Moorebank Precinct East - Stage 2 Proposal

Operational Traffic and Transport Impact Assessment

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 4, Division 4.1, State Significant Development

December 2016

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Operational Traffic & Transport Impact Assessment

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CONTENTS

TABLES VIII

EXECUTIVE SUMMARY XI

The Proposal xi

Assessment Approach xii

Stakeholder Consultation xii

Findings of the Impact Assessment xiii

Traffic Generation from the Proposal xiii

Impact at Key Road Sections xiii

Impact at Key Intersections xiii

Impact on Intersection Performance and Upgrades xiii

Parking Provision xiv

Public Transport and Active Transport Provision xiv

Regional Network Impacts xv

Mitigation measures for the Proposal xv

Roadworks – Moorebank Avenue xvi

Lane configuration xvi

Intersection upgrades xvi

Mitigation measures for the Wider Network xvi

Developer Contributions xix

1 INTRODUCTION 1

1.1 Background 1

1.2 Report purpose 1

1.3 Key terms relevant to the Proposal 5

1.4 Site description 8

1.4.1 Regional Context 8

1.4.2 Local Context 8

1.5 Proposal overview 12

1.6 Built form 13

1.6.1 Warehousing 13

1.6.2 Freight village 16

1.7 Vehicle movement and access 16

1.7.1 MPE Stage 2 site access 16

1.7.2 Traffic circulation within the MPE Stage 2 site 17

1.7.3 Internal roads 17

1.7.4 Service roads 17

1.7.5 Transfer roads 17

1.8 Roadworks – Moorebank Avenue 18

1.8.1 Lane configuration 18

1.8.2 Intersection upgrades 18

1.8.3 Road alignment 19

1.9 Ancillary infrastructure 19

1.10 Operational hours 19

1.11 Reference Traffic Study, Data and Modelling 20

1.12 Consultation with Key Stakeholders 22

1.13 Structure of this Report 23

2 EXISTING TRAFFIC AND TRANSPORT ENVIRONMENT 24

2.1 Study Area 24

2.2 Road hierarchy 26

2.3 Historical Traffic Volumes 30

2.4 Historical Traffic Growth 30

2.5 Crash data 32

2.6 Transport mode share 34

2.6.1 Liverpool Local Government Area 34

2.6.2 Moorebank Catchment Area 35

2.7 Public and Active Transport 36

2.7.1 Public Transport 37

2.7.2 Active Transport 38

3 EXISTING ROAD NETWORK PERFORMANCE 41

3.1 Daily traffic volumes 41

3.2 Peak hour volumes 42

3.3 Existing Network Performance 42

4 FUTURE ROAD NETWORK PERFORMANCE WITHOUT THE PROPOSAL 44

4.1 Future background traffic growth 44

4.2 Future intersection performance without the Proposal 44

5 IMPACT ASSESSMENT 47

5.1 Trip Generation from the Proposal 47

5.1.1 Warehouse Truck Generation Profile 48

5.1.2 Employee Traffic Generation Profile 49

5.2 Traffic Distribution 50

5.2.1 Heavy vehicles 50

5.2.2 Light vehicles 51

5.3 Regional Benefits of the Proposal 51

5.4 Proposed Site Access and Network Upgrades 52

5.4.1 MPE Stage 2 site access 52

5.5 Traffic circulation within the MPE Stage 2 site 54

5.5.1 Internal roads 54

5.5.2 Service roads 54

5.5.3 Transfer roads 54
5.6 Roadworks – Moorebank Avenue 55
5.7 Impact on Network Operation with the Proposal... 57
5.7.1 Daily Traffic Volumes with the Proposal 57
5.7.2 Peak Hour Traffic Volumes with the Proposal 60
5.7.3 Impact on Intersection Performance - 2019 and 2029..................................... 61
5.8 Impact on Cambridge Avenue... 64
5.9 Cumulative Impact during Operation 64
5.10 Parking Provisions.. 68
5.10.1 Car Parking Provisions.. 68
5.10.2 Bicycle Facilities Provisions 69
5.11 Impact on Crashes/Accidents 69
5.11.1 Moorebank Avenue 69
5.11.2 Cambridge Avenue.. 70
5.12 Impact on Bus Public Transport 70
5.13 Impact on Cycling and Walking 72
5.13.1 Cycling Impacts... 72
5.13.2 Pedestrian Impacts.. 72
6 NETWORK IMPROVEMENT AND MITIGATION MEASURES 74
6.1 Potential Infrastructure Upgrade 74
6.1.1 Mitigation measures for the Proposal 74
6.1.2 Mitigation measures not included in the Proposal (wider network assumed) 75
6.1.3 Developer contributions.. 77
6.2 Public Transport and Active Transport Provision... 78
7 CONCLUSION 79
7.1 Existing Network Performance in 2015 79
7.2 Network Performance in the Opening Year 2019 and 2029 (without the Proposal and without upgrades) 79
7.3 Proposal Traffic Generation 79
7.4 Proposal (MPE Stage 2) Site Access 80
7.4.1 Roadworks – Moorebank Avenue 80
7.4.2 Lane configuration.. 80
7.4.3 Intersection upgrades... 80
7.4.4 Road alignment 81
7.5 Impact at Key Road Sections 81
7.6 Impact at Key Intersections... 81
7.7 Network Performance in the Opening Year 2019 and 2029 (with the Proposal and with assumed network upgrades).. 82
7.8 Parking Provision... 82
7.9 Public Transport and Active Transport Provision... 82

7.10 Regional Network Impacts 83

APPENDIX A - TRAFFIC DATA AND ASSUMPTIONS USED IN TRAFFIC AND ACCESSIBILITY IMPACT ASSESSMENT 85

APPENDIX B - TRAFFIC GENERATION AND UNDERLYING ASSUMPTIONS (WSP | PARSONS BRINKERHOFF) 87

APPENDIX C - MPE STAGE 2 / MPW STAGE 2 – CONTAINER HANDLING MOVEMENTS, NEIL MATTHEWS CONSULTING PTY LTD 89

APPENDIX D - PRELIMINARY LAYOUT OF THE PROPOSED MOOREBANK AVENUE UPGRADE 91

FIGURES

Figure 1-1 Document structure for Traffic and Transport related reporting for the Proposal 5
Figure 1-2 Regional context of the Proposal 10
Figure 1-3 Local context of the Proposal 11
Figure 2-1 Study Area Coverage 25
Figure 2-2 Key Intersections and Road Links in the Core Area 26
Figure 2-3 Existing Road Hierarchy surrounding the Proposal site 29
Figure 2-4 Distribution of Crashes on Key Roads between 2010 and 2015 (5 Years) 33
Figure 2-5 Travel Zone as per JTW2011 35
Figure 2-6 Local public transport and pedestrian/cycleway network 36
Figure 2-7 Photo of bus stop signage located on Moorebank Avenue south of Bapaume Road (looking north) 37
Figure 2-8 Sealed & marked road shoulders on Moorebank Avenue – permitted for on-street cycling 38
Figure 2-9 Locations of existing pedestrian crossing facilities on Moorebank Avenue 40
Figure 5-1 Temporal Distribution for Warehouse Trucks 49
Figure 5-2 Weekday Temporal Distribution of Employee Car Trips – Three Shifts per Day 49
Figure 5-3 Truck Traffic Distribution to Precinct in the AM Peak 50
Figure 5-4 Employee Car Traffic Distribution to Precinct in the AM Peak 51
Figure 5-5 Moorebank Avenue Access Strategy for MPW Stage 2 Operation 53
Figure 5-6 Traffic Circulation within MPE Stage 2 site 56
Figure 5-7 Existing Bus Route and Stop Locations 71
Figure 5-8 Proposed Pedestrian and Cyclist Connectivity 73
Figure 6-1 Proposed upgrades at the M5 Motorway/Moorebank Avenue intersection 77

TABLES

Table E-1 Assumed Network Upgrades xvii
Table 1-1 Secretary's Environmental Assessment Requirements relevant to this study 2
Table 1-2 Statement of Commitments relevant to this study 4
Table 1-3 Concept Plan Conditions of Approval 4
Table 1-4 Key terms 5
Table 1-5 Distance to residential suburbs from the Proposal site 9
Table 1-6 Overview of the Proposal 14
Table 1-7 Indicative Warehousing Layout 15
Table 1-8 LoS Criteria for intersection capacity analysis 20
Table 1-9 Assumed Do-Minimum Network Improvements 21

Table 2-1 Existing key roads on the road network adjacent to the Proposal site 27
Table 2-2 Historical Traffic Volumes on Key Roads between 2002 and 2015 31
Table 2-3 Historical Traffic Growth between 2002 and 2015 31
Table 2-4 Crashes by Type (2010 to 2015) 32
Table 2-5 Existing Model Share Liverpool LGA 34
Table 2-6 Daily Work Trips and Model Share for Moorebank Catchment Area 35
Table 2-7 Public Transport Services operating in the vicinity of the Proposal site 38
Table 3-1 Daily Traffic Volumes and Heavy Vehicle Volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue - 2015 41
Table 3-2 Peak hour traffic volumes on key roads in 2015.. 42
Table 3-3 Existing 2015 Level of Service for AM and PM Peak Traffic Condition 43
Table 4-1 Average Peak Hour Traffic Growth (2015-2026) 44
Table 4-2 Intersection Level of Service without the Proposal - 2019.......................... 45
Table 4-3 Intersection Level of Service without the Proposal - 2029.......................... 46
Table 5-1 Proposal Trip Generation Assumptions 47
Table 5-2 Development Parameters 48
Table 5-3 Daily Traffic Volumes and Heavy Vehicle Volumes in 2019 (Opening Year) 58
Table 5-4 Daily Traffic Volumes and Heavy Vehicle Volumes in 2029 (10-Year Horizon) 59
Table 5-5 Traffic Increase Attributed to the Proposal in 2019 and 2029 60
Table 5-6 Intersection Level of Service with and without the Proposal - 2019 62
Table 5-7 Intersection Level of Service with and without the Proposal – 2029 63
Table 5-8 Intersection Level of Service with and without Cumulative Development Scenario – 2019 66
Table 5-9 Intersection Level of Service with and without Cumulative Development Scenario - 2029 67
Table 5-10 Parking Provision with the Proposal 68
Table 6-1 Assumed Network Upgrades 76

APPENDICES

APPENDIX A Traffic Data and Assumptions used in Traffic and Accessibility Impact Assessment

APPENDIX B Traffic Generation and Underlying Assumptions (WSP | Parsons Brinkerhoff)

APPENDIX C MPE Stage 2 / MPW Stage 2 – Container Handling Movements, Neil Matthews Consulting Pty Ltd

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EXECUTIVE SUMMARY

The Proposal

The Proposal involves the construction and operation of Stage 2 of the MPE Project, comprising warehousing and distribution facilities on the MPE site and upgrades to approximately 1.4 kilometres of Moorebank Avenue between the northern MPE site boundary and 120 metres south of the southern MPE site boundary.

