and distribution areas on the central part of the terminal.
3. The **Southern Access** will provide exit to articulated trucks departing the terminal. This access will only permit trucks exiting to Moorebank Avenue in the northbound direction. A new traffic signal is proposed on Moorebank Avenue approximately 750m south of the central access.

The multiple site accesses are proposed to comply with the emergency services requirements. Figure 6-1 below shows proposed access arrangement for SIMTA proposal. The proposed three signals will be between 650 metres and 750 metres distance apart and satisfy RMS's guideline of minimum 120 metres of signal spacing.

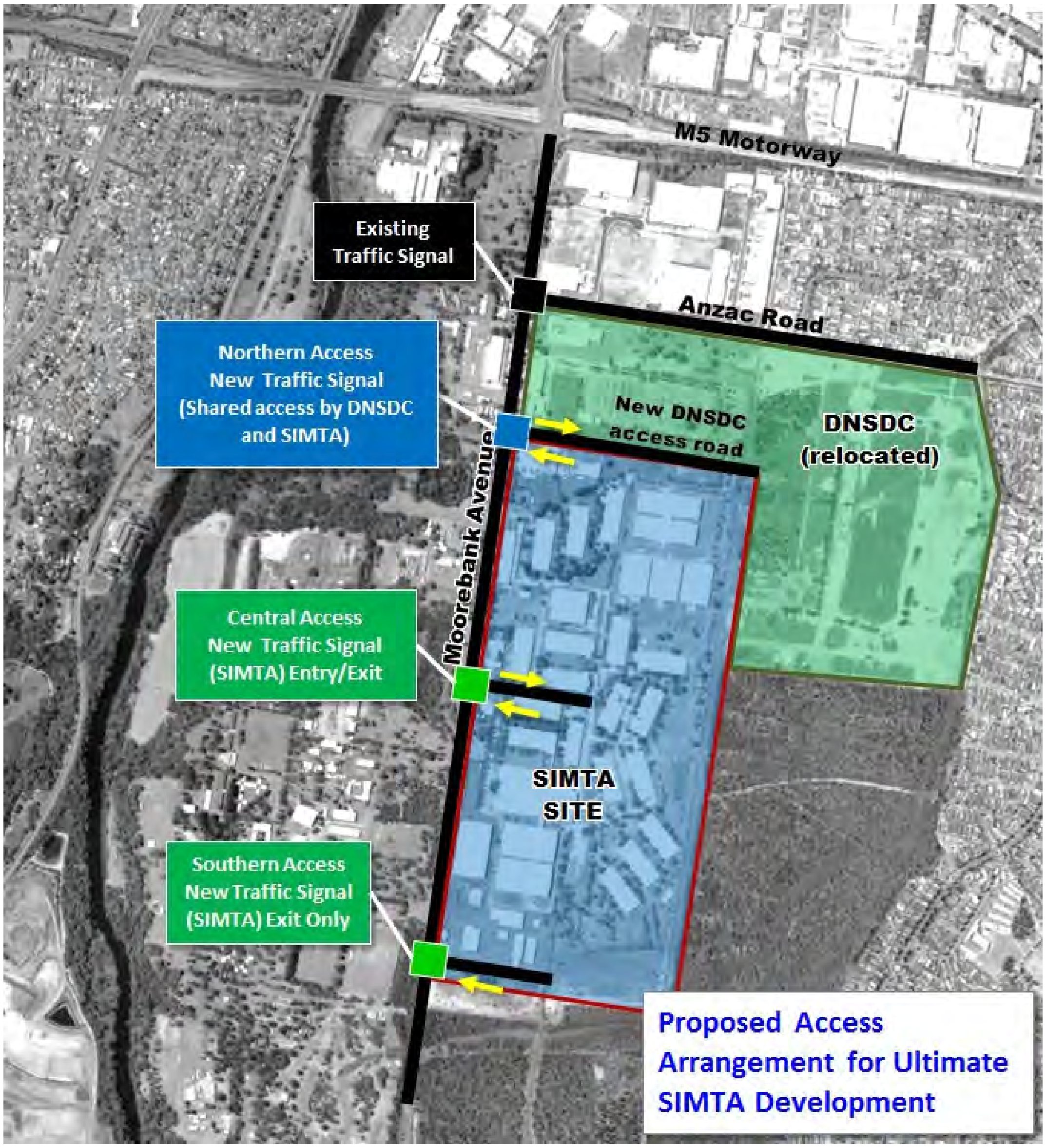


Figure 6-1 Proposed Access Arrangement for SIMTA to Moorebank Avenue

Source: Hyder , 2013

6.2 Trip Generation from On-Site Activity

The primary purpose of the SIMTA proposal will be the transfer of shipping containers to and from Port Botany by rail and the distribution of freight throughout south-western Sydney. The SIMTA proposal allows for the unpacking of a proportion of these containers on-site and the distribution of their contents. These freight-based activities will generate truck trips (rigid trucks, semi-trailers and B-doubles). In addition to freight activities, the site will provide employment in the operation of the Intermodal Terminal, in the warehouses and ancillary freight village. The calculation of freight-generated vehicle trips and employee car trips are included in **Appendix D.**

6.3 Freight Generated Traffic

Freight generated traffic was calculated from first principles based on a set of empirical parameters[10]. This section describes the calculation methodology and assumptions used for SIMTA.

6.3.1 Movement of Containers and Freight

Freight will arrive by rail and be transported to the warehouse and distribution facilities within the SIMTA site, or be directly loaded on to trucks for transport to warehouses and nearby logistics centres. Exports and empty freight containers will be transported to the facility by truck and then loaded onto rail for transport back to Port Botany.

An annual operating capacity of one million TEUs is anticipated in the ultimate stage.

SIMTA have provided the following breakdown of site operations for the full development "business as usual" scenario:

- The volume of container activity through terminal is proposed to be approximately one million TEU per annum moving to and from Port Botany and SIMTA site.
- Containers arriving by rail from Port Botany (500,000 TEUs) will be unloaded onto rail stacks within the intermodal facility. The 500,000 TEUs would be returned to the port by rail. Containers that were unloaded on site (200,000 TEUs), now empty, will be loaded onto trains for return to Port Botany.
- Of those 500,000 TEUs containers arriving by rail, 200,000 TEUs will be transported to warehouses within the intermodal facility and unloaded on-site. The remaining 300,000 TEUs will be transferred directly onto trucks for transport off-site.
- Of the containers that were transported offsite (300,000 TEUs), 175,000 TEUs will be unloaded at external depots and returned to SIMTA for loading onto trains for return to Port Botany. The remaining containers that were transported off-site (125,000 TEUs) will return full, to be loaded onto trains for return to Port Botany and export.

SIMTA have advised that some imported containers (125,000TEUs) will be transported to external depots and re-packed off-site ready to be returned to SIMTA for export. This assumes that depots receiving full containers (importing) will also use those same containers for export. Current industry practice is for the majority of containers unloaded at external depots to return to an empty container store, before being called up for stuffing by customers for export.

Figure 6-2 shows the annual movement of containers and freight through the SIMTA proposal.

---

[10] Intermodal Logistics Centre at Enfield-Environmental Assessment, 2005, Sinclair Knight Merz (SKM)

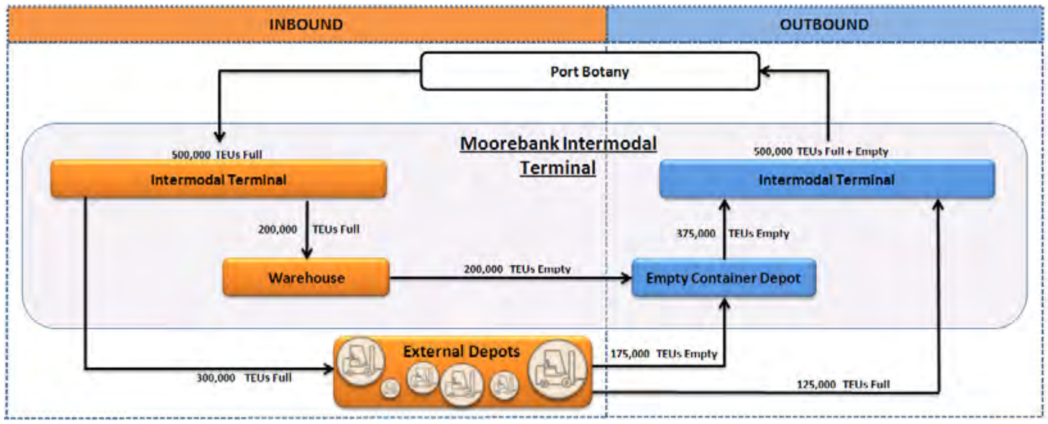


Figure 6-2 Container Movement through SIMTA Proposal (1 million TUE's Throughput)

In addition to truck movements generated by the transport of shipping containers off-site, rigid truck trips will be generated by the transport of freight which will be unpacked within SIMTA site (200,000 TEUs). This freight will either be distributed directly to customers, or to customers via other distribution warehouses outside of SIMTA.

The calculation of daily articulated truck (i.e. carrying containers) generation from annual TEUs is presented in **Appendix D**. The calculation of rigid truck (i.e. unpacked freight) generation from annual TEUs is also contained in **Appendix D.**

6.3.2 Calculation of Daily Articulated Truck Generation

A total of 600,000 TEUs (two-way total) was assumed for articulated truck generation.

The calculation of articulated trucks from 600,000 TEUs are:

1 Of the total containers 60% will be 40ft containers and 40% 20ft containers (i.e. one TEU). Therefore on average each shipping container is equivalent to 1.6 TEUs. Therefore to convert the TEUs throughput to individual containers:

$$600{,}000\ TEUs\ per\ year \div 1.6\ TEUs\ per\ container = 375{,}000\ containers\ per\ year$$

2 The facility will operate 52 weeks of the year, therefore the number of containers each week is calculated as:

$$375{,}000\ containers\ per\ year \div 52\ weeks = 7{,}212\ containers\ per\ week$$

3 Containers will arrive every day of the year. In a typical week 85% of containers are processed on weekdays (Monday-Friday), with the remaining 15% processed on Saturday and Sunday. Therefore the number of containers generated each weekday is:

$$7{,}212\ containers\ per\ week \times 85\%\ in\ weekdays \div 5\ weekdays = 1{,}226\ containers\ per\ weekday$$

4 Semi-trailers will carry one 40ft container and B-doubles will carry a 20ft container and a 40ft container. Each truck (semi-trailers and B-doubles combined) was assumed to carry 1.3 containers on average. This implies a 70/30% split between semi-trailers and B-doubles. The number of truckloads per day is calculated as:

$$1{,}226\ containers\ per\ weekday \div 1.3\ containers\ per\ truck = 943\ truckloads\ per\ weekday$$

5 The majority of articulated trucks will carry a load in one direction only, either to or from the Terminal. Therefore each container movement will result in 2 truck trips. However, 30% of articulated trucks will carry containers in both directions (i.e. back-loading). Therefore, accounting for back-loading, the total number of truck movements per weekday is calculated as:

$$943\ truckloads\ \times 2\ directions - (30\% \times 943\ truckloads) = 1{,}603\ truck\ movements\ per\ weekday$$

Therefore, the SIMTA site will generate approximately 1,603 articulated truck movements (both directions) each weekday.

6.3.3 Calculation of Daily Rigid Truck Generation

The analysis assumed that about 200,000 TEUs would be unpacked into warehouses within the Terminal. The unpacked freight will be transported off-site by rigid trucks.

A total of 200,000 TEUs of freight will be generated by this activity.

The calculation of daily rigid trucks is shown below. The calculation is identical to that used for the articulated trucks for steps 1 to 3, albeit with a different TEU volume.

1 Of the total containers 60% will be 40ft containers and 40% 20ft containers (i.e. one TEU). Therefore on average each shipping container is equivalent to 1.6 TEUs. Therefore to convert the TEUs throughput to individual containers:

$$200{,}000\ TEUs\ per\ year \div 1.6\ TEUs\ per\ container = 125{,}000\ containers\ per\ year$$

2 The facility will operate 52 weeks of the year, therefore the number of containers each week is calculated as:

$$125{,}000\ \text{containers per year} \div 52\ \text{weeks} = 2{,}404\ \text{contain}ers\ per\ week$$

3 Containers will arrive every day of the year. In a typical week 85% of containers are processed on weekdays (Monday-Friday), with the remaining 15% processed on Saturday and Sunday. Therefore the number of containers generated each weekday is:

$$2{,}404\ containers\ per\ week \times 85\%\ in\ weekdays \div 5\ weekdays = 409\ containers\ per\ weekday$$

4 Each container will carry 12.66 tonnes of unpacked freight on average and rigid trucks transporting unpacked freight will carry 10 tonnes each. Therefore the number of truckloads generated per weekday is calculated as:

$$409\ containers \times 12.66\ tonnes \div 10\ tonnes\ per\ truck = 517\ truckloads\ per\ weekday$$

5 All rigid trucks will carry a load in one direction only, either to or from the Terminal. Therefore each container movement will result in 2 truck trips.

$$517\ truckloads\ per\ weekday \times 2\ directions = 1035\ truck\ movements\ per\ weekday$$

Therefore, at ultimate development the SIMTA site will generate 1,035 rigid truck movements (both directions) each weekday.

For simplicity the above calculations assume that all trucks that carry un-packed freight from the SIMTA site to off-site customers will be rigid trucks. It is likely that a small proportion, (10-20%), of these trucks will be articulated trucks instead of rigid trucks. While this may change the proportion split between articulated and rigid trucks, the total number of truck movements will not be changed by this assumption.

6.3.4 Daily Truck Generation

According to the “business as usual” assumptions a total of 2,638 truck movements (i.e. both directions) will be generated by the Moorebank Terminal each weekday. This total is composed of 1,603 articulated truck movements carrying containers and 1,035 rigid truck movements carrying unpacked freight.

6.3.5 Peak Hour Truck Generation

The SIMTA site is planned to operate 24 hours per day, 7 days a week. B-double, semi-trailer and rigid truck movements pick up in the morning from about 05:00 onwards and remain fairly consistent throughout the day. Semi-trailer and B-double movements continue into the evening with reasonable volumes, however the number of rigid truck trips drop off significantly in the evening from about 17:00 onwards. It is assumed that site maintenance activities will be carried out between 3:00am and 5:00am based on typical intermodal terminal operation. Consequently, traffic generation over these two hours is expected to be low. The hourly truck generation profile for SIMTA site is shown in Figure 6-3. The profile shows that the AM and PM peak hour for truck movements will occur at 07:00-08:00 with 204 trucks per hour and 14:00-15:00 with 245 trucks per hour respectively. AM and PM peak hour truck movements will represent 7.7% and 9.3% of total daily truck movements respectively.

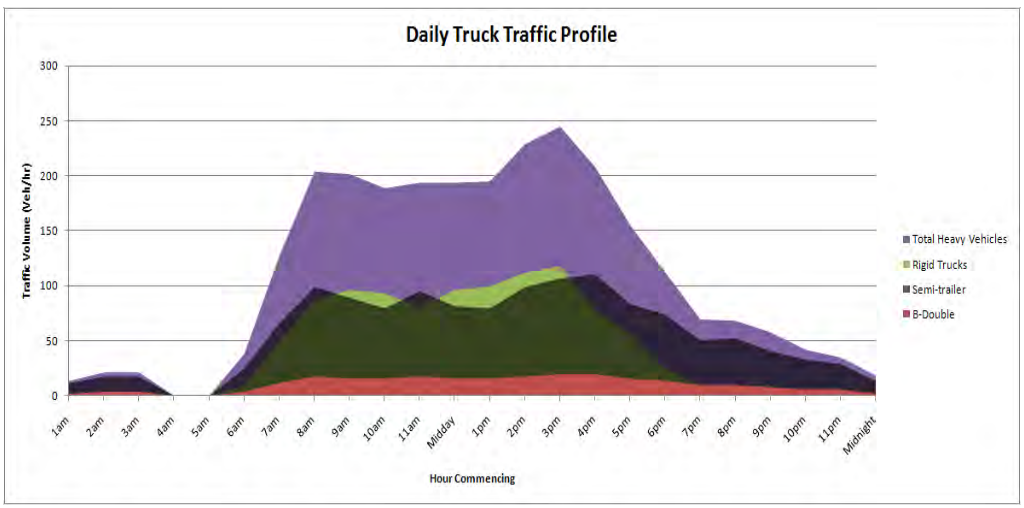


Figure 6-3 SIMTA Daily Truck Generation Profile

6.4 Employee Traffic Generation

The SIMTA facility is expected to accommodate about 2,258 employees on-site at full operation of the development. Employee numbers were calculated based on Gross Floor Areas (GFAs) proposed in the SIMTA proposal Concept Plan. The Needs Assessment for Moorebank Intermodal Facility (PwC, March 2011) has estimated a maximum ongoing direct operational employment of 2,840. This estimate is about 25% higher than the staff totals calculated from GFA contained in the Concept Plan. A higher staff total from PwC has been considered as a sensitivity test in Section 6.6. The majority of staff will work in the warehouses and distribution centres unpacking containers or preparing the contents for distribution. The analysis assumed that SIMTA (terminal warehouses) will operate in two shifts over part of the day. It is expected that the first shift will start prior to 07:00 and finishing around 16:00. The second shift would start at around 16:00 and finish after 12:00 midnight. Actual start and finish times is expected to be staggered to spread out parking and traffic demand.