Key components of the Proposal include:

- Warehousing comprising approximately 300,000m^2 GFA, additional ancillary offices and the ancillary freight village
- Establishment of an internal road network, and connection of the Proposal to the surrounding public road network
- Ancillary supporting infrastructure within the Proposal site, including:
  - Stormwater, drainage and flooding infrastructure
  - Utilities relocation and installation
  - Vegetation clearing, remediation, earthworks, signage and landscaping
- Subdivision of the MPE Stage 2 site
- The Moorebank Avenue upgrade would be comprised of the following key components:
  - Modifications to the existing lane configuration, including some widening
  - Earthworks, including construction of embankments and tie-ins to existing Moorebank Avenue road level at the Proposal's southern and northern extents
  - Raking of the existing pavement and installation of new road pavement
  - Establishment of temporary drainage infrastructure, including temporary basins and / or swales
  - Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder
  - Signalling and intersection works
- Upgrading existing intersections along Moorebank Avenue, including:
  - Moorebank Avenue / MPE Stage 2 access
  - Moorebank Avenue / MPE Stage 1 northern access
  - Moorebank Avenue / MPE Stage 2 central access
  - MPW Northern Access / MPE Stage 2 southern emergency access

The Proposal would interact with the MPE Stage 1 Project (SSD_6766) via the transfer of containers between the MPE Stage 1 IMT and the Proposal's warehousing and distribution facilities. This transfer of freight would be via a fleet of heavy vehicles capable of being loaded with containers and owned by SIMTA. The fleet of vehicles would be stored and used on the MPE Stage 2 site, but registered and suitable for on-road use. The Proposal is expected to operate 24 hours a day, seven days per week.

The Proposal would operate 24 hours a day, 7 days a week.

Assessment Approach

This report supports the Environmental Impact Statement (EIS) for the Proposal and has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the EP&A Act.

This report has been prepared to address:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7628) for the Proposal, issued by NSW DP&E on 27 May 2016.
- The relevant requirements of Concept Plan Approval MP 10_0913 dated 29 September 2014 (as modified).
- The relevant requirements of the approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6229, granted in March 2014 by the Commonwealth Department of the Environment (DoE)) (as relevant).

This report examines the traffic impact of the traffic generated by the Proposal (including the cumulative development impacts of the Proposal with MPE Stage 1 and MPW Stage 2) on the road network. It assesses the intersection and road network impacts using evidence based traffic modelling, and identifies appropriate mitigation measures to address these impacts.

In determining the required intersection improvements to mitigate the impact of Proposal traffic on the road network, a "no-worsening of the without Proposal intersection performance" approach has been adopted as this identifies improvements directly attributable to the Proposal i.e. those not due to growth in background traffic.

The study area comprises a wider area and a core area of investigation. The wider investigation area includes the road network in the Liverpool local government area (LGA) and the suburb of Moorebank. Detailed analysis has been conducted for the key intersections and road links in the core area and includes:

- I-1 Moorebank Avenue / Anzac Road
- I-2 M5 Motorway / Moorebank Avenue
- I-3 M5 Motorway / Hume Highway
- I-4 Moorebank Avenue / Newbridge Road
- I-5 Moorebank Avenue / Heathcote Road
- I-6 M5 Motorway / Heathcote Road
- I-7 Cambridge Avenue / Glenfield Road
- I-8 Cambridge Avenue / Canterbury Road
- I-A Moorebank Avenue / Defence Joint Logistics Unit (DJLU) Access
- I-8 Moorebank Avenue / MPE Stage 2 Site Access.

The above study intersections were identified for assessment based on the SEARs for MPE Stage 2 and also the CoA for the Concept Plan Approval. They have been established through consultation undertaken with Roads and Maritime and TfNSW throughout the MPE Concept Plan Approval and MPE Stage 1 Proposal.

Stakeholder Consultation

Through-out the traffic study, key stakeholders were consulted through a series of meetings to present the scope of the study, impact assessment methodology and preliminary findings of the traffic study. Numerous meetings, emails and telephone conversations have been undertaken to ensure that the modelling undertaken for the Proposal utilises the appropriate AIMSUN (LMARI) model and assessment approach

Findings of the Impact Assessment

Traffic Generation from the Proposal

The Proposal is expected to generate approximately 564 truck trips (2-way) and 3,993 car trips (2-way) to and from the Proposal site each week day. In the cumulative development scenario, with the addition of traffic from MPE Stage 1 and MPW Stage 2, approximately 2,540 truck trips (2-way) and 6,808 car trips (2-way) are estimated to and from the Proposal each week day.

Impact at Key Road Sections

The Proposal has the highest impact on Moorebank Avenue (south of Anzac Road) with traffic volume increases of 23% in 2019 and 19% in 2029. This is followed by Moorebank Avenue (north of Anzac Road) with an increase of 18% in 2019 and 15% in 2029. The analysis suggests increases due to the Proposal on the remaining road sections are expected to be low with increases of below 4% in the opening year and 10-year horizon

Impact at Key Intersections

The highest traffic increase attributable to the Proposal in the peak hour is predicted at the Moorebank Avenue / DJLU Access Road and Moorebank Avenue / MPE Stage 2 Site Access intersections with increases of approximately 10% in 2019 and reducing to approximately 8% by 2029.

The Proposal would increase traffic at Moorebank Avenue / Anzac Road intersection by 7% in 2019 and reduce to 6% by 2029. The increase is expected to reduce due to the growth in background traffic with Proposal traffic remaining constant from year of opening.

It is also predicted to increase traffic at M5 Motorway / Moorebank Avenue intersection by 4% in 2019 and reduce 3.5% by 2029. Increases in traffic due to the Proposal at the M5 Motorway / Hume Highway are less than 0.5%.

To the north, the analysis found that likely traffic increase attributable to the Proposal at Moorebank Avenue / Newbridge Road and Moorebank Avenue / Heathcote Road intersections would be minor (less than 1.0%). To the east, likely traffic increases at the M5 Motorway / Heathcote Road would be marginal (less than 0.7%). Similarly, to the south on Cambridge Avenue, likely traffic increase at two assessed roundabouts would be marginal (less than 0.2%).

It should be noted that the predicted increase in traffic generated by the Proposal which are less than 5% of the observed are within the limits of the variations in day to day traffic volumes. As such, their impacts are considered marginal

Impact on Intersection Performance and Upgrades

- No upgrades are required at the study intersections due to the Proposal (in the opening year 2019 and 2029) with the exception of the Moorebank Avenue / MPE Stage 2 Site Access intersection which provides access to/from the Proposal site.
- Cumulative traffic would likely exceed the current capacity at the M5 Motorway/ Moorebank Avenue intersection and upgrading of the intersection is required by 2019. A staged upgrade of the intersection is recommended.

- Capacity improvements are required at the signalised intersections of Moorebank Avenue/Newbridge Road and Moorebank Avenue / Heathcote Road due to an existing operational network problem, without consideration of the Proposal. These intersections need to be upgraded to cater for the growth in background traffic demand (i.e. not due to the Proposal)
- Capacity improvements are required at the M5 Motorway / Hume Highway and M5 Motorway / Heathcote Road signalised intersections to cater for the growth in background traffic. These intersections need to be upgraded to cater for the growth in background traffic demand (i.e. not due to the Proposal)
- The analysis identified minor impact to roundabouts of Glenfield Road and Canterbury Road with Cambridge Avenue attributable to the Proposal.
- A series committed and anticipated upgrades (Do-Min) are being pursued by Roads and Maritime. These upgrades are needed to cater for the growth in background traffic on the wider road network and is recommended to be implemented as a priority to provide the required additional capacity to meet future demand on the road network.

Parking Provision

Based on the Roads and Maritime parking standards and the proposed warehouse, and office gross floor areas (GFAs) for the Proposal, a total of 1,474 car parking spaces is proposed to be provided as part of the Proposal.

A total of 47 bicycle parking spaces, 47 lockers and 5 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number and location of each across the various built form would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*

Public Transport and Active Transport Provision

In terms of the public transport and active transport provision that is required to cater for the Proposal, that the following mitigation measures are considered suitable:

- SIMTA to undertake consultation with relevant bus provider(s) regarding the potential to extend the 901 bus service (limited bus service along Moorebank Avenue), particularly along Moorebank Avenue fronting the Proposal site and additional bus stops to ensure adequate accessibility to and within the Proposal site. Consultation with TfNSW will be conducted regarding the provision for active transport to/from the Proposal site and along the internal roads, as part of detailed design for the Proposal.
- A total of 47 bicycle parking spaces, 47 lockers and 5 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number and location of each across the various built form would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*.

Regional Network Impacts

The Proposal, which includes the construction of warehouse and distribution facilities to support an IMT at Moorebank, would provide freight distribution functionality from the IMT, thereby minimising the need for heavy vehicles to travel to Port Botany and assist in reducing road congestion. Additional capacity on the freight transport network would also be generated by including warehouses and distribution facilities at the same location as the IMT. This maximises the capacity of Port Botany and encourages more efficient business operations.

From a strategic perspective, the MPE Project, including the Proposal, is considered to be in the public interest, and would result in wider regional benefits by generating a number of economic, social and environmental benefits for the community and economy, including:

- Economic benefits: The unit costs of transporting containers by rail would be reduced, thereby increasing the share of freight movements by rail. This would improve productivity, reduce operating costs, increase reliability, reduce costs associated with road damage, congestion and accidents, and lead to better environmental outcomes. The Proposal would increase cost efficiencies for the handling, storage and distribution of freight
- Job creation: The Proposal would result in the creation of approximately 200 construction employment opportunities during the peak construction period of the Proposal and 1,408 full time equivalent staff for the operation of the warehousing area
- Improved environmental outcomes by contributing to reducing road congestion: the introduction of an IMT at Moorebank would result in fewer truck journeys every day (to and from Port Botany), resulting in reductions in greenhouse gas emissions, fuel consumption and other air pollution and potential increases in road network performance around Port Botany
- Social benefits through reducing road traffic and associated noise along key road freight routes between Moorebank and Port Botany
- Easing the Port Botany bottleneck to enable the Port to more effectively cope with future growth in container trade and provide large scale freight capacity.