The majority of office and ancillary staff would work during the normal working hours, with some staff required to support early morning and late evening shifts. Retail facilities will mainly be services such as food outlets and convenience stores for other staff. The facilities will be required to provide services during each of the main warehouse shifts. A total of 2,258 staff will be required for each weekday spread across the sites normal operating hours.

Previous Section 2.2.4 documented existing public transport usage for Moorebank catchment. The analysis showed that about 85% of trips were made by a private vehicle (78% car driver, 7% car passenger). There is significant scope for improving public transport services to Moorebank as part of the SIMTA proposal. A Transport Management and Accessibility Plan (TMAP) have been prepared for the site (see Section 7) which outlines the measures required to increase the public transport mode share.

For the impact assessment purpose, it was assumed that about 80% of employee trips would be made by private vehicle (car driver, car passenger) when the SIMTA site is fully developed. The employee car mode share is considered to be a conservative estimate in the long term for modelling purpose. There is scope to encourage a more favourable employee public transport mode share where a Travel Demand Management (TDM) approach is adopted on the site and measures put in place to better link the site to the nearby passenger rail network. Section 7 outlines the TDM approach adopted for the site.

With 2,258 personnel working on site, a total of 4,516 passenger movements will be generated to or from the site each weekday. Assuming 80% of these movements will be made by private car (driver or passenger), about 3,613 car movements will be generated. Based on assumptions around the individual daily shift patterns for warehousing and ancillary freight village (office, retail and train terminal operations), the total daily car trips were distributed throughout the day. Shift assumptions for the warehousing and freight village facilities are summarised in **Appendix D.** Figure 6-4 shows the assumed distribution of SIMTA generated car trips throughout the day.

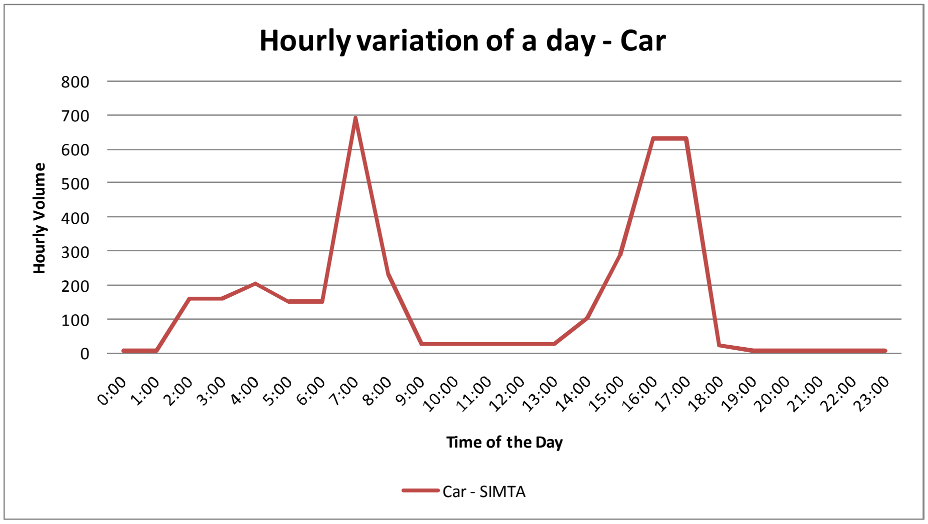


Figure 6-4 Weekday Distribution of Car Trips

The profile shows that the AM and PM peak periods for private car movements occur at 7:00-9:00 and 16:00-18:00 respectively.

At the request of the RMS, Hyder provides further clarification on peak hour employee trip generation assumptions as follows.

- About 922 private cars are forecast to travel to and from site during AM peak period between 7:00 and 9:00 (2 hours).
- As per shift assumptions for warehouse and terminal documented in **Appendix D,** a majority of employee would travel between 7:00 and 8:00 am.
- About 75% of total AM peak 2 hours car trips (about 692 cars movements) are assumed to travel in peak one hour between 7:00 and 8:00 prior to the morning shift start at 8:00 am.
- About 230 car movements (about 25% of total AM peak 2 hours car trips) are assumed to travel between 8:00 and 9:00 am.
- AM peak one hour car movements represents about 19.1% of total daily car movements (692 am peak hour /3613 daily volume=19.1%).

During PM peak period between 16:00 and 18:00 (2 hours), the shift assumptions for warehouse and terminal assumes 50/50 splits in 2 hours period. About 1,260 private car movements are forecast in PM peak 2 hours. Of that, 630 cars (50%) are assumed to travel between 16:00 and 17:00 pm. A similar 50% car would travel between 17:00 and 18:00 pm. The PM peak one hour car movement represents about 17.4 % of total daily car movements (630 pm peak hour /3613 daily volume=17.4%).

6.5 Validation of Truck Generation

The estimated truck generation to and from the SIMTA proposal was validated against other similar developments, and related works including Port Botany and Enfield Intermodal Logistics Centre. The Port Botany Environmental Impact Statement[11] sets out the growth in container movements and traffic expected at the Port through to 2021. On behalf of the Sydney Ports

[11] Port Botany Environmental Impact Statement, Sydney Ports Corporation, 2004.

Corporation, SKM prepared an analysis of the traffic impacts of the proposed Enfield Intermodal Logistics Centre. The EIS traffic report[12] calculated the total traffic generation from first principles. The Enfield ILC and SIMTA will serve the same intermodal function, albeit with different capacities. The Enfield ILC is planned to have a maximum capacity of 300,000 TEUs per annum, in contrast to the 1,000,000 TEU capacity of SIMTA. Otherwise, both terminals are expected to operate in a very similar way, receiving freight containers from Port Botany via rail, transferring directly off-site via articulated trucks, unpacking freight on-site for distribution by rigid trucks, and receiving full and empty containers for return to Port Botany.

A summary of daily and peak hour truck generation rates from Port Botany, Enfield IMT and SIMTA proposal are provided in Table 6-1. It shows that daily truck generation estimates (per million TEUs) from independent sources are very close to the daily truck generation calculated using the SIMTA proposal “business as usual” assumptions. When fully developed, SIMTA is expected to generate about 2,638 truck movements per day. The estimated truck movements for SIMTA site is in line with the Port Botany EIS estimate and the Enfield Traffic Report estimate.

The peak hour factors, as percentage of daily traffic, are also within the range of other independent data sources/estimates.

Table 6-1 Daily Truck Generation Comparisons

Source	Daily Truck Generation (per 1 million TEUs)	AM Peak Hour (% of daily traffic)	PM Peak Hour (% of daily traffic)
Port Botany EIS	2,450	6.0%	3.7%
Enfield ILC Traffic Report	2,753	7.3%	5.4%
SIMTA Proposal	**2,638**	**7.7%**	**9.3%**

This conclusion provides confidence in the assumptions used and the resulting outcome for daily truck generation to and from SIMTA.

6.6 Sensitivity Testing

The RMS has indicated that sensitivity testing should be carried out around key assumptions. This section summarises results from a sensitivity testing exercise to assess the impact of changing container size, vehicle utilisation and employee totals.

The “business as usual” daily traffic generation from SIMTA can be summarised as:

- 1,603 articulated trucks per weekday;
- 1,035 rigid trucks per weekday;
- (2,638 total trucks per weekday);
- 3,613 cars per week day (likely to be much lower if TDM measures are adopted over time).

[12] Enfield Intermodal Logistics Centre – Final Transport Working Paper, Appendix B – Traffic and Transport (July 2005)

6.6.1 Change in Container Size

There is a trend towards the use of larger containers, increasing the proportion of 40ft containers. The "business as usual" analysis assumes that 60% of containers are 40ft containers. The Sydney Ports Corporation (SPC) Port Freight Logistics Plan (2008), which outlines the key forecast efficiency indicators, predicts a change in the ratio of 40ft and 20ft containers from 60%/40% (2006) to 65%/35% by 2016.

Sensitivity testing showed that if the proportion of 40ft containers increased to 70% the total articulated truck generation would reduce by 4%. There is no change in the number of rigid trucks required since the total freight volume remains constant. Increasing the proportion of 40ft containers will therefore reduce the number of articulated trucks required. Our current "business as usual" assumption is therefore considered conservative.

6.6.2 Vehicle Utilisation

B-doubles are assumed to carry a 20ft container and a 40ft container. Semi-trailers are assumed to carry one 40ft container only. The "business as usual" truck utilisation of 1.3 containers per truck (equivalent to 2.08 TEUs per truck) represents a split between B-doubles and semi-trailers of about 30% and 70% respectively.

The SPC Freight Logistics Plan forecasts an increase in truck utilisation from 2.1 (2006) to 2.3 by 2016. Sensitivity testing was carried out on a range of vehicle utilisation parameters.

Table 6-2 shows the impact of changing truck utilisation, increasing the proportion of B-doubles to 40%, 50%, 60% and 70%.

Table 6-2 Sensitivity to Vehicle Utilisation

Vehicle Utilisation (containers per truck)	Vehicle Utilisation (TEUs per truck)	Total Truck Generation (per week day)	% Change in Truck Generation compared to BAU
1.3 (Business as usual)	2.1	2,638	-
1.4	2.2	2,523	4% reduction
1.5	2.4	2,424	8% reduction
1.6	2.6	2,337	11% reduction
1.7	2.7	2,261	17% reduction

Sensitivity testing showed that increasing the truck utilisation has the potential to reduce the total truck generation. Again, there was no reduction in the total number of rigid trucks.

Note that for the purpose of estimating likely future truck traffic generation, no allowance has been made for direct access by B-triples or other PBS type vehicles to/from the SIMTA site that may have the capacity to carry 3 or more containers. Regulations presently prohibit the use of these vehicles in this part of the State, however, the site's proximity to the motorway network may see access for such vehicles revisited as some point in the future.

6.6.3 SIMTA Site Employees

The "business as usual" assessment assumed a total of 2,258 employees, generating a total of 3,613 car movements per weekday. However the Needs Assessment for Moorebank Intermodal Terminal Facility (PwC, March 2011) estimates a maximum of 2,840 employees; about 26%

increase. Assuming the same proportion of employment between the warehouse and ancillary freight village staff, this number of employees would result in about 4,544 movements per weekday. The sensitivity of car movements is directly related to total employment on-site. Therefore an increase in employment will result in a pro-rata increase in weekday car movements.

6.7 Traffic Distribution from Site

The distribution of additional trips generated by the SIMTA trucks and employee cars are key factors in determining its impact on the external road network. For modelling purposes, it was assumed that the site would be fully developed by 2031. Figure 6-5 shows AM peak hour inbound trip distribution (>90% inbound) for employee cars. Figure 6-6 shows inbound truck distribution (rigid and articulated) in the AM peak. The AM peak truck distributions are evenly split (50% in/50% out). Due to the mix of freight and employee related activities peak hour traffic impact on Moorebank Avenue is expected to be counterbalanced. In general, the majority of truck and car movements (up to 95%) would travel via Moorebank Avenue north of SIMTA site.

The Cambridge Avenue south to the SIMTA site has weight limitations which would inhibit the use of this road for heavy trucks. Hyder's traffic assessment considered that it may be possible for this road to be used by small distribution vehicles and employee cars only.

The future year 2031 AM peak hour inbound traffic to employee cars suggests the following distribution trends (see Figure 6-5):

- Majority of SIMTA employee cars (about 95%) are forecast to travel to site via Moorebank Avenue. Of that about 29% are forecast to travel from east to site via the M5 Motorway. About 18% would travel to site from the west via M5 Motorway. About 13% is forecast to travel to site from the west via Hume Highway. About 14% is forecast to travel to site from the north via Moorebank Avenue. Minor employee car traffic is expected to travel to site via Anzac Road (5%) and Cambridge Avenue (5%).

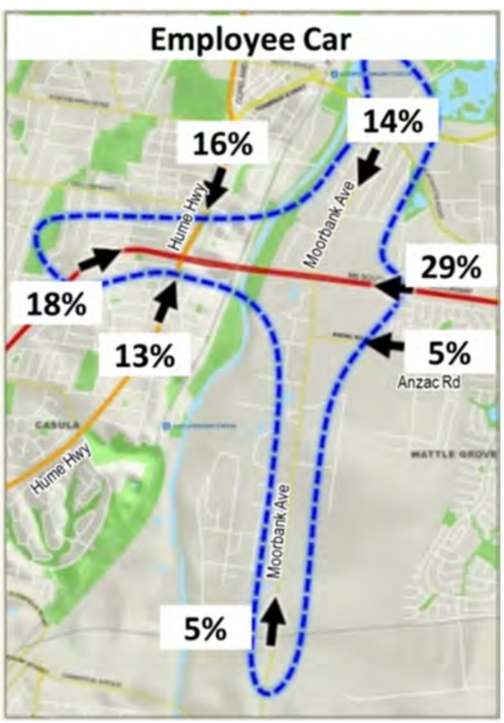


Figure 6-5 Inbound Distribution to the Site in the AM Peak for Employee Car

The future year 2031 AM peak hour inbound truck suggests the following distribution trend (see Figure 6-6):

- When SIMTA is fully developed, it would attract containers from a reasonably clearly defined and localised catchment including Liverpool and part of the South-West and Industrial West. In general SIMTA road based freight distribution catchment will be Liverpool and south-west subregions of Sydney. A slightly different distribution is assumed for container and rigid trucks.
- All container trucks (including semi-trailer and B-double) are forecast to travel via Moorebank Avenue north of SIMTA site. About 35% would travel to site from the west via M5 Motorway. About 13% is forecast to travel to site from the west via Hume Highway. About 14% is forecast to travel to site from the north via Moorebank Avenue. No container trucks would travel to site via Anzac Road and Cambridge Avenue.
- The rigid trucks would follow a very similar path to container trucks distribution except for Cambridge Avenue. The traffic assessment considered that it may be possible for this road to be used by small distribution vehicles. About 5% of small distribution vehicles are assumed to travel to site via Cambridge Avenue.

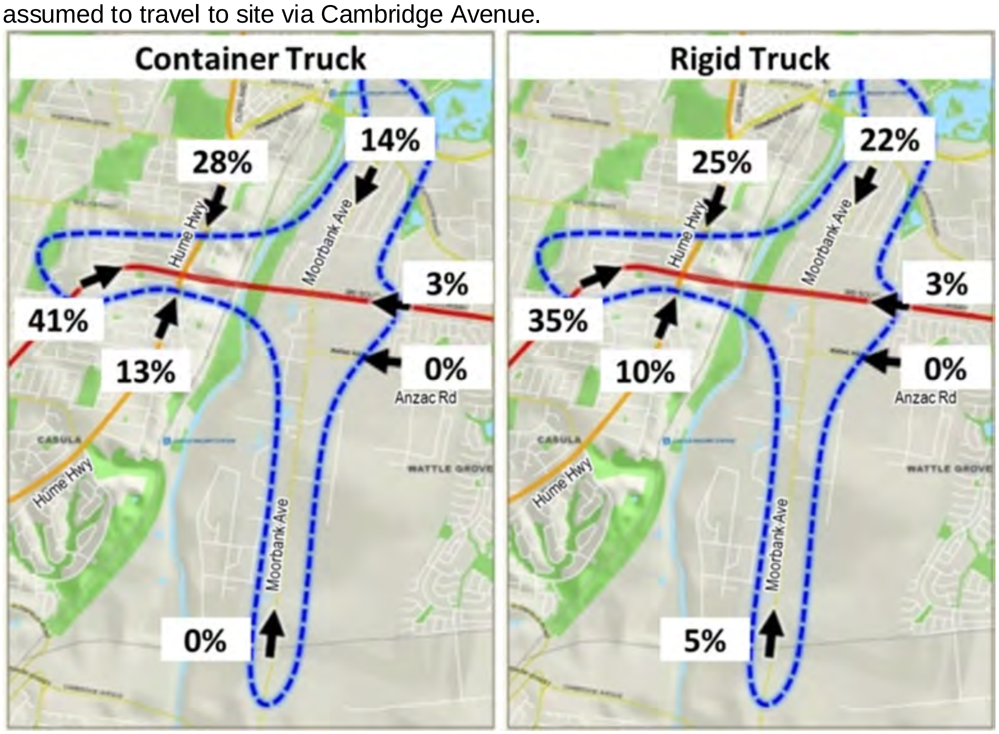


Figure 6-6 Inbound Distribution to Site during AM Peak for Rigid Truck, Container (Semi-trailer/B-double) Trucks

6.8 Impact on Road Network

The road network was analysed both with and without the SIMTA proposal to compare the effect of SIMTA impact on road network.