Mitigation measures for the Proposal

The study identified road network improvements to ensure that satisfactory intersection performance could be achieved based on no-worsening of the performance of the study intersections with and without the Proposal. The assessment concluded that the addition of Proposal traffic does not trigger any intersection upgrades in the opening year 2019 and 2029.

In order to provide access for the Proposal, maintain continuity of operations of surrounding proposals after opening, and to minimise the extent of road network impacts arising as a result of the construction of network improvements, the Proposal includes:

Roadworks – Moorebank Avenue

Moorebank Avenue would be upgraded for about 1.4 kilometres. The Moorebank Avenue upgrade commences from approximately 95 metres south of the northern boundary of the MPE site to approximately120 metres south of the southern MPE site boundary. The Moorebank avenue upgrade is located within the existing Moorebank Avenue road corridor and along the eastern boundary of the MPW site.

The Moorebank Avenue upgrade would be comprised of the following key components:

- Modifications to the existing lane configuration, including some widening
- Signalling and intersection works.
- Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder

Lane configuration

The Moorebank Avenue upgrade would provide for the integration of the Proposal with the wider Moorebank Precinct works and to tie-in to Moorebank Avenue at its existing vertical and horizontal alignment near the northern boundary of the MPE site.

The arrangement of lanes along Moorebank Avenue as part of the Proposal would include:

- Four lanes from the northern extent of the Moorebank Avenue upgrade to the MPE Stage 1 central access.
- Two lanes between the MPE Stage 1 central access to approximately 120 metres south of the MPE site.

The lanes would generally be 3.5m wide central travel lanes, with 4.2m wide kerbside travel lanes with a 4.5 metre verge along both the northbound and southbound carriageways.

Intersection upgrades

The Proposal includes upgrades to four intersections along Moorebank Avenue, including:

- Moorebank Avenue / MPE Stage 2 access
- Moorebank Avenue / MPE Stage 1 northern access
- Moorebank Avenue / MPE Stage 2 central access
- MPW Northern Access / MPE Stage 2 southern emergency access

Mitigation measures for the Wider Network

The study found that the broader road network in the study area needs to be upgraded to provide increased capacity to cater for the forecast increases in traffic volumes which will result from the general growth in background traffic. An area wide network improvement strategy is needed to ensure the desired functionality of the network of motorways, arterials, collector and local roads in the study area is achieved and provide safe and efficient traffic dispersal. These wider network improvements are required to provide an adequate LoS across the road network to meet the predicted growth in traffic demand in the opening year 2019 and 10-year horizon of 2029.

As discussed in the report, a number of key intersections are currently operating at an unsatisfactory LoS as a result of background traffic and anticipated background traffic growth, i.e. prior to consideration of any impacts of the Proposal or cumulative scenario related traffic. These intersections would need to be upgraded by Roads and Maritime to ensure that the network operates sufficiently and that local traffic in the area does not continue to decline in performance. As outlined in Section 1.11, the modelling has assumed a number of planned and committed network improvements (to be completed by Roads and Maritime) to meet the growth in future demand on the road network.

The analysis has identified the need for a number of intersections to be upgraded (in part or full) in order to address the impacts of background and cumulative traffic i.e. not due to the Proposal. For the purpose of this traffic and transport impact assessment these upgrades (as shown in Table E-1) have been assumed within the modelling, however are not nominated for delivery for the Proposal.

Table E-1 Assumed Network Upgrades

ID	Intersection	Recommended Network Improvements to Mitigate Background and Cumulative Traffic	Indicative Timing	Required for
I-1	Moorebank Avenue / Anzac Road	1. Upgrade Moorebank Avenue/Anzac Road signalised intersection to include lane capacity improvements on the northern and southern approaches. The current configuration on Anzac Road (eastern approach) will be retained. 2. Implement vehicle actuated signals 3. Upgraded intersection to comply with relevant RMS design standards	2019	Background and cumulative
I-2	M5 Motorway / Moorebank Avenue	1. Provide additional capacity on M5 westbound on-ramp. 2. Provide additional capacity on M5 eastbound off-ramp 3. Increase the storage lengths of the existing (two-lane) right turn bay on Moorebank Avenue northern approach 4. Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue intersection and Moorebank Avenue/Anzac Road intersection 5. Change the signal to vehicle actuated to improve west and north approaches (See Figure 6-1). 6. Upgraded intersection to comply with relevant RMS design standards	Staged upgrading starting from 2019	Background and cumulative
I-3	M5 Motorway / Hume Highway	Change the signal to vehicle actuation in the PM peak to improve traffic signal operations	2019	Background

ID	Intersection	Recommended Network Improvements to Mitigate Background and Cumulative Traffic	Indicative Timing	Required for
I-4	Moorebank Avenue / Newbridge Road	1. Add an additional right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant RMS design standards	2019	Background
I-5	Moorebank Avenue / Heathcote Road	1. Extend right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant RMS design standards	2019	Background
I-6	M5 Motorway / Heathcote Road	Change the signal to vehicle actuated in PM peak to improve traffic signal operations.	2019	Background
I-A	Moorebank Avenue / DJLU Access	Upgrade intersection capacity on north and south approaches	2029	Background

Figure E-1 Proposed upgrades at the M5 Motorway/Moorebank Avenue intersection

Developer Contributions

The analysis has identified that no intersection upgrades are required as a result of the Proposal, however it is acknowledged that the Proposal will utilise the intersections identified for upgrade in the assumed network improvements outlined earlier in this report. The intent of the Precinct Model is to provide a whole of precinct based approach which will provide Roads and Maritime with further information on upgrades to be undertaken for each stage of the Moorebank Precinct. It is understood, from discussions with Roads and Maritime that the Precinct Model, although part of a separate process to the EIS for the Proposal, would be used to guide developer contributions for the Precinct. Therefore, it is likely that a decision on developer contributions for the Proposal would be deferred until the Precinct Model is available.

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1 INTRODUCTION

1.1 Background

Concept Plan Approval (MP 10_0193) for an intermodal terminal (IMT) facility at Moorebank, NSW (the Moorebank Precinct East Project (MPE Project) (formerly the SIMTA Project)) was received on 29 September 2014 from the NSW Department of Planning and Environment (DP&E). The Concept Plan for the MPE Project involves the development of an IMT, including a rail link to the Southern Sydney Freight Line (SSFL) within the Rail Corridor, warehouse and distribution facilities with ancillary offices, a freight village (ancillary site and operational services), stormwater, landscaping, servicing, associated works on the eastern side of Moorebank Avenue, Moorebank, and construction or operation of any part of the project, which is subject to separate approval(s) under the Environmental Planning and Assessment Act 1979 (EP&A Act).

This Environmental Impact Statement (EIS) is seeking approval, under Part 4, Division 4.1 of the EP&A Act, for the construction and operation of Stage 2 of the MPE Project (herein referred to as the Proposal) under the Concept Plan Approval for the MPE Project, being the construction and operation of warehouse and distribution facilities.

This EIS has been prepared to address:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7628) for the Proposal, issued by NSW DP&E on 27 May 2016 (Appendix A).
- The relevant requirements of the Concept Plan Approval MP 10_0913 dated 29 September 2014 (as modified) (Appendix A).
- The relevant requirements of the approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6229, granted in March 2014 by the Commonwealth Department of the Environment (DoE)) (as relevant) (Appendix A).

This EIS also gives consideration to the MPE Stage 1 Project (SSD 14-6766) including the mitigation measures and conditions of consent as relevant to this Proposal.

This EIS has been prepared to provide a complete assessment of the potential environmental impacts associated with the construction and operation of the Proposal. This EIS proposes measures to mitigate these issues and reduce any unreasonable impacts on the environment and surrounding community.

1.2 Report purpose

This report supports the Environmental Impact Statement (EIS) for the Proposal (refer to Section 1.5 below for an overview of the Proposal) and has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the EP&A Act.

This report has been prepared to address:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7628) for the Proposal, issued by NSW DP&E on 27 May 2016.
- The relevant requirements of Concept Plan Approval MP 10_0913 dated 29 September 2014 (as modified).
- The relevant requirements of the approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6229, granted in March 2014 by the Commonwealth Department of the Environment (DoE)) (as relevant).

The SEARs, the Statement of Commitments and Concept Plan Conditions of Approval relevant to this study, and the section of this report where they have been addressed are provided in Table 1-1, Table 1-2, and Table 1-3, respectively.