Two scenarios were tested for 2031:

- The "do nothing" scenario including the regional traffic growth including Port Botany, Sydney Airport, IMT's in Sydney including Enfield and Eastern Creek.
- The development of the SIMTA proposal at Moorebank scenario.

The growth in traffic demand between 2010 and 2031 is estimated at five key screenlines with and without the SIMTA proposal. Figure 6-7 shows the location of screenlines where traffic impact has been reported. Screenline 6 consists of Moorebank Avenue only to demonstrate the impact of SIMTA traffic immediately north of the site.

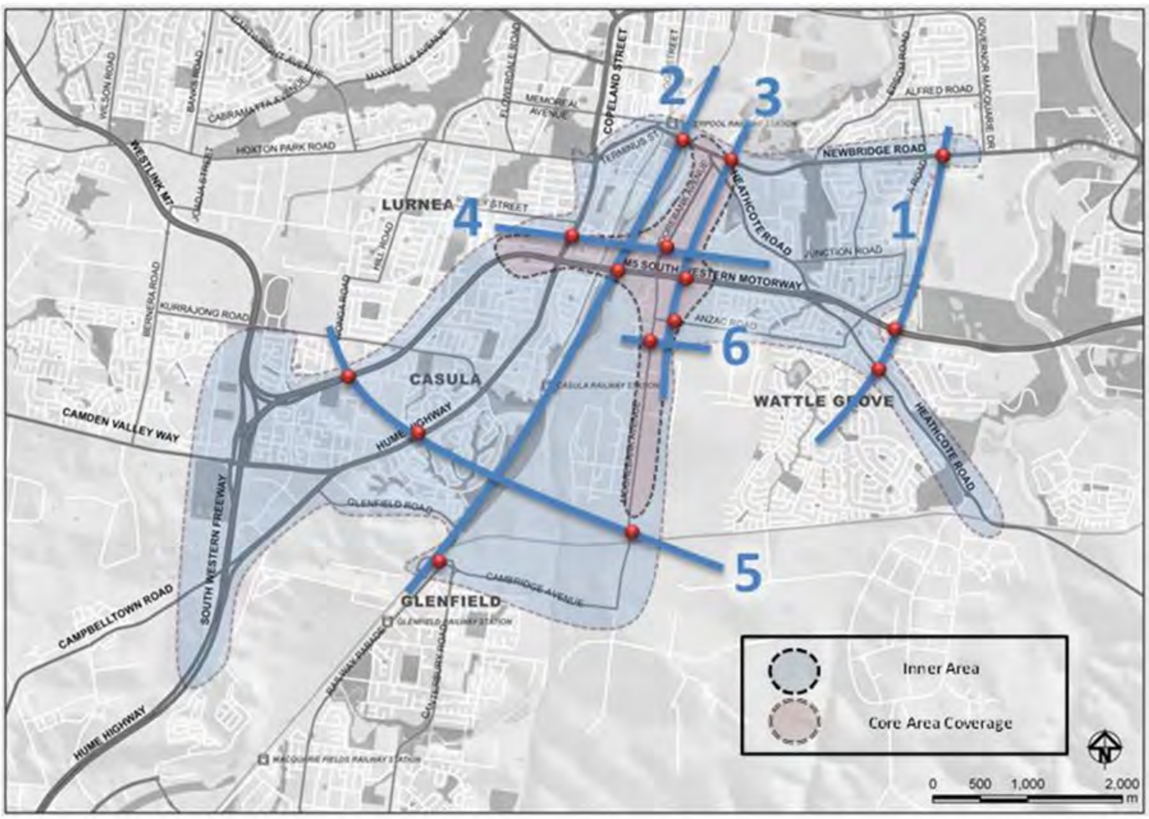


Figure 6-7 Location of Screenlines for Traffic Impact Assessment

Table 6-3 shows the results of peak hour annual average traffic growth between 2010 and 2031 at key screenlines with and without SIMTA.

Table 6-3 Peak Hour Traffic Growth with and without SIMTA, 2010 - 2031

Reported Screenlines	Annual Growth (2010-2031)					
	Do nothing			With SIMTA		
	NB/EB	SB/WB	2-Way	NB/EB	SB/WB	2-Way
AM Peak						
1	2.0%	2.5%	2.2%	2.0%	2.6%	2.2%
2	2.6%	2.2%	2.4%	2.8%	2.2%	2.5%
3	2.9%	2.7%	2.8%	2.9%	2.8%	2.9%
4	0.7%	0.9%	0.8%	0.8%	1.2%	0.9%
5	1.8%	0.6%	1.4%	1.9%	0.6%	1.4%
6 (1)	1.8%	1.8%	1.8%	2.1%	4.8%	3.1%
PM Peak						
1	2.3%	1.9%	2.1%	2.3%	1.9%	2.1%
2	2.9%	2.8%	2.8%	2.9%	2.9%	2.9%
3	3.2%	3.0%	3.1%	3.3%	3.0%	3.1%
4	1.4%	0.7%	0.9%	1.6%	0.7%	1.0%
5	1.0%	0.9%	0.9%	1.0%	1.0%	1.0%
6 (1)	1.6%	1.6%	1.6%	4.9%	2.1%	3.0%

Note: (1) Screenline 6 consists of one road, Moorebank Avenue, to demonstrate the impact of SIMTA traffic immediately north of the site.

When the SIMTA proposal is fully developed, the highest traffic growth is forecast on the Moorebank Avenue north of the SIMTA site (see screenline 6). Without SIMTA, model forecasts peak hour traffic growth on the Moorebank Avenue in the order of 1.6% to 1.8% per annum until 2031.

The average traffic growth rate of 1.6% to 1.8% on Moorebank Avenue included background traffic growth and new traffic associated with the Defence's proposed West Wattle Grove site.

In 2010 Moorebank Avenue carried about 17,500 vehicles per day in a weekday traffic condition. By 2031, the background growth of 1.6% and 1.8% per annum will increase about 6,000 vehicles on Moorebank Avenue. Of that 6,000 vehicles increase, about 1,000 vehicles (16%) would be contributed by Defence's proposed West Wattle Grove site.

This means in the context of overall growth (1.6% to 1.8%), Wattle Grove site would contribute in the order of 0.3% growth. The remaining growth of 1.3% to1.5% per annum would be largely driven by the background traffic that uses the Moorebank Avenue.

The SIMTA development is forecast to increase the traffic growth on Moorebank Avenue up to 3.1% per annum. Anzac Road will not carry trucks generated by the SIMTA proposal but is expected to carry small employee related traffic to SIMTA.

The results show that on most key roads outside the core area, peak hour traffic growth resulting from the development of the SIMTA is small (see results from screenlines 1 and 5). Beyond the core area, where the SIMTA heavy vehicle volume increases, it is generally by a small margin. The additional truck activity generated by the SIMTA proposal would be concentrated on key arterial roads such as M5 Motorway, Hume Highway and M7 Motorway. **Appendix E** included detailed traffic forecasts for 2031 with and without SIMTA on key roads.

6.9 Regional Impact from Cumulative Traffic

The traffic impact from SIMTA proposal has been assessed based on the forecast demand of one million TEU. Any future proposal by the Moorebank Intermodal Company Limited (MICL), formerly known as the Moorebank Project Office (MPO) is expected to service the similar catchment area reducing the ability for the SIMTA to achieve full operational capacity.

The regional road network will need to be developed progressively over the next 20 years to cater for the forecast increase in traffic volumes which will result from both the SIMTA development and the general growth in traffic passing through the study area. The regional road network is proposed to be augmented to cater for general traffic growth. The capacity improvements are proposed by the RMS on the M5 South-West Motorway (widening to three lanes each way between Camden Valley Way at Casula and King Georges Road at Beverly Hills).

The impact of other developments as cumulative traffic has been taken into consideration in the modelling exercise. Hyder's strategic model includes NSW Government's population and employment forecasts in the region sourced from BTS. The future growth also includes predicted container annual throughput from Port Botany and passenger growth in Sydney Airport. The planned freight distribution centres in Sydney have also been considered.

With the SIMTA proposal the container model forecasts reductions in truck trips to and from Port Botany and Eastern Creek. The modelling analysis suggests that the operation of SIMTA at Moorebank would have the potential to reduce the volumes of heavy vehicles movements along the M5 corridor by in the order of 2,700 movements per day. These heavy vehicle movements would be primarily redistributed to the west of M5/Moorebank interchange in Liverpool, part of South-West and Industrial West of Sydney. Beyond the core area, where the SIMTA heavy vehicle volume increases, it is generally by a small margin. The additional truck activity generated by the SIMTA proposal would be concentrated on key arterial roads such as M5 Motorway, Hume Highway and M7 Motorway.

6.10 Impact of SIMTA Proposal on Intersections

6.10.1 Core Area

The previous Section 5.5 identified impacts from future background traffic growth on five key intersections. In general, the additional traffic from the SIMTA site is expected to further reduce level of service (LoS) to those intersections being already identified as problematic. While some of these issues do not necessarily reflect an overcapacity situation for the entire intersection, for example during AM peak, further increase on the demand from SIMTA generated traffic have contributed to poor level of service.

Future network capacity is re-estimated for the five key intersections for 2031 for both the AM and PM peak hours with full SIMTA development traffic. Table 6-4 and Table 6-5 show the intersection performance (LoS) results for 2031 with full SIMTA development for the AM and PM peak hours respectively. Table 6-6 summarises the detailed network operational issues identified with the full SIMTA development. Screenshots from the Paramics models are shown to illustrate the location and nature of the issues identified.

The modelling results from Tables 6-4 and 6-5 suggest a poor LoS F particularly for the PM peak to all five intersections, from cumulative growth inclusive of the SIMTA development. Of that, SIMTA generated traffic is forecast to further contribute to poor LoS F (either AM or PM peaks) for the following roads and intersections:

- Moorebank Avenue between M5/Moorebank Avenue interchange and the SIMTA access. Capacity problem is forecast for both northbound and southbound movements on the Moorebank Avenue. The analysis suggested that Moorebank Avenue would require upgrading to four lanes when SIMTA site is fully developed.
- Concurrent with four lane widening on Moorebank Avenue, the Moorebank Avenue/Anzac Road intersection would require widening at approach roads.
- A new traffic signal at SIMTA's northern access with the Moorebank Avenue.
- A new traffic signal at SIMTA's southern access with the Moorebank Avenue.
- M5 Motorway/Moorebank Avenue interchange. The analysis suggested the need for additional capacity improvements in the form of widening at the following ramp locations including:
  - M5 westbound off-ramp;
  - M5 westbound on-ramp;
  - M5 eastbound off-ramp.

Section 8 describes detailed mitigation measures required when the SIMTA site is fully developed. The performance of proposed upgrade was tested and documented in Section 8.

Table 6-4 Level of Service Summary AM Peak (2031 Future Base Case with SIMTA)

Model :2031 AM with SIMTA					
Intersection	**Approach**	**Average Delay**	**LoS (Delay)**	**Average Delay**	**LoS**
Moorebank Avenue-Anzac Road (Signal)	North	102	F	71	F
	East	83	F		
	South	44	D		
	North - Slip Lane	4	A		
M5 Motorway-Moorebank Avenue (Signal)	North - Right Turn	33	C	49	D
	North - Through	32	C		
	East	55	D		
	South - Right Turn	31	C		
	South - Through	30	C		
	West	40	C		
	North - Slip Lane	13	A		
	East -Slip Lane	155	F		
	South - Slip Lane	65	E		
M5 Motorway-Hume Highway (Signal)	North	43	D	124	F
	East - Right Turn	251	F		
	South - Right Turn	163	F		
	South - Through	125	F		
	East - Left Turn	50	D		
	North - Slip Lane	66	E		
Moorebank Avenue-Heathcote Road (Signal)	North	15	B	152	F
	East	>300	F		
	South - Right Turn	88	F		
	South - Through	72	F		
Moorebank Avenue-Newbridge Road (Signal)	East - Through	>300	F	147	F
	East - Left Turn	>300	F		
	South - Right Turn	29	C		
	South - Left Turn	19	B		
	West - Through	127	F		
	West - Right Turn	60	E		

Paramics Model Code: 2031 AM_TZ022_Stg2_RevE

Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\3-2031 Stg2\2031 AM_TZ022_Stg2\2031 AM_TZ022_Stg2_RevE

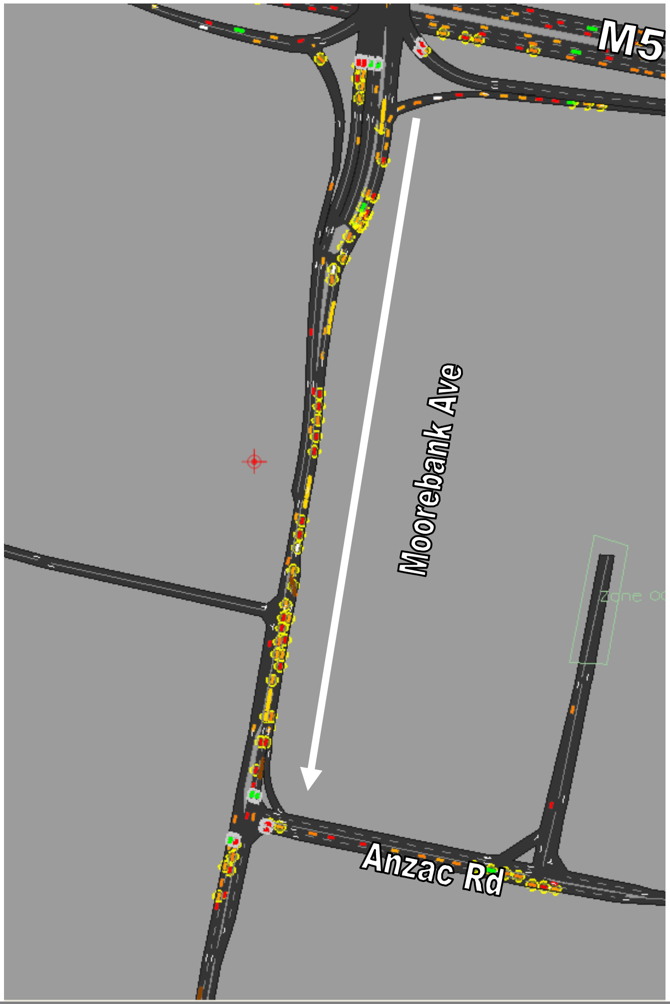
Table 6-5 Level of Service Summary PM Peak (2031 Future Base Case with SIMTA)

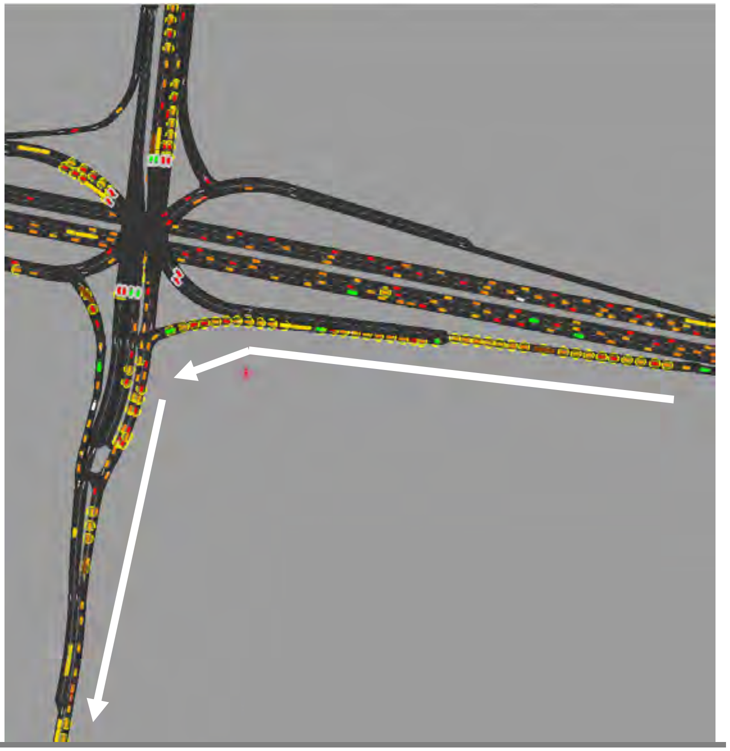
Model :2031 PM with SIMTA					
Intersection	**Approach**	**Average Delay**	**LoS (Delay)**	**Average Delay**	**LoS**
Moorebank Avenue-Anzac Road (Signal)	North	32	C	71	F
	East	105	F		
	South	120	F		
	North - Slip Lane	3	A		
M5 Motorway-Moorebank Avenue (Signal)	North - Right Turn	64	E	68	E
	North - Through	28	B		
	East	32	C		
	South - Right Turn	56	D		
	South - Through	53	D		
	West	36	C		
	North - Slip Lane	17	B		
	East -Slip Lane	30	C		
	South - Slip Lane	283	F		
M5 Motorway-Hume Highway (Signal)	North	74	F	111	F
	East - Right Turn	243	F		
	South - Right Turn	172	F		
	South - Through	72	F		
	East - Left Turn	86	F		
	North - Slip Lane	108	F		
Moorebank Avenue-Heathcote Road (Signal)	North	29	C	255	F
	East	>300	F		
	South - Right Turn	218	F		
	South - Through	231	F		
Moorebank Avenue-Newbridge Road (Signal)	East - Through	152	F	134	F
	East - Left Turn	143	F		
	South - Right Turn	71	F		
	South - Left Turn	78	F		
	West - Right Turn	217	F		
	West - Through	71	F		