Table 1-1 Secretary's Environmental Assessment Requirements relevant to this study

Ref No. / SEARs	**Where Addressed**	
4. Traffic and Transport	*Document*	*Section*
A Traffic Impact Assessment that assesses intersection and road network impacts, including impacts on Cambridge Avenue. The traffic assessment shall:		
a) take into account the RMS Guide to Traffic Generating Developments	Operational Traffic & Transport Impact Assessment	Sections 4, 5 and 6
b) undertake a realistic and justified range of peak hour generation scenarios (to be determined in consultation with TfNSW, RMS and Liverpool City Council) including assumptions about heavy vehicle movements and the percentage of deliveries by railway and road		Sections 1.12, 5.1, 5.5
c) undertake detailed model analysis to confirm network operation and identify intersection upgrade requirements		Sections 3.3, 5.5, 5.6, 5.7, 6.1
d) consider the constructability constraints of proposed upgrade(s) at key intersections, such as vehicle sweep paths, geometry and sight lines		Section 6.1
e) include a draft Construction Traffic Management Plan	Preliminary Construction Traffic Management Plan	Entire document
f) Assess Construction Traffic impacts, which may include a draft Construction Traffic Management Plan including		
i. the identification of haulage routes and the nature of existing traffic on these routes	Construction Traffic Impact Assessment	Entire document

Ref No. / SEARs	Where Addressed	
ii. an assessment of construction traffic volumes (including spoil haulage/delivery of materials and equipment to the road corridor and ancillary facilities)	Construction Traffic Impact Assessment	Entire document
iii. potential impacts to the regional and local road network (including safety and level of service) and potential disruption to existing public transport services and access to properties and businesses	Construction Traffic Impact Assessment	Entire document
g) Assess Operational Traffic and Transport impacts to the local and regional road network including:	Operational Traffic & Transport Impact Assessment	
i. changes to local road connectivity and impacts on local traffic arrangements, road capacity and safety		Sections 2.5, 3.1, 5.4, 5.5, 5.9
ii. traffic capacity of the road network and its ability to cater for predicted future growth		Sections 5.5, 5.6, 5.7
h) provide details of site accesses, internal roads and vehicular parking required as a result of the development		Sections 5.4, 5.8
i) provide an updated Traffic Management and Accessibility Plan for the operation of the facility including:	Preliminary Operational Traffic Management Plan	
i. measures to prevent heavy vehicles accessing residential streets to maintain the residential amenity of the local community		Entire document
ii. details of public transport services and cyclist facilities		Sections 2.7, 5.10, 5.11
iii. details of driver code of conduct		Entire document

Table 1-2 Statement of Commitments relevant to this study

Ref No. / Statement of Commitments	Where Addressed	
Transport and Access	**Document**	**Section**
d) The Proponent commits to undertaking an actual truck trip generation survey after 24 months of operation and then progressively as the SIMTA site is developed	Preliminary Operational Traffic Management Plan	Entire document
f) The Proponent commits to developing a Traffic Site Management Plan prior to the commencement of operations at the site to minimise the potential impacts, including: a. Management measures to avoid trucks parking and idling either within or outside of the site boundaries b. Provision of adequate parking for heavy vehicles to accommodate any potential delays in schedule times	Preliminary Operational Traffic Management Plan	Entire document

Table 1-3 Concept Plan Conditions of Approval

Ref No. / Concept Plan Instrument of Approval	Where Addressed	
Traffic and Transport	**Document**	**Section**
Any future Development Application shall include a Traffic Impact Assessment that assesses intersection and road network impacts, including impacts on Cambridge Avenue. The traffic assessment shall: e) provide an updated Traffic Management and Accessibility Plan including: a. measures to prevent heavy vehicles accessing residential streets to maintain the residential amenity of the local community; b. public transport; c. cyclist facilities; and d. driver code of conduct	Preliminary Operational Traffic Management Plan	Entire document

The diagram below illustrates the document structure established for traffic and transport-related reporting for the Proposal. Four standalone reports have been prepared to inform and support the required responses to the SEARs, as well as the Concept Plan Conditions of Approval and Statement of Commitments:

1. Construction Traffic Impact Assessment (CTIA)
2. Preliminary Construction Traffic Management Plan (PCTMP)
3. Operational Traffic and Transport Impact Assessment (OTTIA)
4. Preliminary Operational Traffic Management Plan (POTMP)

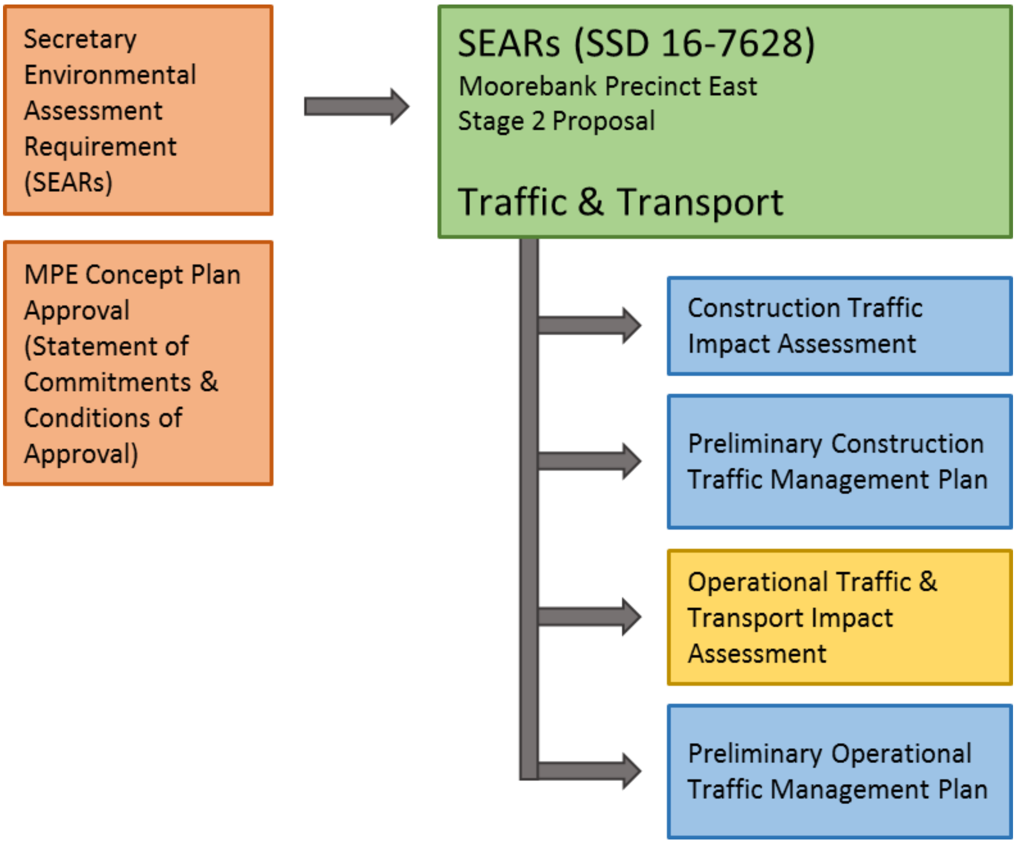

Figure 1-1 Document structure for Traffic and Transport related reporting for the Proposal

This OTTIA has been prepared to address the operation-related impacts of the Proposal. It is intended that this OTTIA report be read in conjunction with the three other standalone traffic reports prepared for the Proposal, as detailed above.

1.3 Key terms relevant to the Proposal

Table 1-4 provides a summary of key terms which are included within this report.

Table 1-4 Key terms

Term	Definition
General terms	
AEP	Annual Exceedance Probability
AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AM	Morning Peak
CoA	Conditions of Approval
Cumulative traffic	Traffic generated by the Proposal, MPE Stage 1 and MPW Stage 2.
DP	Deposited Plan
EIS	Environmental Impact Statement
EOW	Explosive ordnance waste
EP&A Act	Environment Planning and Assessment Act

Term	Definition
GFA	Gross Floor Area
IMT	Intermodal Terminal
IP	Inter-peak
JLU	Joint Logistics Unit
LoS	Level of Service
LMARI	Liverpool Moorebank Arterial Road Investigations
MIC	Moorebank Intermodal Company
MPE	Moorebank Precinct East
MPW	Moorebank Precinct West
Moorebank Precinct West (MPW) Project (formerly the MIC Project)	The MPW Intermodal Terminal Facility as approved under the MPW Concept Plan Approval (SSD_5066) and the MPW EPBC Approval (No. 2011/6086).
Moorebank Precinct West (MPW) site (formerly the MIC site)	The site which is the subject of the MPW Concept Plan Approval, MPW EPBC Approval and MPW Planning Proposal. The MPW site does not include the rail link as referenced in the MPW Concept Plan Approval or MPE Concept Plan Approval.
Moorebank Precinct East (MPE) Concept Plan Approval (formerly the SIMTA Concept Plan Approval)	MPE Concept Plan Approval (SSD_0193) granted by the NSW Department of Planning and Environment on 29 September 2014 for the development of former defence land at Moorebank to be developed in three stages; a rail link connecting the site to the Southern Sydney Freight Line, an intermodal terminal, warehousing and distribution facilities and a freight village.
Moorebank Precinct East (MPE) Project (formerly the SIMTA Project)	The MPE Intermodal Terminal Facility, including a rail link and warehouse and distribution facilities at Moorebank (eastern side of Moorebank Avenue) as approved by the Concept Plan Approval (MP 10_0913) and the MPE Stage 1 Approval (14_6766).
Moorebank Precinct East (MPE) Site (formerly the SIMTA Site)	Including the former DNSDC site and the land owned by SIMTA which is subject to the Concept Plan Approval. The MPE site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
Statement of Commitments (SoC)	Recommendations provided in the specialist consultant reports prepared as part of the MPE Concept Plan application to mitigate environmental impacts, monitor environmental performance and/or achieve a positive environmentally sustainable outcome in respect of the MPE Project. The Statement of Commitments have been proposed by SIMTA as the Proponent of the MPE Concept Plan Approval.
PM	Evening Peak
Precinct Model	Whole of precinct traffic modelling for the ultimate “full-build” scenario
Proposal Model	Traffic modelling for MPE Stage 2
Proposal traffic	Traffic generated by the MPE Stage 2
RAE	Royal Australian Engineers

Term	Definition
REMM	Revised Environmental Mitigation Measures
RMS	Roads and Maritime Service of NSW
RtS	Response to Submissions
SEARS	Secretary's Environmental Assessment Requirements
SIMTA	Sydney Intermodal Terminal Alliance
SSD	State Significant Development
SSFL	Southern Sydney Freight Line
SRtS	Supplementary Response to Submissions
SME	School of Military Engineering
TEU	Twenty-foot Equivalent Unit
The Moorebank Precinct	Refers to the whole Moorebank intermodal precinct, i.e. the MPE site and the MPW site
The Proposal	MPE Stage 2
TfNSW	Transport for New South Wales
Trip	A movement with an origin and a destination
USTs	Underground storage tanks
UXO	Unexploded ordnance
VHT	Vehicle-hours travelled
VKT	Vehicle-kilometres-travelled
VPA	Voluntary Planning Agreement
WSP – PB	Parsons Brinkerhoff
MPE Stage 1 Project-specific terms	
Rail Corridor	Area defined as the 'Rail Corridor' within the MPE Concept Plan Approval.
Rail Link	The rail link from the South Sydney Freight Line to the MPE IMEX Terminal, including the area on either side to be impacted by the construction works included in MPE Stage 1.
MPE Stage 1	Stage 1 (14-6766) of the MPE Concept Plan Approval for the development of the MPE Intermodal Terminal Facility, including the rail link at Moorebank. This reference also includes associated conditions of approval and environmental management measures which form part of the documentation for the approval.
MPE Stage 1 site	Includes the MPE Stage 1 site and the Rail Corridor, i.e. the area for which approval (construction and operation) was sought within the MPE Stage 1 Proposal EIS.

Term	Definition
MPE Stage 2 specific terms	
MPE Stage 2 Proposal/ the Proposal	The subject of this EIS; being Stage 2 of the MPE Concept Plan Approval including the construction and operation of 300,000m^2 of warehousing and distribution facilities on the MPE site and the Moorebank Avenue upgrade within the Moorebank Precinct.
MPE Stage 2 site	The area within the MPE site which would be disturbed by the MPE Stage 2 Proposal (including the operational area and construction area). The MPE Stage 2 site includes the former DNSDC site and the land owned by SIMTA which is subject to the MPE Concept Plan Approval. The MPE site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
The Moorebank Avenue site	The extent of construction works to facilitate the construction of the Moorebank Avenue upgrade.
The Moorebank Avenue upgrade	Raising of the vertical alignment of Moorebank Avenue for 1.5 kilometres of its length by about two metres, from the northern boundary of the MPE site to approximately 120 metres south of the MPE site. The Moorebank Avenue upgrade also includes upgrades to intersections, ancillary works and the construction of an on-site detention basin to the west of Moorebank Avenue within the MPW site.
Construction area	Extent of construction works, namely areas to be disturbed during the construction of the MPE Stage 2 Proposal (the Proposal).
Operational area	Extent of operational activities for the operation of the MPE Stage 2 Proposal (the Proposal).

1.4 Site description

1.4.1 Regional Context

The MPE site, including the Proposal site, is located approximately 27 km south-west of the Sydney Central Business District (CBD) and approximately 26 km west of Port Botany. The MPE site is situated within the Liverpool Local Government Area (LGA), in Sydney's South West subregion, approximately 2.5 km from the Liverpool City Centre.

The MPE site is located approximately 800 m south of the intersection of Moorebank Avenue and the M5 Motorway. The M5 Motorway provides the main road link between the MPE site, and the key employment and industrial areas within Sydney's West and South-Western subregions, the Sydney orbital network and the National Road Network. The M5 connects with the M7 Motorway to the west, providing access to the Greater Metropolitan Region and NSW road network. Similarly, the M5 Motorway is the principal connection to Sydney's north and north-east via the Hume Highway. The regional context of the Proposal is shown on Figure 1-2.

1.4.2 Local Context

The Proposal site is located approximately 2.5 km south of the Liverpool City Centre, 800 m south of the Moorebank Avenue/M5 Motorway interchange and one kilometre to the east of the SSFL providing convenient access to and from the site for rail freight (via a dedicated freight rail line) and for trucks via the Sydney Motorway Network.

The land surrounding the Proposal site comprises:

- The MPW site, formerly the School of Military Engineering (SME), on the western side of Moorebank Avenue directly adjacent to the MPE site (subject to the MPW Concept Plan Approval), which is owned by the Commonwealth;
- The East Hills Rail Corridor to the south of the MPE site, which is owned and operated by Sydney Trains;
- The Holsworthy Military Reserve, to the south of the East Hills Rail Corridor, which is owned by the Commonwealth; The Boot Land, to the immediate east of the MPE site between the eastern site boundary and the Wattle Grove residential area, which is owned by the Commonwealth.
- The southern Boot Land, to the immediate south of the MPE site between the southern site boundary and the East Hills Rail Corridor, which is owned by the Commonwealth.

Glenfield Waste Services, south-west of the Proposal is proposing to develop a Materials Recycling Facility on land owned by the Glenfield Waste Services Group within the boundary of the current landfill site at Glenfield. The facility is proposed to recycle a maximum of 450,000 tonnes of material per year. The Glenfield Waste Services Proposal is the subject of a DA (SSD_6249) under Part 4, Division 4.1 of the EP&A Act.

The closest industrial precinct to the Proposal is at Moorebank, comprising around 200 hectares of industrial development. This area includes (but is not limited to) the Yulong and ABB sites to the south of the M5 Motorway and the Goodman MFive Business Park and Miscellaneous industrial and commercial development to the north of the M5 Motorway. The majority of this development is located to the north of the M5 Motorway between Newbridge Road, the Georges River and Anzac Creek. The Moorebank Industrial Area supports a range of industrial and commercial uses, including freight and logistics, heavy and light manufacturing, offices and business park developments.

There are other areas of industrial development near the Proposal at Warwick Farm to the north, Chipping Norton to the north-east, Prestons to the west and Glenfield and Ingleburn to the south-west.

The local context of the Proposal is shown on Figure 1-3.

A number of residential suburbs are located in proximity to the Proposal site. The approximate distances of these suburbs to the MPE Stage 2 site and the Moorebank Avenue site are provided in Table 1-5 below.

Table 1-5 Distance to residential suburbs from the Proposal site

Suburb	Distance to MPE Stage 2 site	Distance to Moorebank Avenue site
Wattle Grove	360 m to the north-east	865 m to the north-east
Moorebank	1300 m to the north	1430 m to the north
Casula	820 m to the west	760 m to the west
Glenfield	1830 m to the south-west	1540 m to the south-west