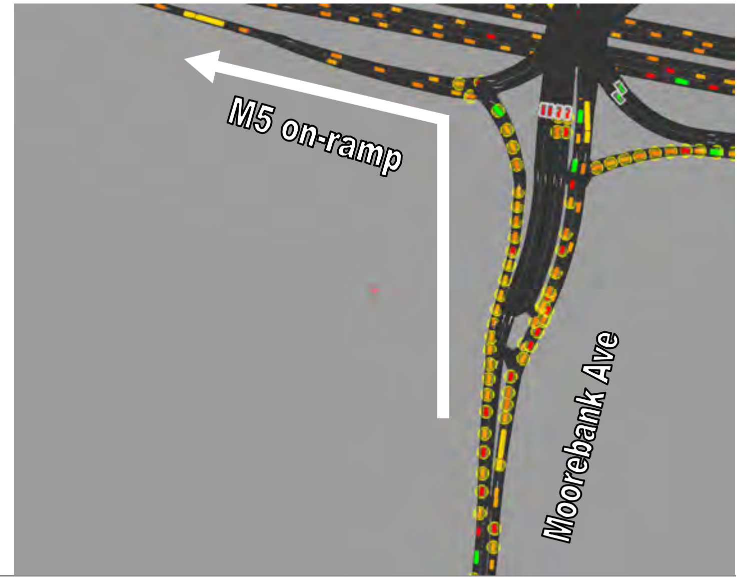
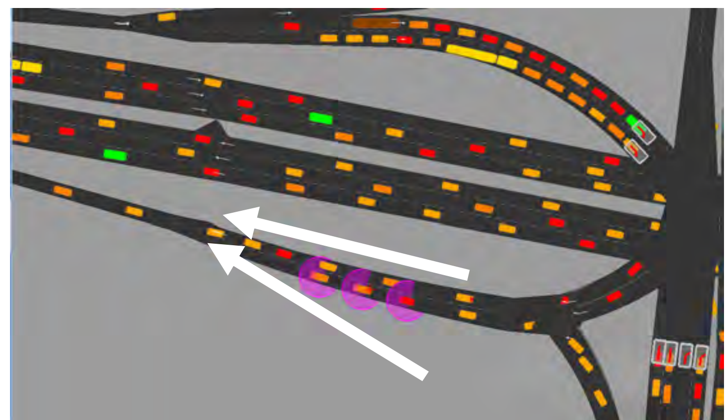
Paramics Model Code: 2031 PM_TZ022_Stg2_RevD

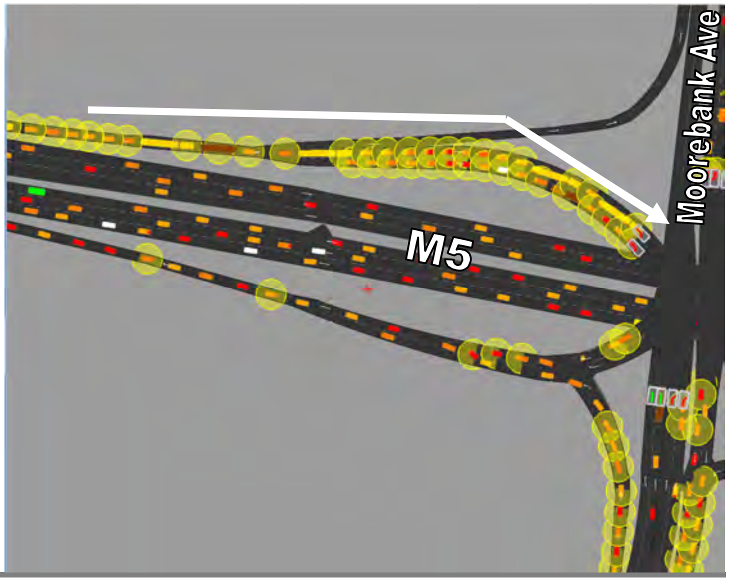
Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\3-2031 Stg2\2031 PM_TZ022_Stg2\2031 PM_TZ022_Stg2_RevD

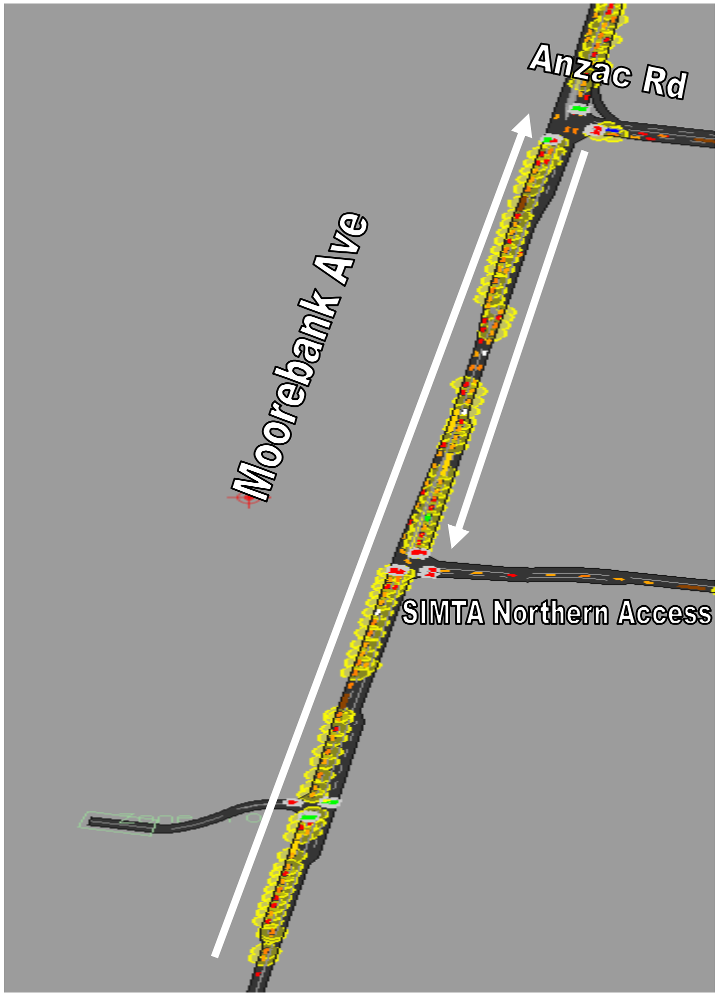
Table 6-6 Core Area Network Operational issue for 2031 Future Base Case with SIMTA Full Development

Intersection	Network operational issue	Paramics snapshot
Moorebank Avenue/Anzac Road	1) With full SIMTA development traffic, the model indicates long and extended queues on Moorebank Avenue (south of M5) in the southbound direction. The model forecasts a low LoS F. Long queues are predicted on Moorebank Av south of M5.	

Intersection	Network operational issue	Paramics snapshot
Moorebank Avenue/M5 Interchange	2) The traffic model indicates extended queues on the left turn slip lane from M5 westbound off-ramp onto Moorebank Avenue south. This operational issue was observed in both the AM and PM. The capacity constraint (one lane per direction) on Moorebank Ave also contributes the queues.	

Intersection	Network operational issue	Paramics snapshot
	3) The increased SIMTA traffic has predicted occasional queues along the left turn slip lane from Moorebank Avenue (south) onto the M5 westbound on-ramp. During the PM peak, queues from the left turn slip lane are likely to spill back to one lane section of Moorebank Avenue. This is likely to cause disruption and low speeds on Moorebank Avenue for traffic in the northbound direction. The predicted heavy vehicles from the SIMTA site are likely to contribute to longer queues as they need longer gaps and more time to accelerate.	
Moorebank Avenue/M5 Interchange	4) The traffic model indicates a capacity issue due to a two-lane to one-lane merge on the short section of the M5 westbound on-ramp, particularly during the PM peak.	

Intersection	Network operational issue	Paramics snapshot
Moorebank Avenue/M5 Interchange	5) The model indicates queues to the right turning vehicles from the M5 west into Moorebank Avenue (south). Queues are likely to spill back onto one lane section of M5 eastbound off-ramp.	

Intersection	Network operational issue	Paramics snapshot
Moorebank Avenue	6) The model indicates long queues between Anzac Road and SIMTA's northern Access. This was observed on Moorebank Avenue in the northbound direction (PM peak). The two through lane capacity on Moorebank Avenue is likely to contribute to the extended delays when the SIMTA site is fully developed.	

Paramics Model Code: 2031 AM_TZ022_Stg2_RevE, 2031 PM_TZ022_Stg2_RevD

6.10.2 Further Data Requested by RMS within Core Area

At the request of RMS, Hyder provided modelling results in Table 6-7 for five assessed intersections. The results are compared with and without SIMTA showing impact on delay and level of service. The relative contribution of SIMTA traffic at five intersections is also shown. The results are shown for 2031 for AM and PM peak traffic.

The analysis found SIMTA traffic contribution in the order of 23% to 25% to Moorebank Avenue/Anzac Road intersection. SIMTA traffic contribution to Moorebank Avenue/M5 Motorway interchange was found to be 16%. SIMTA traffic contributions were found between 2% and 3% to M5 Motorway/ Hume Highway, Moorebank Avenue/ Heathcote Road and Moorebank Avenue/Newbridge Road intersections.

When comparing the SIMTA impact in terms of intersection delays, the analysis showed a delay increase between 3% and 92% depending on the intersection locations and nature of existing congestion problems. In general, delays increase at a faster rate where intersections currently have a capacity problem.

The analysis has demonstrated that using delay as the only criteria for assessing the overall SIMTA impact is potentially misleading. The contributions of SIMTA traffic to overall intersection traffic volumes are also important consideration when assessing impact.

Table 6-7 Detailed Analysis on LoS Results – Core Area

Intersection	2031 AM Peak without SIMTA		2031 AM Peak SIMTA		Overall Delay Change	% SIMTA Traffic on Total Intersection Volume
	Overall Delay (sec/veh)	LoS	Overall Delay (sec/veh)	LoS		
2031 AM Peak						
Moorebank Avenue/Anzac Road	49	D	71	F	45%	23%
M5 Motorway/Moorebank Avenue	30	C	49	D	53%	16%
M5 Motorway/Hume Highway	120	F	124	F	3%	3%
Moorebank Avenue/Heathcote Road	103	F	152	F	48%	2%
Moorebank Avenue/Newbridge Road	144	F	147	F	2%	2%
2031 PM Peak						
Moorebank Avenue/Anzac Road	37	C	71	F	92%	25%
M5 Motorway/Moorebank Avenue	44	D	68	E	55%	16%
M5 Motorway/Hume Highway	75	F	111	F	48%	3%
Moorebank Avenue/Heathcote Road	205	F	255	F	24%	3%
Moorebank Avenue/Newbridge Road	124	F	134	F	8%	2%

Paramics Model Code: 2031 AM_TZ022_Stg2_RevE Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\3-2031 Stg2\2031 AM_TZ022_Stg2\2031 AM_TZ022_Stg2_RevE
Paramics Model Code: 2031 PM_TZ022_Stg2_RevD Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\3-2031 Stg2\2031 PM_TZ022_Stg2\2031 PM_TZ022_Stg2_RevD

6.10.3 Modelling Results on Moorebank Avenue between Helles Avenue and High Lane

Similar to the existing situation, key intersections on Moorebank Avenue between Helles Avenue and High Lane were re-analysed for 2031 future traffic with SIMTA. For a direct comparison, delay and LoS results without SIMTA is also included. Table 6-8 and Table 6-9 show AM and PM peak LoS results sourced from Paramics model for future 2031 traffic condition with and without SIMTA. The background traffic growth on this section of Moorebank Avenue would result in a poor LoS F to two intersections at Helles Avenue and Church Road in the PM peak. The LoS is predicted B and C in AM peak.

In the future, regardless of SIMTA, right turn volumes out of Moorebank Avenue into M5 Motorway (westbound direction) would increase. The capacity problem at this right turn would adversely impact the southbound through traffic on Moorebank Avenue. This would further impact traffic volumes out of nearby Helles Avenue and Church Road particularly in the PM peak.

The SIMTA impact to Moorebank Avenue north of M5 Motorway was found to be insignificant . The SIMTA site would not have an adverse impact on the Moorebank Avenue/Hells Avenue, Moorebank Avenue/Church Road intersections.

Table 6-8 Future LoS on Moorebank Avenue between Hells Avenue and High Lane – 2031 AM without and with SIMTA

Intersection	Approach	2031 AM Without SIMTA				2031 AM With SIMTA			
		Average Delay	LoS (Delay)	Average Delay	LoS	Average Delay	LoS (Delay)	Average Delay	LoS
Moorebank Avenue-Helles Avenue (Priority)	North	4	A	32	C	6	A	35	C
	South	1	A			1	A		
	West	32	C			35	C		
Moorebank Avenue-Church Road (Priority)	North	1	A	19	B	1	A	21	B
	East	19	B			21	B		
	South	3	A			4	A		
Moorebank Avenue-Industrial access (Signal)	North	9	A	16	B	14	B	18	B
	South	19	B			21	B		
	West	34	C			36	C		

Paramics model code: 2031 AM_TZ67_PDBC_29052013_1 Link: F:\AA003760\T-Traffic Modelling\Amended Concept Application_April13\Paramics Model\Models Run_May 2013\Re-Run 2031 BC Models

Paramics Model Code: 2031 AM_TZ022_Stg2_RevE Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\3-2031 Stg2\2031 AM_TZ022_Stg2\2031 AM_TZ022_Stg2_RevE

Table 6-9 Future LoS on Moorebank Avenue between Hells Avenue and High Lane – 2031 PM without and with SIMTA

Intersection	Approach	2031 AM Without SIMTA				2031 AM With SIMTA			
		Average Delay	LoS (Delay)	Average Delay	LoS	Average Delay	LoS (Delay)	Average Delay	LoS
Moorebank Avenue-Helles Avenue (Priority)	North	43	D	>300	F	43	D	>300	F
	South	1	A			1	A		
	West	>300	F			>300	F		
Moorebank Avenue-Church Road (Priority)	North	28	B	>300	F	35	C	>300	F
	East	>300	F			>300	F		
	South	7	A			10	A		
Moorebank Avenue-Industrial access (Signal)	North	44	D	20	B	47	D	29	C
	South	13	A			15	B		
	West	29	C			31	C		

Paramics model code: 2031 PM_TZ67_PDBC_29052013_1 Link: F:\AA003760\T-Traffic Modelling\Amended Concept Application_April13\Paramics Model\Models Run_May 2013\Re-Run 2031 BC Models

Paramics Model Code: 2031 PM_TZ022_Stg2_RevD Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\1- Hyder's Paramics\3-2031 Stg2\2031 PM_TZ022_Stg2\2031 PM_TZ022_Stg2_RevD

6.11 Impact of SIMTA Proposal outside Core Area

Future network capacity outside core area is re-estimated on RMS's State Road at eight key locations for 2031 for both AM and PM peak hours with full SIMTA development traffic. Table 6-10 summarises forecast intersection level of service with full SIMTA development on RMS's State roads and intersections. Detailed future network capacity issues with full SIMTA development are summarised in **Appendix B**.

The analysis found low impact to roads and intersections outside the core area attributable to the SIMTA development. Regardless of SIMTA, eight assessed intersections outside the core area would operate with a poor level of service either in the AM or PM peak period.