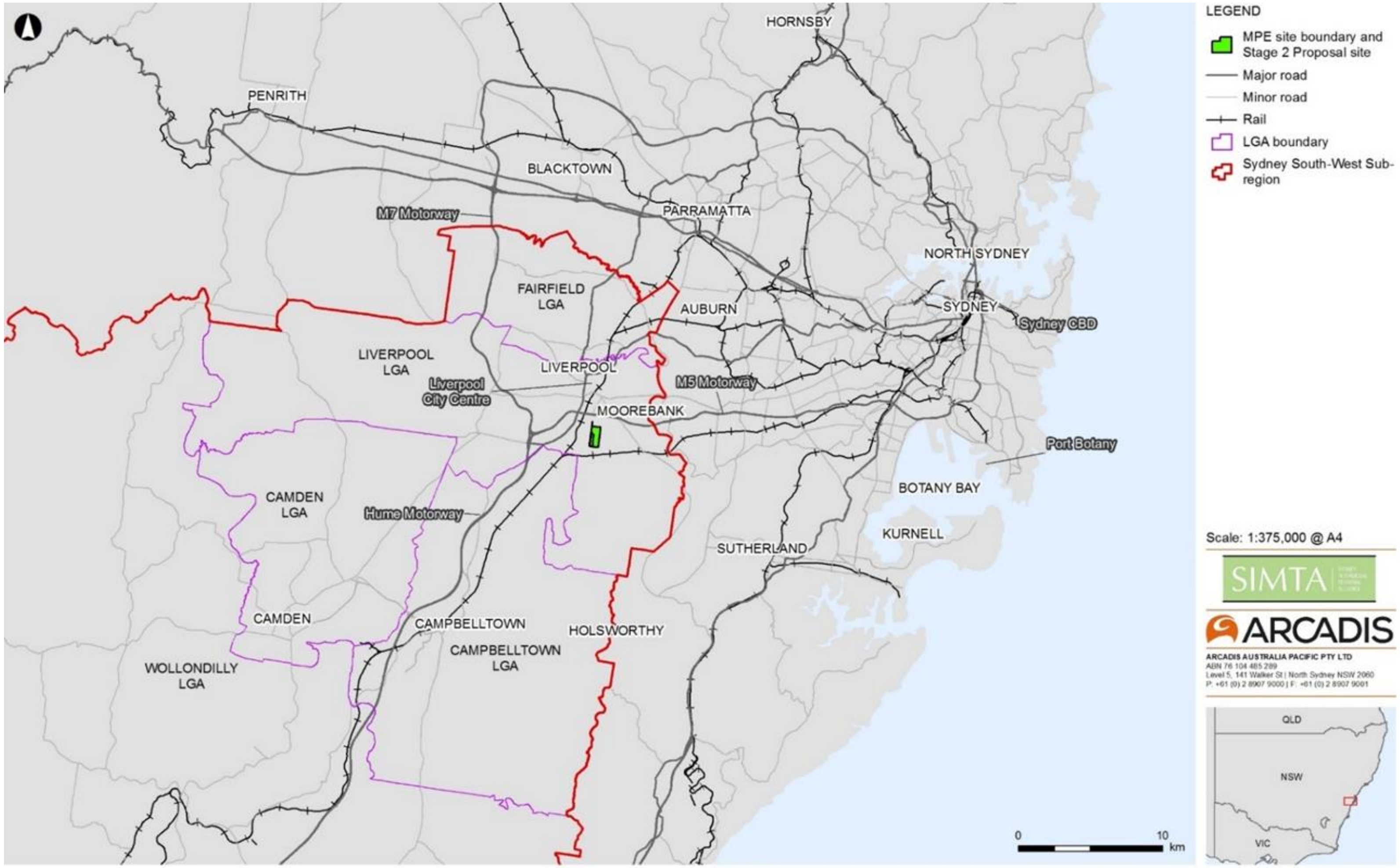

Figure 1-2 Regional context of the Proposal

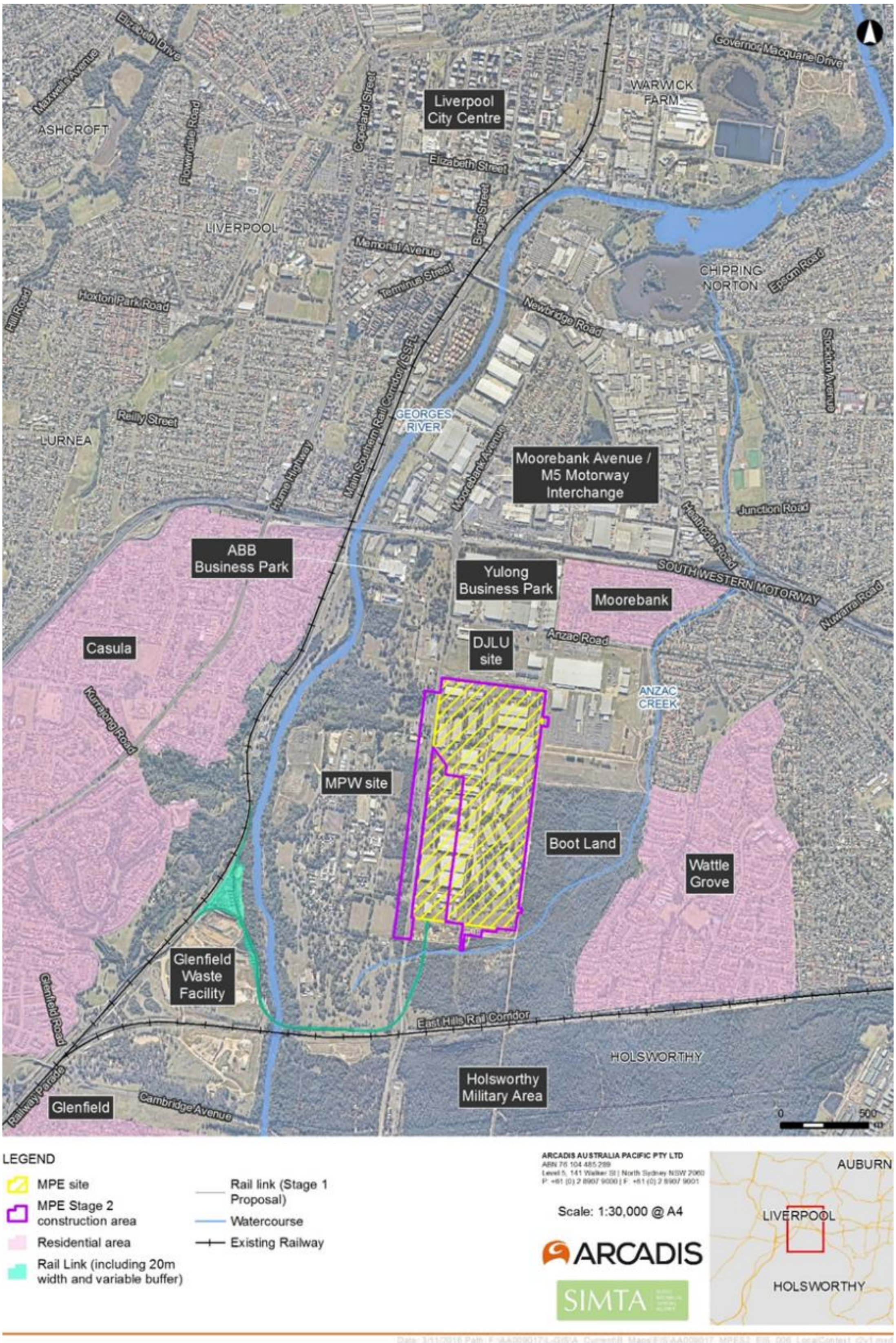

Figure 1-3 Local context of the Proposal

1.5 Proposal overview

The Proposal involves the construction and operation of Stage 2 of the MPE Project, comprising warehousing and distribution facilities on the MPE site and upgrades to approximately 1.4 kilometres of Moorebank Avenue between the northern MPE site boundary and 120 metres south of the southern MPE site boundary.

Key components of the Proposal include:

- Warehousing comprising approximately 300,000m^2 GFA, additional ancillary offices and the ancillary freight village
- Establishment of an internal road network, and connection of the Proposal to the surrounding public road network
- Ancillary supporting infrastructure within the Proposal site, including:
  - Stormwater, drainage and flooding infrastructure
  - Utilities relocation and installation
  - Vegetation clearing, remediation, earthworks, signage and landscaping
- Subdivision of the MPE Stage 2 site
- The Moorebank Avenue upgrade would be comprised of the following key components:
  - Modifications to the existing lane configuration, including some widening
  - Earthworks, including construction of embankments and tie-ins to existing Moorebank Avenue road level at the Proposal's southern and northern extents
  - Raking of the existing pavement and installation of new road pavement
  - Establishment of temporary drainage infrastructure, including temporary basins and / or swales
  - Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder
  - Signalling and intersection works
- Upgrading existing intersections along Moorebank Avenue, including:
  - Moorebank Avenue / MPE Stage 2 access
  - Moorebank Avenue / MPE Stage 1 northern access
  - Moorebank Avenue / MPE Stage 2 central access
  - MPW Northern Access / MPE Stage 2 southern emergency access

The Proposal would interact with the MPE Stage 1 Project (SSD_6766) via the transfer of containers between the MPE Stage 1 IMT and the Proposal's warehousing and distribution facilities. This transfer of freight would be via a fleet of heavy vehicles capable of being loaded with containers and owned by SIMTA. The fleet of vehicles would be stored and used on the MPE Stage 2 site, but registered and suitable for on-road use. The Proposal is expected to operate 24 hours a day, seven days per week.

The Proposal would operate 24 hours a day, 7 days a week.

The footprint and operational layout of the Proposal are shown on Figure 1-6. More information relating to the operations of the Proposal is provided below.

1.6 Built form

1.6.1 Warehousing

The Proposal would provide up to 300,000m^2 of warehousing across the MPE Stage 2 site, with ancillary offices attached. The Proposal would include eight warehouses, which would be up to 21 metres in height and would range in size from 20,350m^2 to 61,500m^2. The Proposal would also include some internal fitout of the warehouses, namely the installation of racking and associated services. The Proposal would seek approval for the construction of these warehouses and also the operation of these warehouses by future tenants.

The indicative layout of the warehouses is shown in Figure 1-7.

Each individual warehouse would consist of the following:

- A container storage area
- Office and administration facilities
- Amenities
- Car parking
- Truck loading/unloading docks
- Internal parking for pick-up and delivery vehicles (PUD)
- Specialised sortation and conveyor equipment
- Hardstand areas that provide trailer parking spaces, external PUD parking spaces, vehicle manoeuvring areas and access to the main internal site road
- Signage for business identification purposes, including backlit illuminated signage on each warehouse
- Internal fitout, comprising racking and storage.