Table 6-10 Impact on road network with SIMTA – Outside Core Area

Forecast Intersection Level of Service (LoS) for 2031 Future Base Case with SIMTA – Outside Core Area				
Intersection	AM Peak		PM Peak	
	Overall Average Delay	LoS	Overall Average Delay	LoS
Hume Highway / Camden Valley Way	80	F	69	E
Hume Highway / Kurrajong Road	294	F	77	F
Hume Highway / De Meyrick Avenue	220	F	22	B
Hume Highway / Hoxton Park Road / Macquarie Street	96	F	112	F
Terminus Street / Speed Street	41	C	136	F
Newbridge Road / Nuwarra Road	75	F	404	F
Heathcote Road / Nuwarra Road	120	F	90	F
M5 Motorway / Heathcote Road	90	F	131	F

Paramics Model Code: 2031 AM_TZ070_PDStg2, Link: F:\AA003210\D-Calculations\Traffic and Modelling_POST DGR\Modelling\Paramics\3- Spreadsheets\1 LoS\Report\2031\SIMTA

6.11.1 Further Data Requested by RMS outside the Core Area

At the request of RMS, Hyder provided modelling results in Table 6-11 for eight assessed intersections. The results are compared with and without SIMTA showing impact on delay and level of service. The relative contribution of SIMTA traffic at the eight intersections is also shown. The results are shown for 2031 for AM and PM peak traffic.

The analysis found SIMTA traffic contribution to the assessed eight intersections outside core area to be less than 2%. When comparing the SIMTA impact in terms of intersection delays, the analysis showed a delay increase between 5% and 79% depending on the intersection locations and nature of existing congestion problems. In general, the delay increased at a faster rate where intersections currently have a capacity problem. The congestion problem on the regional road network outside core area contributed primarily to poor level of service and extended delays.

Table 6-11 Detailed Analysis on LoS Results – Outside Core Area

Intersection	2031 AM Peak without SIMTA		2031 AM Peak SIMTA		Overall Delay Change	% SIMTA Traffic on Total Intersection Volume
	Overall Delay (sec/veh)	LoS	Overall Delay (sec/veh)	LoS		
2031 AM Peak						
Hume Highway/Camden Valley Way	68	E	80	F	18%	0.4%
Hume Highway/Kurrajong Road	239	F	294	F	23%	0.8%
Humne Highway/De Meyrick Ave	189	F	220	F	16%	1.0%
Hume Highway/Hoxton Park Road/Macquarie Street	96	F	96	F	0%	2.3%
Terminus Street/Speed Street	39	C	41	C	5%	1.3%
Newbridge Road/Nuwarra Road	42	D	75	F	79%	0.8%
Heathcote Road/Nuwarra Road	103	F	120	F	17%	0.8%
M5 Motorway/Heathcote Road	52	D	90	F	73%	0.6%
2031 PM Peak						
Hume Highway/Camden Valley Way	63	E	69	E	10%	0.5%
Hume Highway/Kurrajong Road	71	F	77	F	8%	0.9%
Humne Highway/De Meyrick Ave	22	B	22	B	0%	1.6%
Hume Highway/Hoxton Park Road/Macquarie Street	108	F	112	F	4%	1.9%
Terminus Street/Speed Street	122	F	136	F	11%	2.1%
Newbridge Road/Nuwarra Road	373	F	404	F	8%	0.8%
Heathcote Road/Nuwarra Road	73	E	90	F	23%	0.5%
M5 Motorway/Heathcote Road	108	F	131	F	21%	0.8%

6.12 Impact on Crashes/Accidents

As discussed in Section 2.2.2, a five year period crash data was analysed for the period between 1 July 2004 and 30 June 2009. There were a total of 39 reported crashes on the section of Moorebank Avenue between the M5 Interchange and Chatham Avenue (about 2.1 km). This includes crashes on side roads within 10 m of Moorebank Avenue (including the M5 on/off ramps to and from Moorebank Avenue, but excluding crashes on M5 main link). This translates about 7.8 crashes per year and represents the existing condition.

If no improvements were made to Moorebank Avenue and associated key intersections, including M5 interchange, then the post development condition crash rate is forecast to increase to approximately 10.5 crashes per year. The predicted crash rate for the post development scenario, includes both car and heavy vehicles.

Section 8.1 of this report identifies proposed infrastructure upgrade works to improve the post development condition. The upgrade works proposed include widening of Moorebank Avenue to four lanes, new traffic signals at key access intersections and upgrade of M5 interchange at Moorebank Avenue.

Appendix C of the *RMS Accident Reduction Guide Part 1 – Accident Investigation and Prevention* (2004) provides guidance on forecast crash reduction for an undivided road (for example Moorebank Avenue):

- 30% reduction in intersection, adjacent approaches crashes.
- 30% reduction in u-turn related crashes.
- 30% reduction in rear-end crashes.
- 50% reduction in pedestrian crashes.

A typical crash profile for Moorebank Avenue (inclusive intersections and on /off ramps of M5 interchange) indicates that for every 100 crashes:

- 13 of these would be intersection, adjacent approaches crashes.
- 0.4 would be u-turn related.
- 37 would be rear-end crashes.
- 1.4 would be pedestrian crashes.

As such, applying these crash reduction percentages to a sample of 100 crashes would indicate an overall crash reduction of 15.8% associated with the proposed road improvements as outlined in Section 8.1.

When applying the 15.8% reduction (1.7 less crashes per year) to the 10.5 crashes per year derived above, reduces to approximately 8.8 crashes per year. As such, the net impact of the additional traffic induced by SIMTA, as well as the road network (and safety) improvements associated with the project would be a marginal increase from 7.8 crashes per year to 8.8 crashes per year.

The analysis demonstrated that the SIMTA proposal would not substantially increase the likelihood of crashes/accidents in the longer term.

7 TRAFFIC MANAGEMENT AND ACCESSIBILITY PLAN (TMAP)

7.1 Sustainable Travel Measures

Urbanhorizon Pty Ltd has undertaken a review of the public transport needs and opportunities for the SIMTA development. A Transport Management and Accessibility Plan (TMAP) approach has been adopted with a view to encouraging employees to travel to and from the site by modes other than the car. The key findings of the analysis are as follows:

There are a number of opportunities that can be targeted in the development of a sustainable transport plan for the terminal site, these include:

- The sites proximity to the higher order road network which connects to Liverpool and Holsworthy rail stations.
- Existing favourable walk mode shares comparable with those across Sydney.
- Car passenger mode shares higher than the Sydney and Liverpool averages which suggests a propensity towards public transport node drop-off and pick-up.
- Availability of commuter car parking at Holsworthy rail station.

Conversely, some of the constraints that will need to be overcome include:

- Existing low bus and train mode shares within the locality.
- Existing above average car ownership across Liverpool.
- Distances separating the development site from existing public transport nodes.
- Current inaccessibility to local and regional bus services.

7.2 Achieving a Favourable Public Transport Mode Share

An individual’s decision to use public transport or car or a combination for a particular journey is a function of many factors; car availability, relative travel times and costs, availability and cost of parking and other non-quantifiable factors. Adopting a laissez-faire approach to the development will more than likely see mode shares mimic those found elsewhere in southern and western Sydney. A proactive demand management approach is required whereby public transport use is encouraged by ensuring services and facilities are in place to offer a realistic alternative to the car. The design and layout of the terminal facility must facilitate public transport use.

Travel Demand Management (TDM) involves the application of strategies and initiatives to change travel behaviour and reduce travel demand, especially for car based trips to and from the proposed development. A TDM approach seeks to bring about more efficient travel patterns and travel choices by:

- Improving transport and trip making choices;
- Providing incentives to modify the choice of mode, travel times and the need for travel;
- Enhancing land use accessibility;
- Changing policies.

There are many benefits of a TDM approach:

- Reduces car based trip making;
- Reduces road traffic congestion;
- Allows total on-site car parking provision to be minimised and for land to be put to other uses;
- Encourages the use of less environmentally damaging modes such as walking, cycling and public transport;
- Health and fitness benefits through increased walking and cycling;
- Lessens the costs associated with car ownership and maintenance.

Achieving a favourable TDM outcome for the subject terminal site will require both infrastructure and non-infrastructure initiatives. Candidate initiatives include the following:

7.2.1 Infrastructure based TDM initiatives:

- Ensuring that the use of personal non-motorised transport is encouraged through appropriate warehouse layout/design and road intersection design.
- Designing and constructing the central spine road and other site roads to accommodate buses, bus infrastructure and cyclist use for employees.
- Construction of a covered bus drop-off/pick-up facility near the proposed Freight Management Office in the north sector of the site and another in the southern sector of the site to encourage the use of buses for access to and from the site.
- Review and rationalise the locations of 901 bus stops in the vicinity of the site to match the proposed northern terminal entry location and enhance accessibility.
- Monitor the need for additional bus priority at key intersections within and external to the site to accommodate the proposed bus service extensions forming part of the package of measures.

7.2.2 Non-Infrastructure based TDM initiatives:

- Reduce the total supply of car parking available to terminal employees on-site and dedicate some of the land to the two bus drop-off/pick-up facilities.
- Provide peak period and SIMTA shift work responsive express buses to/from the site and Liverpool Station via Moorebank Avenue and Newbridge Roads.
- Provide peak period express buses to/from the site and Holsworthy rail station via Anzac Road, Wattle Grove Drive and Heathcote Road.
- Extend Route 901 bus through the site via the light vehicle road.
- Increasing peak period Route 901 bus service frequencies (through the site) to better match the needs of existing and future employees of the locality as terminal development proceeds.
- The introduction of a travel behaviour change program for the terminal employees.
- Provide walkways and cycleways through the terminal site linking with the proposed on-site bus facility.
- Initiate a marketing and awareness campaign for all new employees on the site and in the locality to promote the TDM initiatives including:

- Bus services linking to Liverpool and Holsworthy stations.
- Walking and cycling facilities linking to bus stops.

- Adopt a proponent designed and funded car sharing scheme.

7.2.3 Park and Ride

The location of the site in relation to Holsworthy and (to a lesser extent) Liverpool rail stations is such that park and ride should form a legitimate part of a public transport plan for the site. The Transport Construction Authority (TCA) has been implementing a commuter car park and interchange program over recent years. A new 520 space commuter car park was opened at Holsworthy Station in December 2009 in recognition of the high demand for park and ride at this station.

In 2004, 76% of all persons accessing Holsworthy station did so by car, 55% parking at the station before boarding a train. Only six stations had higher car parking access mode percentages that year. Recent data for mode access to Liverpool station is not available, however, in 1995, almost 40% of all persons accessing Liverpool station did so by car, 21% being passenger drop-offs at the station. There are no plans to encourage greater park and ride to Liverpool station through the provision of additional commuter car parking.

7.3 SIMTA Employee Mode Share Target

The State Plan targets aim to increase the public transport share of commuter trips across Sydney from the current 24% to 28% by 2016, a 4% increase. A 4% increase across Sydney is an ambitious target and one that relies on developments such as that proposed for Moorebank pursuing a TDM approach. The comparatively higher than average car based mode shares in the Liverpool area and the inaccessibility of the development site require that the TDM package for the site target an ambitious development specific mode share shift. In order to ensure the viability of a weekday express (an all stops or limited stops service is unlikely to be patronised by employees as it will not deliver travel times better than or similar to the private car) bus service to and from Liverpool and Holsworthy stations, a public transport mode share of at least 30% should be targeted.

If, at full development, 30% of all employees working on the site, used a bus to access Liverpool and Holsworthy rail stations, this would equate to about 680 employees. The benefits of achieving such a mode share target would be as follows:

- 680 fewer AM and PM peak car trips to and from the terminal site.
- It would reduce the total on-site car parking provision by about 680 car spaces (subject to Council approval and compliance with relevant planning instruments, see Section 8.5), equivalent to about 15,000 square metres or 1.5 hectares of site area which could be put to more productive use.
- It would provide the patronage required to support the viability of the express bus services proposed.
- It would take pressure off the already well patronised commuter car parking facilities at Holsworthy rail station.

Assuming the majority (75%) of employees would have an origin (AM) and destination (PM) at Liverpool station, about 9 or 10 buses would need to depart the station in the morning peak 2 hours to accommodate likely patronage under a 30% scenario. Three to four buses would be required to accommodate the remainder of employees travelling to the site from Holsworthy station. **Appendix A** includes detail analysis on sustainable travel measures for the SIMTA site.

7.4 On-site Management

The operation of the site is likely to involve a number of different lessees, operating independently but with similar objectives. A broader site traffic management plan should be developed to control the traffic on-site, which includes:

- Site entries will be managed to ensure security of containers, their contents and site staff. Measure will be in place to ensure that unauthorised persons or vehicles will not be able to access the site.
- Appropriate traffic management measures to control the arrival of authorised vehicles so that queuing is minimised and vehicles are directed to their destination within the Terminal.
- The controls would be extended to staff and visitors as required to control access and to maintain appropriate security, particularly for bonded or quarantined material.
- Other measures such as short range radios, GPS and wireless communications will be provided to maximise the efficiency of access and the circulation of vehicles, goods and staff within the SIMTA site.

7.5 Parking Provision

The RMS *Guide to Traffic Generating Developments* provides indicative parking and trip generation rates for a range of land uses including warehouses. The rates are based on developments that are not reflected in the actual operation of the subject SIMTA development. The RMS Guide has discussed Transport Terminals but does not provide guidance on car parking. The parking requirement for warehouses is one space per 300m^2 GFA.

The Council's Development Control Plan DCP 2008 Part 1.2 identifies the parking requirement for warehouses as one space per 75m^2 LFA or one space per two employees, whichever is greatest. The office component of a warehouse is to have one space per 35m^2 LFA. One per cent of spaces are to be for mobility impaired use. There is no specific provision for Transport Hubs.

The parking rates documented in RMS's and Liverpool Council's Guidelines may not be used directly for SIMTA site as it does not take into account the likely shift work or the nature of the Intermodal development, where employment and hence parking demand depend entirely on the proposed activities within the warehouses and rail terminal.

The Concept Plan for SIMTA is proposed to provide up to 1,800 parking spaces. When the SIMTA site is fully developed the analysis has determined about 2,258 staff be required for each weekday spread across the site normal operating hours (depending on the success of the proposed TDM initiatives and the 30% public transport mode share target). The analysis assumed that SIMTA (terminal warehouses) will operate in two shifts over part of the day. It is expected that the first shift will start prior to 07:00 and finishing around 16:00. The second shift would start at around 16:00 and finish after 12:00 midnight. Actual start and finish times is expected to be staggered to spread out parking and traffic demand.

The majority of office and ancillary staff would work during the normal working hours, with some staff required to support early morning and late evening shifts.

Retail facilities will mainly be services such as food outlets and convenience stores for other staff. The facilities will be required to provide services during each of the main warehouse shifts.

It is expected that shift start and finish times will be varied to ensure that overlapping of shifts is minimised and parking demand is spread across the day.

Further parking assessment should be undertaken as the development progresses stage by stage.

8 NETWORK IMPROVEMENTS AND MITIGATION MEASURES

The road network will need to be developed progressively over the next 20 years to cater for the forecast increase in traffic volumes which will result from both the SIMTA development and the general growth in traffic passing through the study area. The regional road network is proposed to be augmented to cater for general growth. The capacity improvements are proposed by the RMS on the M5 South-West Motorway (widening to three lanes each way between Camden Valley Way at Casula and King Georges Road at Beverly Hills). Major work on the M5 West widening project commenced in August 2012. When completed, the project will reduce travel time for motorists using the motorway and surrounding roads and support planned residential and employment growth in south-west Sydney. The project is expected to be completed in late 2014.

8.1 Infrastructure Upgrade

Hyder's study identified the road capacity improvements required to cater for the traffic demands from both background growth and additional traffic generated by SIMTA when the site is fully developed. This investigation reviewed existing infrastructure and then identified the need for road and intersection upgrades. The study identified the following road network improvements that would be required by 2031 when the SIMTA site is fully developed:

- Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue grade separated interchange and the Southern SIMTA site access. Some localised improvements will be required around central access and southern access points;
- Concurrent with four lane widening on Moorebank Avenue, the Moorebank Avenue/Anzac Road signal will require some form of widening at the approach roads;
- A new traffic signal at SIMTA's northern access with Moorebank Avenue. This traffic signal is proposed to be shared with the new DNSDC site.
- A new traffic signal at SIMTA's southern access with Moorebank Avenue. This traffic signal will only allow exit from the terminal to Moorebank Avenue in the northbound direction.
- The central access currently being used by DNSDC will be retained for SIMTA access.
- Potential upgrading works at the M5 Motorway/Moorebank Avenue grade separated interchange to cater for both background and additional SIMTA traffic growth.

Following the TfNSW and RMS's response to the Concept Plan application, Hyder have updated the upgrading works proposed at M5 Motorway / Moorebank Avenue interchange. Previously, ramp metering was proposed for M5 westbound on-ramp. This has now been removed from the proposed upgrade lists. Other upgrading works proposed previously would remain unchanged. The level of service results provided by the proposed upgrading works is summarised in Section 8.1.1.

Table 8-1 below shows proposed upgrading works at M5 Motorway/Moorebank Avenue grade separated interchange.

Figure 8-1 shows indicative locations of proposed upgrade works.

Table 8-1 Proposed Upgrading Works at M5 Motorway/Moorebank Avenue Interchange

Location	Potential Upgrade Works	Assessments
M5 westbound off-ramp	Provide one additional short lane. New traffic signals at left turn slip lane (from east).	The proposed widening of left turn slip lane would provide adequate capacity for left turning vehicles from M5 (east) into Moorebank Avenue (south). This improvement is required to mitigate impact from SIMTA generated traffic increase. Currently, short left turn slip lane is under give way control. A new traffic signal is proposed to improve vehicle operation and pedestrian safety as well. The improvement is shown by number 1 in Figure 8-1.
M5 westbound on-ramp	Provide one additional short lane. New traffic signals at left turn slip lane (to west). Provide additional capacity on M5 westbound on-ramp.	The proposed widening of left turn slip lane would provide adequate capacity for left turning vehicles from Moorebank Avenue (south) into M5 (west). This improvement is required to mitigate impact onto SIMTA generated traffic increase. Currently, short left turn slip lane is under give way control. A new traffic signal is proposed. Currently, M5 westbound on-ramp has two lane short sections prior to merge into one lane. Additional widening is proposed on M5 westbound on-ramp. The improvement is shown by number 2 in Figure 8-1
M5 eastbound off-ramp	Widening M5 eastbound off-ramp. The widening includes: ▪ Provide additional right turn from current 2 lanes to 3 lanes. ▪ Increase the length of current single left turn lane. ▪ Widening Moorebank Avenue southbound carriageway to three through lanes	Provide additional third right turn lane to increase the stacking capacity and reduce queue length for the right turning vehicles from M5 (west) to Moorebank Avenue (south). This improvement is required to mitigate impact from SIMTA generated traffic increase. To work this option, the exit approach on Moorebank Avenue (south) is required to widen into three lanes. The current M5 eastbound exit divergence is one lane. The proposed widening of two lanes is expected to provide additional capacity to accommodate future demand. The improvement is shown by number 3 in Figure 8-1
Moorebank Avenue northern approach	Increase the length of the existing (two-lane) right turn bay	In the future background traffic growth is expected to reduce capacity of right hand turn movement from Moorebank Avenue southbound regardless of SIMTA proposal. It is proposed to extend right turn bay providing additional capacity. The proposed upgrade is expected to reduce disruption to the southbound through traffic on the Moorebank Avenue. The improvement is shown by number 5 in Figure 8-1

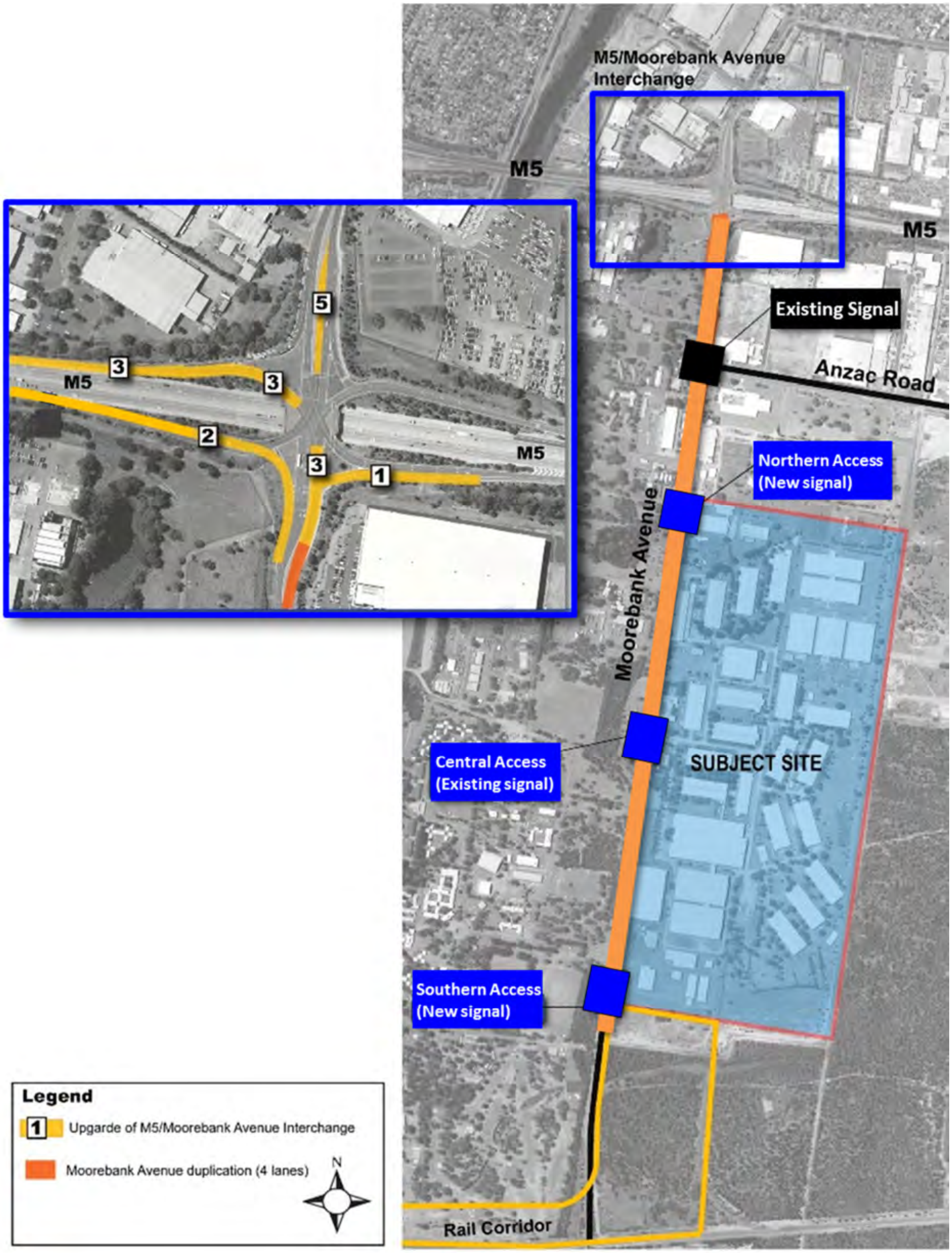


Figure 8-1 Proposed Upgrading Works

When allowance is made for all potential improvements surrounding the SIMTA site that impact on access to the external and local road system, it is evident that traffic management measures will need to be introduced. The package of traffic management measures described in this section will deliver adequate capacity to road network until 2031. The traffic management measures have a finite capacity and all reasonable steps should be taken to ensure that new developments provide walk, cycle and public transport use.

The timing of the individual road and intersection capacity improvements would depend on a number of factors, but the prime factor would be the rate of development within the SIMTA site. A staged approach would be required as development progresses across the site.

8.1.1 Level of Service Results of Proposed Infrastructure Upgrade

In addressing the TfNSW and RMS's issues identified in their response to the Concept Plan application, Hyder has undertaken a new Paramics scenario (*Improved* case) assuming all proposed upgrades are in place. The analysis was undertaken for 2031 for both AM and PM peak. The upgrading works documented in Section 8.1 formed the basis of improved case modelling.

At the request of RMS, Hyder has also prepared sketch plans of the proposed upgrade at following locations:

- M5 Motorway / Moorebank Avenue surface road intersection;
- Moorebank Avenue / Anzac Road intersection;
- Moorebank Avenue / Northern SIMTA Access;
- Moorebank Avenue / Central SIMTA Access; and
- Moorebank Avenue / Southern SIMTA Access.

Appendix F includes the sketch plan of the proposed upgrade.

Table 8-2 summarises forecast intersection level of service for both AM and PM peak for improved case network in 2031.

The upgrading works proposed on Moorebank Avenue at M5 Motorway and Anzac Road intersections would improve the level of service in 2031. The Anzac Road intersection would provide LoS C and D with proposed upgrade in place.

The proposed improvement at Moorebank Avenue interchange would provide LoS C in AM peak and LoS E in PM peak in 2031. The improvements in LoS results are attributable to the proposed upgrade. The high traffic growth predicted on M5 Motorway after widening has potential to offset the improvement tested at Moorebank Avenue interchange particularly in the PM peak. The M5 mainline traffic has been found to be the dominating factor and influenced largely to "on ramp" traffic performance particularly from Moorebank Avenue in PM peak. Hyder has tested a PM peak scenario with reduced growth of 2% per annum on M5 Motorway after widening. The LoS result at Moorebank Avenue interchange is predicted LoS D in PM peak with proposed upgrade in place. Should traffic growth assumed on M5 Motorway after widening requires longer time than assumed in traffic model, the proposed improvements in 2031 would provide better level of service than predicted by traffic model.

There is a need for RMS to monitor actual traffic growth on M5 Motorway after widening is complete.

The proposed traffic signals on Moorebank Avenue with SIMTA access(s) would provide LoS A and C in 2031. The result demonstrated that four lanes upgrade proposed on Moorebank Avenue and associated turning bays at all three access points would provide acceptable level of service.

Table 8-2 Intersection LoS Results – 2031 *Improve* Case

Intersection	AM Peak		PM Peak	
	Overall Average Delay	LoS	Overall Average Delay	LoS
Moorebank Avenue-Anzac Road (Signal)	41	C	52	D
M5 Motorway-Moorebank Ave (Signal)	34	C	66	E
Moorebank Ave-Northern Access (Signal)	13	A	16	B
Moorebank Ave-Central Access (Signal)	21	B	41	C
Moorebank Ave-Southern Access (Signal)	16	B	12	A

Paramics model code: 2031 AM_TZ070_Stg2_Improved_29052013_1 Link: F:\AA003760\T-Traffic Modelling\Amended Concept Application_April13\Paramics Model\Models Run_May 2013\Improved Scenarios_May 2013

Paramics model code: 2031 PM_TZ070_Stg2_Improved_29052013_2 Link: F:\AA003760\T-Traffic Modelling\Amended Concept Application_April13\Paramics Model\Models Run_May 2013\Improved Scenarios_May 2013

8.2 Sensitivity Analysis Using Aurecon's Trip Generation

In addressing the TfNSW and RMS's issues identified in their response to Concept Plan application, Hyder has undertaken a sensitivity analysis using truck trip generation assumptions documented in "Intermodal Freight Terminal Traffic Generation Rates" report, dated 30 August 2011, prepared by Aurecon. RMS provided a copy of Aurecon report to Hyder for review, which was completed since the completion of the previous application.

There is a significant difference in the assumed container movement and distribution between the two studies, based on the anticipated site operation. The Aurecon study assumes a mix of "domestic and maritime" rail movements, while SIMTA considers a port-shuttle freight rail service to and from Port Botany.

For the purpose of traffic impact assessment, Table 8-3 below shows predicted truck movements in morning and afternoon peak hour between the two studies. The peak hour truck generation is critical to determine the infrastructure upgrade requirements, hence showed in Table 8-3 In general, SIMTA assumed higher trip generation rate than Aurecon when estimated articulated truck generation. Conversely Aurecon assumed a significantly higher trip generation rate for rigid truck/general freight for warehousing. When compared in one peak hour, Aurecon truck trip prediction is almost double that of the SIMTA prediction.

Table 8-3 Truck trip generation assumptions (SIMTA vs. Aurecon)

Truck Generation Assumptions	SIMTA	Aurecon Study	Impact (relative to SIMTA)
Total container movements (TEU)	1,000,000	1,000,000	Similar TEU have been adopted for the comparison.
Backload percentage	30%	10%	A small increase in trip generation
Container Movement Trip Rate Articulated vehicles (TEU / trip)[1]	2.08[2]	1.9	SIMTA assumed higher than Aurecon rate for articulated vehicle trips.
General Freight Movement Trip Rate Rigid vehicles (TEU / trip)[3]	1.26[4]	0.3	Aerecon assumed a significantly higher trip generation rate for warehousing.
Peak period truck trips (in 1hr)			
AM Truck trips (1 hr)[5]	203	564	In AM peak, truck trips as per Aurecon rate is about 361 more trips than SIMTA.
PM Truck trips (1 hr)[6]	245	500	In PM peak Truck trips as per Aurecon rate is about 255 more trips than SIMTA.

Notes:

1. Articulated vehicle relates to container trips.
2. Implied factor, i.e. 1.6 TEU per container * 1.3 containers per truck
3. Rigid vehicle (general trucks) trip rate is applied to trips associated with the internal warehouse
4. Implied factor, i.e. 1.6 TEU per container * (12.66 tonnes / 10 tonnes per truck)$^{-1}$

5 and 6. The Aerocon study did not provide peak one hour distribution from two hours in AM and three hours in PM. Instead Hyder has used 50% for AM peak one hour from two hours. The split was 33% for one hour PM peak from three hours.

Source: Table 8, Intermodal Freight Terminal Traffic Generation Rates" report, dated 30 August 2011, prepared by Aurecon. RMS provided a copy of Aurecon report to Hyder

Regardless of key differences in site operation, Hyder has tested the workability of the proposed upgrade using higher truck trip generation rates from Aurecon study. A sensitivity analysis was undertaken using truck volumes from Aurecon study for one million TEU. The employee car traffic was assumed to be as per SIMTA assumption for full development. The sensitivity analysis was undertaken in 2031 for both AM and PM peak.

Hyder’s sensitivity analysis has found that a proposed four lane upgrade on Moorebank Avenue will accommodate additional trucks in AM peak should a higher truck trip generation according to Aurecon prediction is achieved. The capacity of Moorebank Avenue in PM peak (northbound direction) will be influenced by the traffic performance of M5 Motorway/Moorebank Avenue interchange particularly the “on ramp” from Moorebank Avenue in the westbound direction.

The upgrading works proposed at M5 Motorway/ Moorebank Avenue interchange is likely to provide acceptable capacity in AM peak. However, the proposed upgrade is unlikely to work in PM peak with higher truck generation in 2031.

It is recommended that an actual truck trip generation survey from SIMTA site is undertaken after 24 months of operation of the terminal. There is a need to validate truck traffic generation prediction as SIMTA site is developed progressively.

8.3 Staging of Proposed Upgrade and Potential Triggers Point

8.3.1 Indicative Development Staging

It is expected that the SIMTA site will be developed in stages. Each phase of the staging will determine the detailed access requirements, internal roads/intersections and then determine the internal road and intersection capacity needed to service the demand from the site. An annual operating capacity of one million TEU is anticipated in the ultimate development stage.

An indicative development staging is shown in Table 8-4.

Table 8-4 Indicative Development Staging

Stage	Scope	Timing
Stage 1 – *Construction of the intermodal terminal and rail link*	Stage 1 shall include: Construction of the rail link between the SIMTA site and the SSFL. Construction of hardstand for container storage. Possible construction of a control tower. Construction of a truck maintenance shed. Construction of access driveways, freight truck loading area and internal circulation roads required to service the intermodal terminal. Provision / upgrade of stormwater infrastructure and utility services required to service the intermodal terminal. Landscaping to Moorebank Avenue boundary. Possible construction of some warehousing.*	Construction commencement: End - 2014 Completion: Mid-2015
Stage 2 – *Construction of warehouses and distribution facilities*	Stage 2 shall construct the central portion of the intermodal terminal warehousing and distribution facilities and the south-eastern portion of the Large Format Warehousing and Distribution Facilities, including: Circulation roads required to service the proposed warehouses. Staff and visitor car parking spaces required to service the proposed warehouses. Landscaping treatments within the development areas. Provision / upgrade of stormwater infrastructure and utility services required to service the Stage 2 warehouses.	Commencement: Subject to market demand Completion: Mid-2019

Stage	Scope	Timing
Stage 3 – *Extension of the intermodal terminal and completion of warehouses and distribution facilities*	Stage 3 (the final stage) shall include: Extension of the intermodal terminal from 650 metres to 1,200 metres in length. Construction of the remaining warehouse and distribution facilities. Construction of the ancillary terminal facilities in the north-east corner of the site. Completion of the circulation roads. Staff and visitor car parking spaces required to service the additional warehouses. Completion of the landscaping treatments. Provision / upgrade of stormwater infrastructure and utility services requires to service the additional warehouses.	Completion: Mid-2022

In addressing the TfNSW and RMS's issues identified in their response to concept plan application, Hyder has prepared an indicative staging program and potential trigger points (in TEU thresholds) of proposed road works.

Table 8-5 summarised indicative staging program and associated TEU thresholds of proposed road infrastructure works.