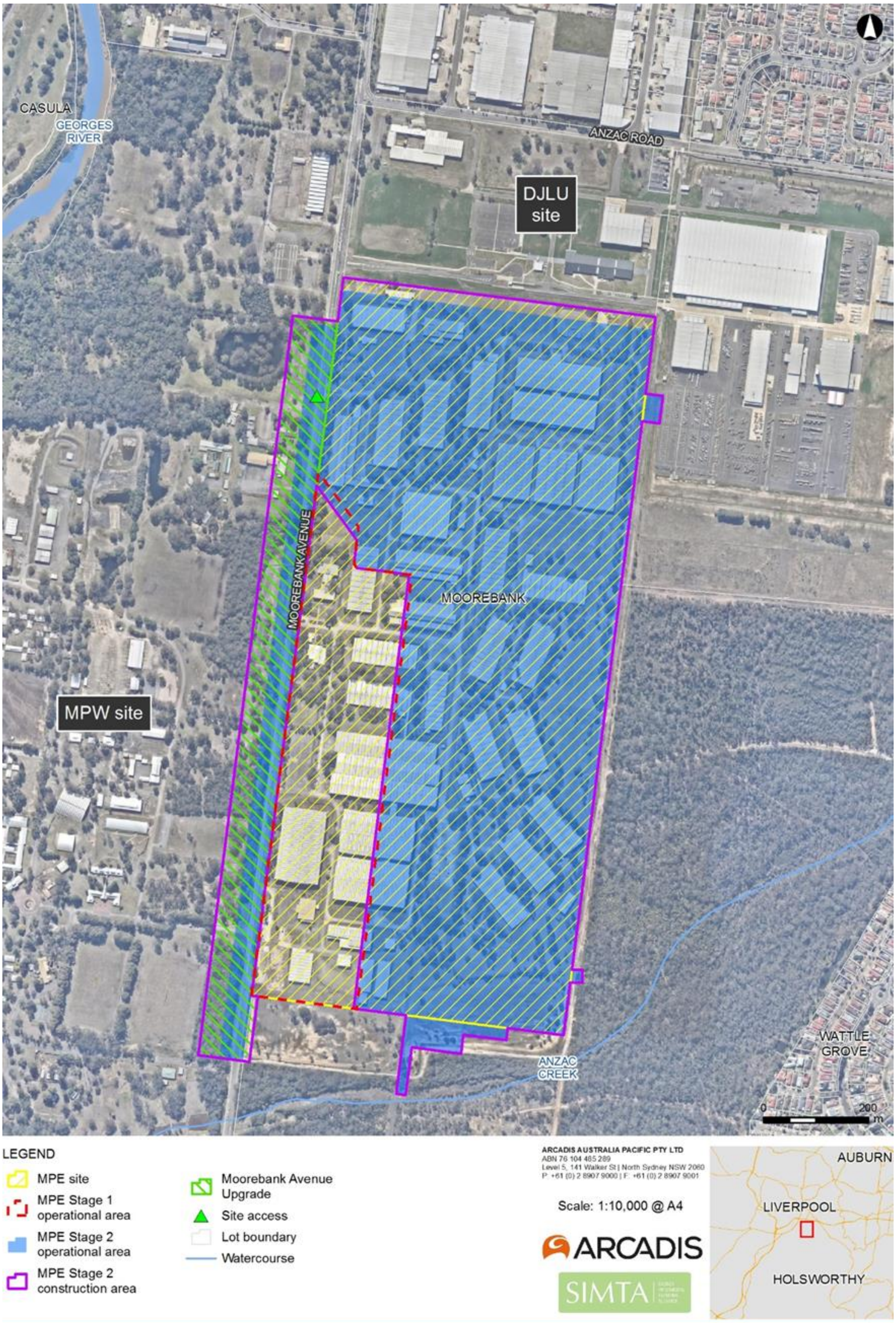

Table 1-6 Overview of the Proposal

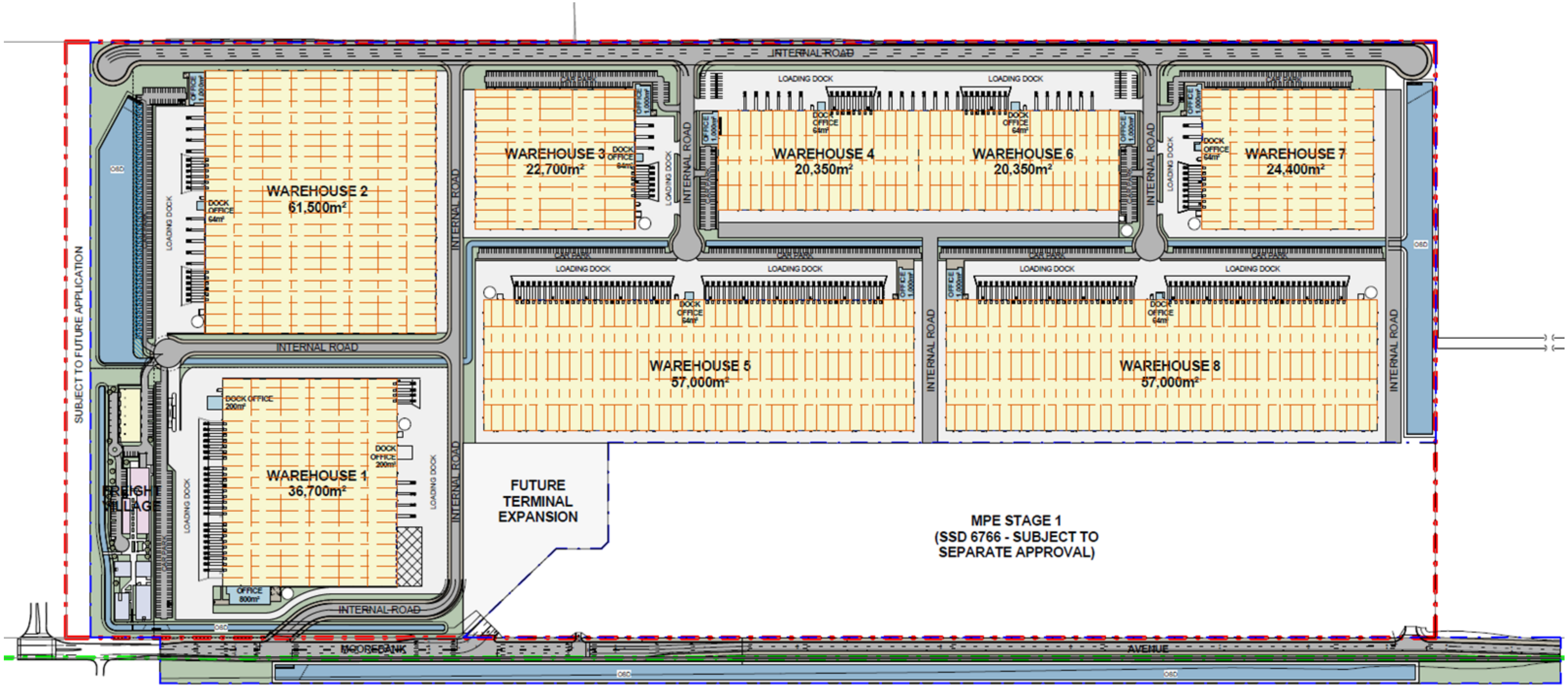

Table 1-7 Indicative Warehousing Layout

1.6.2 Freight village

A freight village including amenities would be provided on the MPE site as part of the Proposal. The ancillary freight village would be located in the north-west of the Proposal site, directly north of Warehouse 1 and east of Moorebank Avenue. The freight village would include five buildings which would provide for a mixture of retail, commercial and light industrial land uses, with a combined GFA of approximately 8,000m^2. An overview of buildings within the ancillary freight village is provided in previous Figure 1-7.

The freight village would also include the provision of:

- Food outlets
- Amenities
- Loading dock(s)
- Services area
- Services corridor
- landscaping,
- Car parking (258 spaces), including basement parking.

The indicative layout of the freight village is show on previous Figure 1-7.

Buildings and structures within the freight village would be up to 15 m in height and of varying size and design, as detailed in Section 15 (visual amenity, landscape and urban design) of the MPE Stage 2 EIS. The Proposal would also include the internal fitout of these buildings, including utilities and services. The Proposal would seek approval for the construction of this freight village and also the operation of these premises by future tenants.

Associated with this built form is a number of ancillary works, which include materials and finishes, signage, lighting, vegetation removal and landscaping, water management works and utilities, which have been discussed throughout this section of the EIS.

1.7 Vehicle movement and access

The Proposal would include one site access point, with traffic circulating through the site using internal roads, service roads and internal transfer roads. A description of site access and traffic circulation throughout the Proposal site is described below.

1.7.1 MPE Stage 2 site access

Access to and from the Proposal site would be via the existing DNSDC northern access, to the north of the MPE Stage 1 Project. Site access at this location would allow for vehicular access to warehouse and distribution facilities to enable the direct delivery and dispatch of goods to the warehouses. The site access point is shown on previous Figure 1-6.

1.7.2 Traffic circulation within the MPE Stage 2 site

During the interim stages of operation, the traffic circulation throughout the MPE Stage 2 site would be via a combination of the roads described below (i.e. the final configuration) and the use of modified existing roads. Interim vehicle movement and access throughout the MPE Stage 2 site would be included in the relevant environmental management plans for operation of the Proposal, including the Construction Traffic Management Plan and Operational Traffic Management Plan

1.7.3 Internal roads

The MPE Stage 2 site includes two main internal roads, which provided the main east-west and north-south traffic movements throughout the MPE Stage 2 site. On entering the MPE Stage 2 site, light and heavy vehicles would travel along an east-west oriented internal road (internal road 1). Internal road 1 would connect at its easternmost point to a second north-south oriented internal road (internal road 2).

Internal roads 1 and 2 would connect to three service roads which would provide vehicle access to warehouses, loading docks and car parking.

Internal road 2 would provide for traffic movements along the entire eastern perimeter of the Proposal, and would have a cul-de-sac at both the northern and southern ends to allow vehicles to turn around. The internal roads would be two lanes wide (one lane in each direction) and would be wide enough to accommodate heavy vehicle turning movements, including B-doubles.

1.7.4 Service roads

Three service roads would connect to the internal roads within the MPE Stage 2 site. The service roads would provide access to loading docks at warehouses for heavy vehicles to park and be packed with materials which have been received and stored within the warehouses. Service roads would also enable access to light vehicle parking for users of the warehouses. Each service road would have a cul-de-sac for vehicles to turn around, which would be able to accommodate turning movements of B-doubles.

Service road 1 would connect to internal road 1 via a T-intersection, and would provide access to Warehouse 1, Warehouse 2 and the ancillary freight village. Two additional service roads would connect to internal road 2 via t-intersections; service road 2 would provide access for warehouses 3, 4 and 5, and service road 3 would provide access to warehouses 6, 7 and 8.

1.7.5 Transfer roads

There would be three Transfer roads within the MPE Stage 2 site. These roads would provide connections between the warehouses and the MPE Stage 1 IMT. It is intended that the transfer of freight between the Stage 1 IMT and warehouses would be via an internal fleet of vehicles which would remain on the MPE Stage 2 site and would not use the external road network.

Transfer road 1 would travel mostly along the same path as internal road 1 and provide access between the Stage 1 IMT facility and Warehouses 1, 2 and 3. Transfer road 2 would travel through the centre of the MPE Stage 2 site and would provide access between the Stage 1 IMT facility and Warehouses 4, 5, 6 and 8. Transfer road 3 would travel along the southern boundary of the MPE site, and provide access between the Stage 1 IMT facility and Warehouses 7 and 8.

With the exception of transfer road 1, which travels along the same path as internal road 1, the movement of internal fleet vehicles along transfer roads would be separated from light and heavy vehicles entering and exiting the MPE Stage 2 site to maintain efficiency and to provide for a safe internal road network

1.8 Roadworks – Moorebank Avenue

As part of the Proposal, Moorebank Avenue would be upgraded for about 1.4 kilometres. The Moorebank Avenue upgrade commences from approximately 95 metres south of the northern boundary of the MPE site to approximately120 metres south of the southern MPE site boundary. The Moorebank avenue upgrade is located within the existing Moorebank Avenue road corridor and along the eastern boundary of the MPW site (refer to previous Figure 1-6 for extent of works).

The Moorebank Avenue upgrade would be comprised of the following key components:

- Modifications to the existing lane configuration, including some widening
- Signalling and intersection works.
- Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder

1.8.1 Lane configuration

The Moorebank Avenue upgrade would provide for the integration of the Proposal with the wider Moorebank Precinct works and to tie-in to Moorebank Avenue at its existing vertical and horizontal alignment near the northern boundary of the MPE site.

The arrangement of lanes along Moorebank Avenue as part of the Proposal would include:

- Four lanes from the northern extent of the Moorebank Avenue upgrade to the MPE Stage 1 central access.
- Two lanes between the MPE Stage 1 central access to approximately 120 metres south of the MPE site.

The lanes would generally be 3.5m wide central travel lanes, with 4.2m wide kerbside travel lanes with a 4.5 metre verge along both the northbound and southbound carriageways.

1.8.2 Intersection upgrades

The Proposal includes upgrades to four intersections along Moorebank Avenue, including:

- Moorebank Avenue / MPE Stage 2 access
- Moorebank Avenue / MPE Stage 1 northern access
- Moorebank Avenue / MPE Stage 2 central access
- MPW Northern Access / MPE Stage 2 southern emergency access

1.8.3 Road alignment

The horizontal alignment of Moorebank Avenue is not expected to change significantly as a result of the Proposal, with the upgraded road remaining primarily within the existing Lot 2 of DP1197707.

As part of the Proposal, the vertical alignment of Moorebank Avenue within the operational footprint of the Moorebank Avenue upgrade would be raised by approximately two metres. At the northern and southern extents of this work, the vertical alignment would be graded to tie-in to the remainder of Moorebank Avenue.

1.9 Ancillary infrastructure

The Proposal would also include ancillary supporting infrastructure to facilitate the efficient operation of the Proposal, to minimise the environmental impact and enhance the visual amenity of the Proposal site. Ancillary infrastructure to be included on the Proposal site would comprise:

- Landscaping within the MPE site and along Moorebank Avenue
- Water management works, including stormwater infrastructure and on-site detention within the MPE site and along Moorebank Avenue
- The installation of signage throughout the Proposal site for the purposes of way finding and access to/from the warehousing facilities.
- The provision of road signage along Moorebank Avenue within the Proposal site
- Lighting around the warehouse entry and exit points, freight village, ancillary offices and along the internal roads.
- Street lighting along Moorebank Avenue
- Relocation and installation of utilities to connect to nearby public utility networks within the MPE site and along Moorebank Avenue
- Subdivision of the Proposal site for the purpose of segregating the intermodal terminal and warehousing, and also for the tenanting of individual warehouses within the facility.