Table 8-5 Indicative Staging Program and TEU Thresholds

Item No	Description	Indicative TEU Thresholds
1	Central Access traffic signal. SIMTA will retain existing traffic signal at current DNSDC site. The existing traffic signal would provide central access terminal entry and exit. In conjunction with that, a left in only access will be constructed on Moorebank Avenue for truck entry immediately (about 20 metres) south of Central access,	Prior to Stage 1 development. Approximately 250,000 TEUs.
2	Terminal Exit Point (southern access). Provide a new traffic signal approximately 750 metres south of SIMTA Central access.	Prior to Stage 1 development. Approximately 250,000 TEUs.
3	As part of the DNSDC relocation (Defence Logistics Transformation Program works in Moorebank[2]), there will be a new traffic signal on Moorebank Avenue approximately 300 metres south of the existing traffic signal at Anzac Road. SIMTA proposes to share the traffic signal with DNSDC. The new traffic signals would also provide northern access (entry/exit) to the warehousing and distribution areas.	Further discussion will be held with DNSDC to determine access sharing arrangement of the northern access.
4	Widen Moorebank Avenue to four lanes (2/2).	Between 250,000 and 500,000 TEUs during Stage 2 developments.
5	Upgrade Moorebank Avenue/Anzac Road traffic	Concurrent with Moorebank Avenue widening

	signals.	(item 4).
6	Potential upgrade works at the M5 Motorway/Moorebank Avenue grade separated interchange.	Following the completion of Stage 2. Between 500,000 and 1 million TEUs subject to further investigation after M5 West Widening Project is complete[1].

Note:

(1) The proposed M5 West widening would expand the South-West Motorway from two to three lanes in each direction generally from Camden Valley Way to King Georges Road. This would reduce travel time for motorists using the motorway and surrounding roads. Major work on the M5 West widening project commenced in August 2012. The project is expected to be completed in late 2014. There is a need that RMS monitors traffic growth on M5 Motorway near Moorebank after widening is complete.

(2) Construction at the site commenced in December 2012 and is planned to be completed in late 2014, March 2013 Construction Update, Department of Defence.

8.4 Public Transport Services

The following measures are designed to influence and change travel behaviour to bring about sustainable travel to and from the development site. The costs of these measures are likely to be such that a staged approach would be required as development progresses across the site. The staging below assumes that development will occur over a 20 year period.

8.4.1 Non-Infrastructure Measures

A travel behaviour change program comprising a Moorebank Intermodal Terminal Facility car sharing scheme and marketing and awareness campaign will need to be implemented in the early phases of the development. The marketing and awareness campaign will embrace the following:

- Information explaining that a package of measures to support travel by modes other than just car will be implemented in a staged manner over time.
- Travel information on both a specific Moorebank Intermodal Terminal Facility website and Liverpool Council's website including a description of the measures to be put in place in the short, medium and longer term.
- Regular marketing and promotion campaigns and events designed to influence the mode choice of employees by better understanding their travel needs.
- The operators on the site will be encouraged to implement a Workplace Travel Plan for its employees to encourage and enable employees and visitors to take advantage of modes other than just car for trips to and from the site. Workplace travel planning information is available on the NSW Premier's Council for Active Living (PCAL) Website.
- An aggressive campaign to both promote the express bus services linking the site to the rail network at Liverpool and Holsworthy rail stations and communication that on-site car parking provision for employees will be limited.
- Consideration of the imposition of pay and display parking for all day employee parking in conjunction with the introduction of parking time restrictions on streets external to the terminal site.
- Car sharing databases will need to be prepared and maintained.
- A bicycle loan scheme will be required for movement across the terminal site.

Bus Travel

The above non-infrastructure short term measures will need to be supported by one or more infrastructure measures designed to influence travel behaviour change for employees from day one. Having regard to the findings of the above TZ review, the provision of a peak express bus service to and from Liverpool Station via Moorebank Avenue and Newbridge Roads will be important. The service will need to be funded by the proponent and would need to provide travel times of less than 10 minutes between the site entry and station.

In order to achieve the ambitious mode shares it will be necessary to provide high service frequencies of not greater than 10 minutes in the AM and PM peak periods and at appropriate shift change over times. That is, in the AM peak (6-9am) as employees travel to the terminal site, a bus will need to depart the station every 5-10 minutes. Similarly, in the PM, return buses will need to operate on a 5-10 minute frequency or better. Outside the peaks, bus service frequencies of 30 minutes should be maintained. This measure may need to be supported by targeted bus priority measures at key intersections which can be monitored over time (see Figure 8-2).

Supporting a bus service during the early phases of development will be challenging and will necessitate proponent intervention and funding. For illustration purposes assume in the early phases there are 1,000 employees active on site all of whom could take public transport. If 30% or about 300 of these workers travelled by bus then it would require about 6 or 7 buses in the AM and PM peaks, and at shift change over times. This would grow over time as indicated above and depending on the split of demand between Liverpool and Holsworthy rail stations.

Rail Capacity

Liverpool station is located on the Southern Line. RailCorp data reaffirms that in March 2010 the average load factor (rail seats to passenger ratio) was about 125% between 7:50 and 8:50am. Given that a larger proportion of the terminal workers will choose to travel to and from the site outside the network peaks, the Southern line is expected to be able to accommodate the growth in demand generated by the ambitious public transport mode share target. Similarly, the East Hills line had average load factors above 100% between 7:50 and 8:50am but has the capacity to absorb the extra demand generated by the terminal development on the shoulders of the peak periods.

8.4.2 Possible Long Term Measures

In the longer term there may be the opportunity to introduce a cross regional Metro bus service that uses the M5 Motorway and deviates to access the terminal site and other nearby demand generators. Deviation of the existing M90 services from Newbridge Road would not be feasible.

8.4.3 Cumulative Mode Share Benefits

The combined impact of the bus and rail focussed measures will be to achieve terminal site specific mode share increases above those applying across Liverpool at the moment. A terminal employee public transport mode share shift of about 30% is considered feasible. If a reasonable proportion of employees work within the region, then substantial trip reduction benefits can be achieved. This could manifest itself in a 2-3% increase in walk mode share at the expense of car based trips.

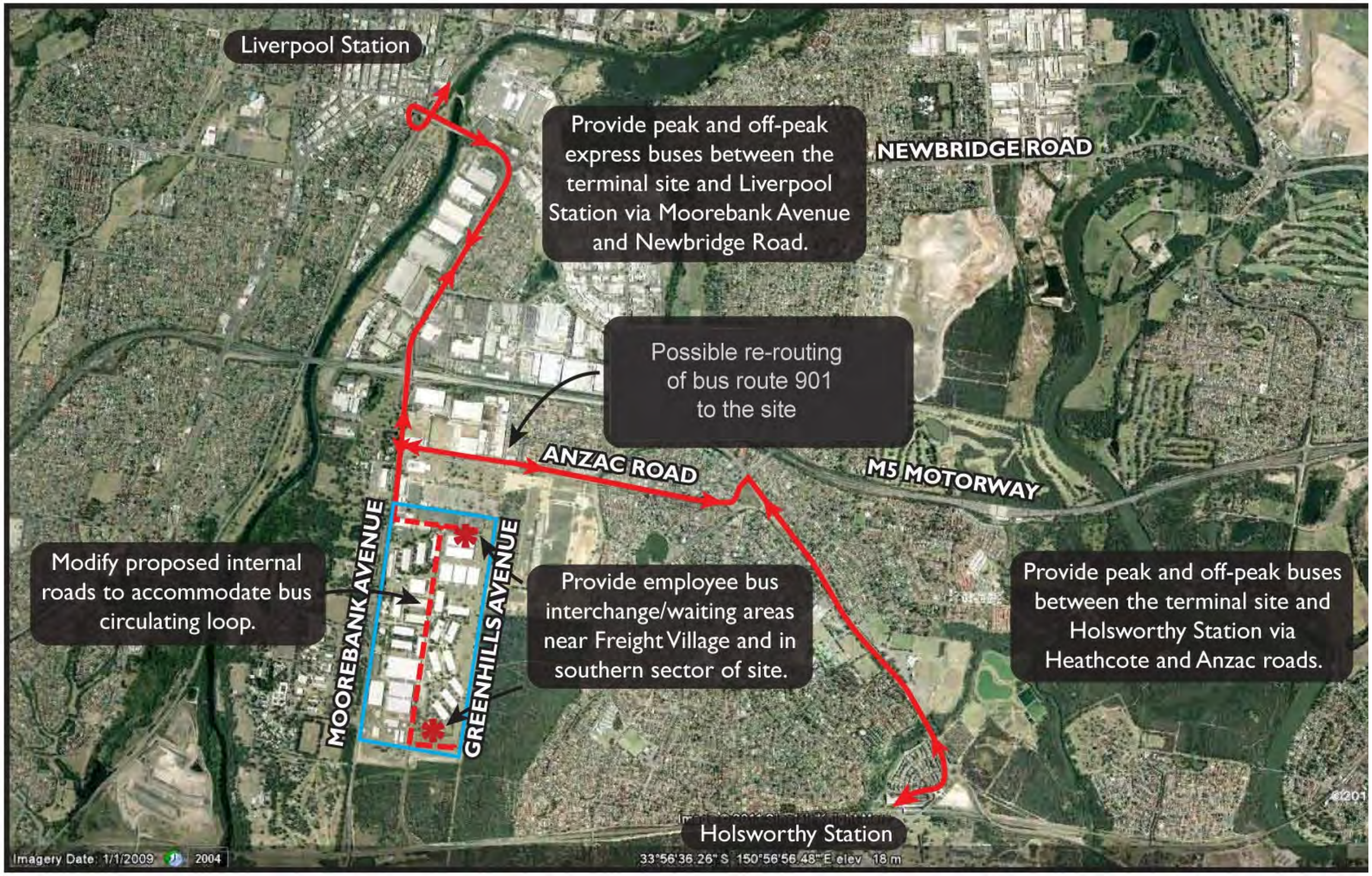


Figure 8-2 Suggested Package of Public Transport Related Measures

Source: Urbanhorizon Pty Ltd

8.5 Summary of Public Transport Measures

A Travel Demand Management (TDM) approach involving the application of strategies and initiatives to change travel behaviour and reduce travel demand is recommended for the development site. A suggested package of measures is shown in the following Table 8-6.

Table 8-6 Suggested Public Transport Measures

Measure	Summary
Measure 1 – Travel behaviour change program	Various measures including marketing, promotion campaigns, events and Workplace Travel Plans designed to influence the mode choice of individuals by better understanding their travel needs.
Measure 2 – Reduce On-Site Car Parking Supply	Reduce proposed on-site employee parking by up to 680 spaces.
Measure 3 – Liverpool Station Express Bus Services	Provision of a peak and shift change over time express bus service to and from Liverpool Station via Moorebank Avenue and Newbridge Road.
Measure 4 – Holsworthy Station Express Bus Services	Provision of a peak and shift change over time express bus service to and from Holsworthy Station via Anzac and Heathcote Roads.
Measure 5 – Bus Interchange/Waiting Area	Provide an employee bus interchange/waiting areas within the site.
Measure 6 – Bus Priority Works	Bus priority measures at key intersections as required.
Measure 7 – Walking and Cycleways	Shared or separate walking and cycle paths connecting the warehousing areas to the employee bus interchange/waiting areas and to the Moorebank Avenue bus stops.
Measure 8 – Extend Route 901 Bus	Extend Route 901 bus services to traverse the northern sector of the site.
Measure 9 – Glenfield Station to Liverpool Station Shuttle Bus through Moorebank Avenue	Operate a Glenfield Station to Liverpool Station Shuttle Bus through Moorebank Avenue serving the development.
Measure 10 – Rationalise Route 870, 871 and 872 bus	Subject to funding and consultation, rationalise routes 870, 871 and 872 (all travelling Campbelltown to Liverpool via Glenfield and Cross Roads). This could potentially involve discontinuing the 871 service, increasing the frequency of the 872 service and rerouting the 870 service to operate via Moorebank Avenue.

9 SUMMARY OF FINDINGS

This Traffic and Transport study has been prepared by Hyder Consulting Pty Ltd (Hyder) to accompany a Part 3A Concept Plan Study Requirements for the planned Moorebank Intermodal Freight Terminal (SIMTA proposal).

The SIMTA site, approximately 83 hectares in area, is currently operating as a Defence storage and distribution centre.

SIMTA Proposal

The SIMTA site is located in the Liverpool Local Government Area (LGA), forming part of the South-West Subregion. It is 27 kilometres west of the Sydney CBD, 16 kilometres south of the Parramatta CBD, 5 kilometres east of the M5/M7 Interchange, 2 kilometres from the main north-south rail line and future Southern Sydney Freight Line, and 0.6 kilometres from the M5 South-West Motorway (M5). The SIMTA site is well positioned and presents a strategic location for Intermodal Terminal Facility within the Liverpool LGA.

The SIMTA proposal for the Moorebank site comprises the following key components:

- **Rail Link** – new rail link connecting the SIMTA site with the Southern Sydney Freight Line. The detailed design of the rail infrastructure comprising the rail link will be subject to a further application and approval process.
- **Intermodal Terminal** – the terminal is proposed to include on-site freight rail sidings to accommodate local freight trains to Port Botany. Freight will arrive by rail and be transported to the warehouse and distribution facilities within the SIMTA site, or be directly loaded on to trucks for transport to warehouses and nearby logistics centres. Exports and empty freight containers will be transported to the facility by truck and then loaded onto rail for transport back to Port Botany. The terminal is expected to contain four rail sidings, with areas for container handling and storage, and is anticipated to have the capacity to handle up to 1 million twenty foot equivalent units (TEUs) per annum.
- **Empty Container Storage** – will be provided within the site. Empty containers would either be packed on-site ready for transport to the port by rail, or trucked to off-site locations where they would be packed and returned to the SIMTA site to be loaded onto rail and transported to the port.
- **Warehouse and Distribution Facilities** - approximately 300,000m^2 of warehouses with ancillary offices will be constructed to the east of the intermodal terminal. These buildings are proposed to be constructed in stages in response to site servicing availability and market demands. It is expected that warehouses will range in size, depending on tenant needs.
- **Freight Village** – approximately 8,000m^2 of support services will be provided on site. These may include site management and security offices, meeting rooms, driver facilities and convenience retail and business services.

The terminal facility operations will involve freight being loaded onto trains at Port Botany, directly transporting containers to Moorebank on a dedicated freight line, unloading the containers at Moorebank into warehouses on-site or onto trucks for delivery to businesses and warehouses across south-western Sydney. This operation would also work in reverse, taking freight containers to Port Botany. It is expected that once fully operational, the facility will have capacity to handle up to 1 million TEUs throughput annually.

Existing Traffic

The current road network in and around the SIMTA site provides a number of route choices or alternative accesses. This implies that motorists will have a number of options on how they will access the SIMTA development. Key roads including the M5 South-West Motorway (M5), Hume Highway and Moorebank Avenue carry a significant volume of regional and local traffic. In 2009 M5 over Georges River carried about 113,000 vehicles per day. Heavy vehicle proportion was recorded approximately 10 per cent. On the M5, the highest morning and evening peak hour flows were observed between the Hume Highway and Moorebank Avenue in the order of 4,000 to 5,500 vehicles per hour in either eastbound or westbound direction. There is a significant volume of traffic entering and leaving the M5 at Moorebank, Hume Highway and Heathcote Road interchanges. In 2010, Moorebank Avenue near SIMTA site carried about 17,500 vehicles per day. Heavy vehicle proportion at this location was recorded approximately 5 per cent. Traffic volume on Anzac Road is low, in the order of 9,500 vehicles per day.

Local Impact Area

For the purpose of assessing SIMTA's impact in a local area, a core study area has been defined and modelled using Paramics micro-simulation model. In general, the core area is bounded by the following roads:

- M5 Motorway between Hume Highway and Heathcote Road (east and west);
- Hume Highway (north and south);
- Moorebank Avenue between Newbridge Road and Cambridge Avenue (north and south);
- Anzac Road (east).

Existing Network Performance

The existing network capacity was investigated for the following five key intersections within the core area:

- Moorebank Avenue / Anzac Road;
- M5 Motorway / Moorebank Avenue;
- M5 Motorway / Hume Highway;
- Moorebank Avenue / Heathcote Road;
- Newbridge Rd / Moorebank Avenue.

Intersection analysis, based on the core area Paramics assessment, indicated some ten intersection-related operational issues within the "core" area. The analysis determined a LoS between B and E for key intersections. The modelling result indicates that some movements at these five intersections are operating close to or at capacity level with low level of service (LoS) between D and F. Regular overflow queues are observed on Moorebank Avenue (north of M5) and Newbridge Road. A weaving analysis was undertaken on the M5 West Motorway between the Hume Highway and Moorebank Avenue using Paramics. Based on the modelling analysis, there appears to be an existing weaving problem on the M5 for eastbound traffic. Further modelling analysis indicates both weaving and merging problems on the M5 for westbound traffic.

Network Analysis

Future traffic conditions on the regional road network in the vicinity of the SIMTA site will be determined by a number of complex drivers. The South-West subregion of Sydney is expected to experience the highest level of growth. By 2036, the population of South-West Subregion is forecast to increase by 113.1% compared with 2006 population. The Subregional Strategies identified significant job growth in Western Sydney and South-West Subregions. The Liverpool CBD was identified as a key employment growth centre. The future predicted population and employment growth from the South-West Subregion will have significant impacts on traffic operations on the M5 South-West Motorway, its ramps and signalised intersections at the interchanges. Due to the complexity of future travel patterns within the corridor, Hyder used data from Bureau of Transport Statistics (BTS)'s Sydney Strategic Travel Model (STM). To quantify the SIMTA impact on the regional network, Hyder's Sydney Strategic Traffic Model (SSTM) was updated using TransCAD software. The 2010/2011 base model was calibrated and validated based on the traffic count data collected for this study. Hyder's SSTM model was used to assess the future impact of the SIMTA proposal on the surrounding road network.

Future Growth and Traffic Impact without SIMTA

The development capacity of the SIMTA site will be driven by the network performance of key roads including the M5 Motorway, Hume Highway, Moorebank Avenue and Newbridge Road as identified above. The performance of these roads will also be driven by spare capacity available at key intersections. By 2031, the population and employment growth predicted in Liverpool LGA and South-West Subregion will impact the traffic operations of key roads and intersections in the M5 corridor. The proposed widening of M5 South-West Motorway will involve a further traffic redistribution impact on these roads.

In the next 20 years with background traffic alone, Hyder's model forecasts peak hour growth in the core study area between 1.7% and 1.9% per annum. With proposed widening the growth on M5 Motorway is forecast to increase between 2.7% and 3% per annum.

The background growth by 2031 will reduce the level of service (LoS) to those intersections currently being identified as problematic. The background traffic growth is forecast to reduce the capacity and level of service of critical movements at the following key intersections, regardless of the SIMTA development:

- M5 Motorway/Hume Highway;
- Moorebank Avenue/Heathcote Road;
- Moorebank Avenue/Newbridge Road.

By 2031, the background traffic growth is expected to worsen the weaving issue on the M5 Motorway/Moorebank Avenue interchange for eastbound traffic. Similarly, the merging and weaving issues identified on M5 Motorway is expected to worsen for westbound traffic. The merging and weaving issues would be largely contributed by increase in background traffic growth predicted on M5 Motorway after the widening.

Proposed SIMTA Site Accesses

The developable areas proposed in the SIMTA Concept Plan have been established on the basis of detailed investigations in respect to available and proposed infrastructure, existing environmental constraints and opportunities for future sustainable growth. It is expected that the SIMTA site will be developed in stages. Each phase of the staging will determine the detailed access requirements, internal roads/intersections and then determine the internal road and intersection capacity needed to service the demand from the site. An annual operating capacity of one million TEUs is anticipated in the ultimate development stage. A total of 2,260 employees are expected to work on-site when fully developed under "business as usual" assumption.

The following accesses are proposed in the Concept Plan.

- The Northern Access will provide an entry and exit for the terminal. It will service both trucks and cars to the warehousing and distribution areas on the eastern side of the terminal. As part of the DNSDC relocation, there will be a new traffic signal approximately 300 metres south of existing traffic signal at Anzac Road providing access to new DNSDC facilities. SIMTA proposes to share the new traffic signal with DNSDC. The northern access traffic signal will provide full access permitting all movements. Further discussion will be held with DNSDC on potential access share arrangements. If the shared access with DNSDC was not the approved layout, then other options would need to be investigated, including the use of the **Central Access** as the main entry and exit point, or another access at least 150m south of the intersection currently labelled as **Northern Access.**
- The Central Access will provide an entry and exit for the terminal. The location is at the existing traffic signal that provides access to current DNSDC facility. The existing traffic signal will be retained. The central access will provide full access permitting all movements. It will service mainly for trucks to the terminal. The access will also be used for trucks and cars to the warehouse and distribution areas on the central part of the terminal.
- The Southern Access will provide an exit to articulated trucks departing the terminal. This access will only permit trucks exiting to Moorebank Avenue in the northbound direction. A new traffic signal is proposed on Moorebank Avenue approximately 750 south of central access. The multiple site accesses are proposed to comply with the emergency services requirements.

Traffic Generated by the SIMTA Proposal

The site will generate articulated trucks (B-doubles, semi-trailers) and rigid trucks related to freight movements, and car trips related to direct employment at the site. When the SIMTA site is fully developed and reaches its one million TEU capacity, approximately 2,600 daily truck movements are expected to be generated to and from the site. These heavy vehicle movements would be primarily redistributed to the west of M5/Moorebank interchange in Liverpool, part of South-West and Industrial West of Sydney. When the site is fully operational to its ultimate capacity, approximately 3,600 daily car movements are expected to be generated to and from site under the “business as usual” assumptions.

Traffic Distribution to and from SIMTA

The traffic generated by the proposed SIMTA proposal was distributed onto the surrounding road network, based on the forecast market area for the site. The container models developed provides data for SSTM model (TransCAD). In order to model this distribution of truck activity from the SIMTA proposal, representative industrial zones in each local government area were identified, and the SSTM model adjusted to reflect these origins and destinations. In general SIMTA road based freight distribution catchment will be Liverpool and south-west subregions of Sydney. A majority of trucks (up to 95%) are forecast to travel via Moorebank Avenue north of SIMTA site. About 5% of small distribution vehicles are assumed to travel to site via Cambridge Avenue. Key access routes include the M5 Motorway, Hume Highway and M7 Motorway.

Traffic Impact of the SIMTA Proposal

When the SIMTA facility is fully developed, the highest traffic growth is forecast on the Moorebank Avenue north of SIMTA site. Without SIMTA, model forecasts peak hour traffic growth on the Moorebank Avenue in the order of 1.6% to 1.8% per annum until 2031. The SIMTA development is forecast to increase traffic growth on Moorebank Avenue by up to 3.1% per annum. Anzac Road will not carry trucks originating from the SIMTA site but is expected to carry minor employee related traffic volumes to/from SIMTA.

The results show that on most key roads outside the core area, peak hour traffic growth resulting from the development of SIMTA is small. The additional truck activity generated by the SIMTA proposal would be concentrated on key arterial roads such as M5 Motorway, Hume Highway and M7 Motorway.

Regional Impact from Cumulative Traffic

The regional road network will need to be developed progressively over the next 20 years to cater for the forecast increase in traffic volumes which will result from both the SIMTA development and the general growth in traffic passing through the study area. The regional road network is proposed to be augmented to cater for general traffic growth. The capacity improvements are proposed by the RMS on the M5 South-West Motorway (widening to three lanes each way between Camden Valley Way at Casula and King Georges Road at Beverly Hills). Major work on the M5 West widening project commenced in August 2012. When completed, M5 west widening will reduce travel time for motorists using the motorway and surrounding roads and support planned residential and employment growth in south-west Sydney. The project is expected to be completed in late 2014.

The impact of other developments as cumulative traffic has been taken into consideration in the modelling exercise. The future growth includes predicted container annual throughput from Port Botany and passenger growth in Sydney Airport. The planned freight distribution centres in Sydney have also been considered. Any future proposal by the Moorebank Intermodal Company Limited (MICL), formerly known as the Moorebank Project Office (MPO) is expected to service the similar catchment area reducing the ability for the SIMTA to achieve full operational capacity.

The modelling analysis suggests that the operation of SIMTA at Moorebank would have the potential to reduce the volumes of heavy vehicle movements along the M5 corridor by in the order of 2,700 movements per day. These heavy vehicle movements would be primarily redistributed to the west of M5/Moorebank interchange in Liverpool, part of South-West and Industrial West of Sydney. Beyond the core area, where the SIMTA heavy vehicle volume increases, it is generally by a small margin. The additional truck activity generated by the SIMTA proposal would be concentrated on key arterial roads such as M5 Motorway, Hume Highway and M7 Motorway.

Mitigation Measures

The analysis identified the road capacity improvements required to cater for the traffic demands from both background growth and additional traffic generated by the SIMTA proposal. This investigation reviewed existing infrastructure and then identified the need for road and intersection upgrade. The analysis identified the need for road network improvements by 2031 when the SIMTA site is fully developed. They are:

- Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue grade separated interchange and Southern SIMTA site access. Some localised improvements will be required around central access and southern access points;
- Concurrent with four lane widening on Moorebank Avenue, the Moorebank Avenue/Anzac Road signal will require some form of widening at approach roads;
- A new traffic signal at SIMTA northern entry and egress points with the Moorebank Avenue;
- A new traffic signal at SIMTA southern egress points with the Moorebank Avenue; and
- Potential upgrade works at the M5 Motorway/Moorebank Avenue grade separated interchange to cater for both background and additional SIMTA traffic growth.

A Travel Demand Management (TDM) approach involving the application of strategies and initiatives to change travel behaviour and reduce travel demand is recommended for the development site. A suggested package of mitigation measures is shown in the following table.

Suggested Package of Public Transport Mitigation Measures

Mitigation Measures	Summary
Measure 1 – Travel behaviour change program	Various measures including marketing, promotion campaigns, events and Workplace Travel Plans designed to influence the mode choice of individuals by better understanding their travel needs.
Measure 2 – Reduce On-Site Car Parking Supply	Reduce proposed on-site employee parking by up to 680 spaces.
Measure 3 – Liverpool Station Express Bus Services	Provision of a peak and shift change over time express bus service to and from Liverpool Station via Moorebank Avenue and Newbridge Road.
Measure 4 – Holsworthy Station Express Bus Services	Provision of a peak and shift change over time express bus service to and from Holsworthy Station via Anzac and Heathcote Roads.
Measure 5 – Bus Interchange/Waiting Area	Provide an employee bus interchange/waiting areas within the site.
Measure 6 – Bus Priority Works	Bus priority measures at key intersections as required.
Measure 7 – Walking and Cycleways	Shared or separate walking and cycle paths connecting the warehousing areas to the employee bus interchange/waiting areas and to the Moorebank Avenue bus stops.
Measure 8 – Extend Route 901 Bus	Extend Route 901 bus services to traverse at least the northern sector of the site.
Measure 9 – Glenfield Station to Liverpool Station Shuttle Bus through Moorebank Avenue	When the demand called for this mitigation measure. Operate a Glenfield Station to Liverpool Station Shuttle Bus through Moorebank Avenue serving the development.
Measure 10 – Rationalise Route 870, 871 and 872 bus	Subject to funding and contribution, rationalise routes 870, 871 and 872 (all travelling Campbelltown to Liverpool via Glenfield and Cross Roads). This could potentially involve discontinuing the 871 service, increasing the frequency of the 872 service and rerouting the 870 service to operate via Moorebank Avenue.

When allowance is made for all potential improvements surrounding the SIMTA site that impact on access to the external and local road system, it is evident that traffic management measures will need to be introduced. The package of traffic management measures described in this section will deliver adequate capacity to road network until 2031.The traffic management measures have a finite capacity and all reasonable steps should be taken to ensure that new developments accommodate walk, cycle and public transport access.

10 COMPLIANCE REQUIREMENTS

10.1 Director-General's Requirements

Table 10-1 Director-General's Requirements

DG Requirement	Relevant Report Chapter(s)
(1) Transport and Access – including but not limited to: (a) a Transport and Accessibility Impact Assessment demonstrating how the project will facilitate freight transport objectives, meet freight infrastructure requirements and address impacts to local and regional transport networks;	Ch 6.8, Ch.6.9, Ch.8.1, Ch.9
(b) access to and from the project (including rail access to the Southern Sydney Freight Line), and interaction and integration with existing and planned transport infrastructure and services; and details of internal transport and logistic requirements to minimise external transport impacts and access to public transport for employees;	Ch.2, Ch.3, Ch.6, Ch. 7, Ch. 8.4, Ch. 8.5 Appendix A
(c) the number of train and truck movements, origin and destination, types of road transport likely to be used (for example B-doubles) and the capacity of existing and proposed road and rail routes to handle predicted increases in traffic, based on appropriate empirical analysis and strategic and project modelling; and identification of whether any road and rail infrastructure upgrades are required;	Ch.4, Ch.5, Ch.6.2, Ch. 6.3, Ch.6.4, Appendix B and C
(d) cumulative impacts, particularly with regard to existing and proposed freight distribution facilities in the locality and potential cumulative mitigation measures; and	Ch. 6.9. Ch.8
(e) taking into account of the Guide to Traffic Generating Developments (RTA) and the Integrating Land Use and Transport Package.	Ch.2, Ch.3, Ch. 6.2, Ch.7

10.2 Compliance of TfNSW and RMS's Issues

Table 10-2 TfNSW and RMS's Requirements

ID	TfNSW/RMS reference	Key issues discussed	Relevant Report Chapter(s)
1	original TfNSW submission CD12/05199, point 6.3	Hyder to undertake additional modelling results on Moorebank Av between Helles Av and High Lane. Hyder to provide results within updated Traffic Assessment Report.	Ch.3.3.4, Ch.6.10.3
2	original TfNSW submission CD12/05199, point 6.4 File note RMS/TFNSW meeting, Tactical 12 April113, item 3.2.10	Hyder to undertake weaving analysis on M5 for westbound traffic between Moorebank Av and Hume Hwy. Hyder to provide results within updated Traffic Assessment Report.	Ch.3.3.6
3	original TfNSW submission CD12/05199, point 6.5 File note RMS/TFNSW Tactical 12 April113, item 3.2.5	Hyder to undertake one sensitivity analysis using trip generation assumptions contained in Aurecon Study (Intermodal Freight Terminal Traffic Generation Rates, Aug 2011). The sensitivity analysis will be undertaken for future 2031 model for AM and PM peak assuming peak hour truck generation as per Aurecon study. The modelling results from sensitivity test will be reported for key intersections within the core area. Hyder to provide outcome within updated Traffic Assessment Report.	Ch.8.2
4	original TfNSW submission CD12/05199, point 6.6	Hyder to clarify modelling results of intersections reported outside the core area. The results will be prepared showing SIMTA traffic volumes, delay by approach. RMS has requested for results on following five intersections: 1. M5/Heathcote Road interchange; 2. Heathcote Road/Nuwarra Road intersection; 3. Newbridge/Nuwarra Road intersection; 4. Hume Hwy/De Meyrick Av intersection; 5. Hume Hwy/Kurrajong Rd intersection. Hyder to provide results within updated Traffic Assessment Report.	Ch.6.11.1

ID	TfNSW/RMS reference	Key issues discussed	Relevant Report Chapter(s)
5	original TfNSW submission CD12/05199, point 6.7	Hyder to clarify modelling results for three intersections within the core area- RMS has requested model results showing SIMTA traffic volumes delay by approach for three intersections: 1. M5/Hume Highway interchange; 2. Moorerbank Avenue / Heathcote Road intersection; 3. Moorebank Avenue/ Newbridge Rd intersection. Hyder to provide results within updated Traffic Assessment Report.	Ch.6.10.2
6	original TfNSW submission CD12/05199, point 6.8	Hyder to update traffic model incorporating changes from defence relocation new traffic signals (min distance of 120 m between two signals).	Ch.5.7, Ch.6.1
7	original TfNSW submission CD12/05199, point 6.9	Hyder to provide modelling results (LoS) at five key intersections with Moorebank Av where upgrades are being proposed. They are: ▪ Moorebank Avenue / SIMTA access intersections (three SIMTA access, north, central and south); ▪ Moorebank Avenue / Anzac Road intersection; ▪ Moorebank Avenue / M5 interchange. Hyder to provide outcomes within updated Traffic Assessment Report.	Ch.8.1.1
8	File note, Tactical 12 April13, item 3.2.8	Hyder to prepare sketch/plan on site access and proposed upgrades as per item 7 above. Hyder to provide sketch plans within updated Traffic Assessment Report.	Appendix F
9	File note, Tactical 12 April13, item 3.2.9	Hyder to provide an indicative TEU based thresholds trigger points for potential road and intersection upgrade on Moorebank Av. Hyder to provide results within updated Traffic Assessment Report.	Ch.8.3
10	original TfNSW submission CD12/05199, point 2, 5, 6,	Hyder to update Appendix K Traffic Assessment Report of SIMTA Environmental Assessment.	

ID	TfNSW/RMS reference	Key issues discussed	Relevant Report Chapter(s)
11	original TfNSW submission CD12/05199, point 6.5	Hyder to provide clarification on employee trips distribution	Ch 6.4

APPENDIX A

PUBLIC TRANSPORT ASSESSMENT (URBANHORIZON PTY LTD)

APPENDIX B

TECHNICAL NOTE 4 EXISTING ROAD NETWORK CAPACITY

APPENDIX C

STRATEGIC MODELLING ASSUMPTION, CALIBRATION/VALIDATION AND FORECASTING RESULTS

APPENDIX D

TECHNICAL NOTE 3 TRAFFIC GENERATION

APPENDIX E

PARAMICS (TRAFFIC) MODEL AUDIT, HALCROW

APPENDIX F

SKETCH PLAN OF PROPOSED UPGRADE