1.10 Operational hours

Movement of freight between the IMT and warehouses within the Proposal site would be undertaken 24 hours per day, seven days a week. The warehouses would generally be operational for 24 hours per day, seven days a week.

1.11 Reference Traffic Study, Data and Modelling

For the purpose of the study, future traffic growth and modelling data was sourced from Roads and Maritime's wider Liverpool Moorebank Arterial Road Investigations (LMARI) model built in AIMSUN modelling software version 8.0.9 (R35843).

The LMARI AIMSUN traffic model has been developed, calibrated and validated by Jacobs[1] and subsequently updated by GTA consultants[2] (GTA). Roads and Maritime provided the 2026 and 2036 future base model (Do Minimum) on 20 June 2016. For the purpose of the operational traffic modelling undertaken for the Proposal, Arcadis used the AIMSUN traffic model provided by Roads and Maritime dated 20 June 2016. Arcadis supplemented this assessment with additional traffic modelling using SIDRA Network version 7.

The performance of the study intersections was assessed based on the level of service (LoS). The adopted standard for LoS is the NSW Level of Service criteria for intersection performance (see Table 1-8 below).

Table 1-8 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: Roads and Maritime Guide to Traffic Generating Development

Roads and Maritime has identified a series of planned and committed network improvements to meet the growth in future demand on the road network. These have been assumed as part of the do-minimum network improvements and incorporated into the modelling conducted by Arcadis. A summary of these improvements Is provided in Table 1-8. The inclusion of these assumed network improvements to the Do Minimum model has been called the "Do Minimum scenario" and has been adopted as the base case for traffic modelling for the operation of the Proposal.

[1] Liverpool Moorebank Arterial Road Investigations, MITRA Base Model Calibration and Validation Report, Final Revision B.0, Jacobs, 12 October 2015.
[2] Moorebank Intermodal Terminal AIMSUN Existing Conditions Model – Modelling Review Summary, Memorandum, GTA Consultants, 26 November 2015.

Table 1-9 Assumed Do-Minimum Network Improvements

Intersection/ Location of network improvement	Description of works
1. Camden Valley Way/Croatia Avenue	• Widening of Croatia Avenue to two lanes in each direction
2. Campbelltown Road/Glenfield Road	• Short left-turn lane from Glenfield Road to Campbelltown Road • Widening of Glenfield Road to two lanes in each direction between Campbelltown Road and Brampton Avenue
3. Campbelltown Road/Glenfield Road	• Reconfiguration of the intersection
4. Hume Highway/ Bigge Street	• Reconfiguration of the intersection
5. Speed Street/ Pirie Street	• New traffic signals and phasing, with no change in the intersection footprint • Left-turn slip lane on the northern approach converted to a continuous turn lane
6. Campbelltown Road corridor	• Road widening between Glenfield Road and Edmondson Park station
7. Heathcote Road corridor	• Widening of Heathcote Road to two lanes in each direction between Moorebank Sports Club and Pleasure Point •
8. Applied 'yellow box' to ensure no blockage of occurs from vehicles queueing across the intersection	• Croatia Avenue/Edmondson Park Station Access • Moorebank Avenue/Church Road • Church Road/Market Street • Flowerdale Road/Mainsbridge Avenue • Cedar Road/Wattle Road.

Source: Roads and Maritime

Arcadis also used appropriate data from traffic reports previously prepared for the Moorebank Precinct including the following:

- Moorebank Precinct East Project (MPE) Project[3] – The Intermodal terminal facility on the MPE site as approved by the MPE Concept Plan Approval (MP 10_0913) and including the MPE Stage 1 Proposal (14-6766). This report references previous Transport and Accessibility Impact Assessment reports (2013, 2015 Arcadis previously known as Hyder Consulting) prepared for both Concept Plan Approval and Stage 1 Proposals where required.

[3] MPE Concept Plan, Traffic and Accessibility Impact Assessment, Hyder Consulting, 2013 and MPE Intermodal Terminal Facility – Stage 1, Traffic and Accessibility Impact Assessment, Hyder Consulting, 2015

- Moorebank Precinct West (MPW) Concept Plan Approval - MPW Concept Plan and Early Works Approval (SSD 5066) granted on 3 June 2016 for the development of the MPW intermodal terminal facility at Moorebank and the undertaking of the Early Works. This report references previous Traffic and Transport Impact Assessment traffic reports (2015, WSP | Parsons Brinkerhoff previously known as Parsons Brinkerhoff) prepared for both the Concept Plan Approval and Stage 1 Proposals where required.
- Moorebank Intermodal Terminal Precinct – Traffic Generation and Underlying Assumptions, Memorandum, Parsons Brinckerhoff, September 2016.

In addition to the above, MIC (and WSP – PB) are currently undertaking traffic modelling which utilises the June 2016 "Do Minimum" AIMSUN (LMARI) model provided by Roads and Maritime. The intent of this modelling exercise (the Precinct Model) is to assess the impacts on the surrounding road network arising as a result of the ultimate full-build scenario for the entire Moorebank Intermodal Precinct (i.e. the MPW and MPE Projects). The expected outcomes of the Precinct Model include identifying appropriate network upgrades to mitigate the Precinct's impacts on the road network to a "no-worse than without development" state and to nominate the staging of the upgrades. It is understood that this reporting would be available in December 2016, and that at this time it would be provided to the relevant agencies for review and discussion.

Arcadis has actively coordinated with MIC (and WSP – PB) in relation to the modelling inputs for the Proposal into the Precinct Modelling to ensure consistency between the two modelling exercises. This traffic report recommends upgrades which are considered relevant to addressing the traffic impacts of the Proposal, as is required by the SEARs. The Precinct Modelling would seek to verify the size and scale of the upgrades for not only the Proposal's impact, but also indicate size and scale of upgrades for all future stages of the Moorebank Intermodal Precinct.

1.12 Consultation with Key Stakeholders

In the preparation of this traffic assessment and to fulfil the requirements of the SEARs, SoC and CoA, consultation was undertaken with the key stakeholders including Roads and Maritime, Transport for New South Wales, Liverpool City Council and Campbelltown City Council. Through-out the traffic study, key stakeholders were consulted through a series of meetings, emails and phone calls to present the scope of the study, impact assessment methodology and preliminary findings of the traffic study.

Roads and Maritime have been consulted on a number of occasions since the last quarter of 2015 regarding the planning applications associated with the MPE and MPW Projects. Consultation undertaken specifically for the Proposal has been focussed on establishing and agreeing on a suitable approach to the operational traffic modelling to be undertaken for the Proposal, particularly in the context of the separate overall precinct modelling.

Regular consultation via meetings, email correspondence and telephone conversations have been undertaken throughout the preparation of this OTTIA to ensure that the modelling undertaken for the Proposal utilises the appropriate AIMSUN (LMARI) model and assessment approach.

Key meetings and presentations to key stakeholders have included:

- Meetings with NSW Roads and Maritime Services (Roads and Maritime) to discuss Roads and Maritime AIMSUN modelling and assessment methodology on 10 February 2016 and 9 June 2016
- Presentation on Traffic Methodology and Preliminary Findings to Liverpool City Council (LCC) on 31 October 2016
- Presentation on Traffic Methodology and Preliminary Findings to Roads and Maritime and Transport for New South Wales (TfNSW) on 8 November 2016.

1.13 Structure of this Report

This Traffic and Transport Impact Assessment contains the following seven sections providing an assessment of the traffic issues relating to the proposed construction of Proposal.

- Section 1 provides an overview of the Proposal and details the objectives of the assessment, including a summary of the relevant SEARs/ SoC/ CoA requirements.
- Section 2 describes the existing traffic and transport environment within which the assessment has taken place. This section provides an overview of existing travel patterns in the study area as well as existing public transport, pedestrian and cycle provisions.
- Section 3 describes the existing road network performance and level of service. An assessment of existing network capacity has been undertaken, summarising network deficiency at key roads and intersections.
- Section 4 reports on traffic impacts without the Proposal, taking into consideration background traffic growth.
- Section 5 details traffic impacts associated with the Proposal. In particular this section documents proposed accesses to the Proposal site, trip generation, level of service, traffic impacts to the road network, including Cambridge Avenue and public transport.
- Section 6 presents the proposed mitigation measures to address traffic generated by the Proposal, background and cumulative traffic.
- Section 7 summarises the key findings and recommendations of the assessment.

2 EXISTING TRAFFIC AND TRANSPORT ENVIRONMENT

The existing traffic and transport conditions in the study area are described within this section of the OTTIA. This section provides the regional and local transport context within which the OTTIA has been undertaken.

2.1 Study Area

The traffic study area comprises two components:

- The core traffic study area selected for the Proposal includes ten key intersections, which have the most potential to be impacted by the Proposal. Detailed analysis has been conducted for these study intersections and road links in the core area (as shown in Figure 2-1) and includes:
  - I-1: Moorebank Avenue / Anzac Road
  - I-2: M5 Motorway / Moorebank Avenue
  - I-3: M5 Motorway / Hume Highway
  - I-4: Moorebank Avenue / Newbridge Road
  - I-5: Moorebank Avenue / Heathcote Road
  - I-6: M5 Motorway / Heathcote Road
  - I-7: Cambridge Avenue / Glenfield Road
  - I-8: Cambridge Avenue / Canterbury Road
  - I-A: Moorebank Avenue / DJLU Access
  - I-B: Moorebank Avenue / MPE Stage 2 Site Access.

  The operational traffic impact assessment of these intersections (only) was provided to Roads and Maritime as part of the consultation undertaken on 8 November 2016, prior to completing the modelling (refer to Section 1.12 of this report for traffic consultation undertaken for the Proposal
- The wider traffic study area, which includes the surrounding road network in the Liverpool local government area (LGA), which has been delineated by the Roads and Maritime's LMARI traffic model.

These areas are derived from investigations based on previous modelling undertaken for the MPE Stage 1 Project and the Roads and Maritime's LMARI traffic model. Figure 2-1 delineates the core traffic study area and wider traffic study area.

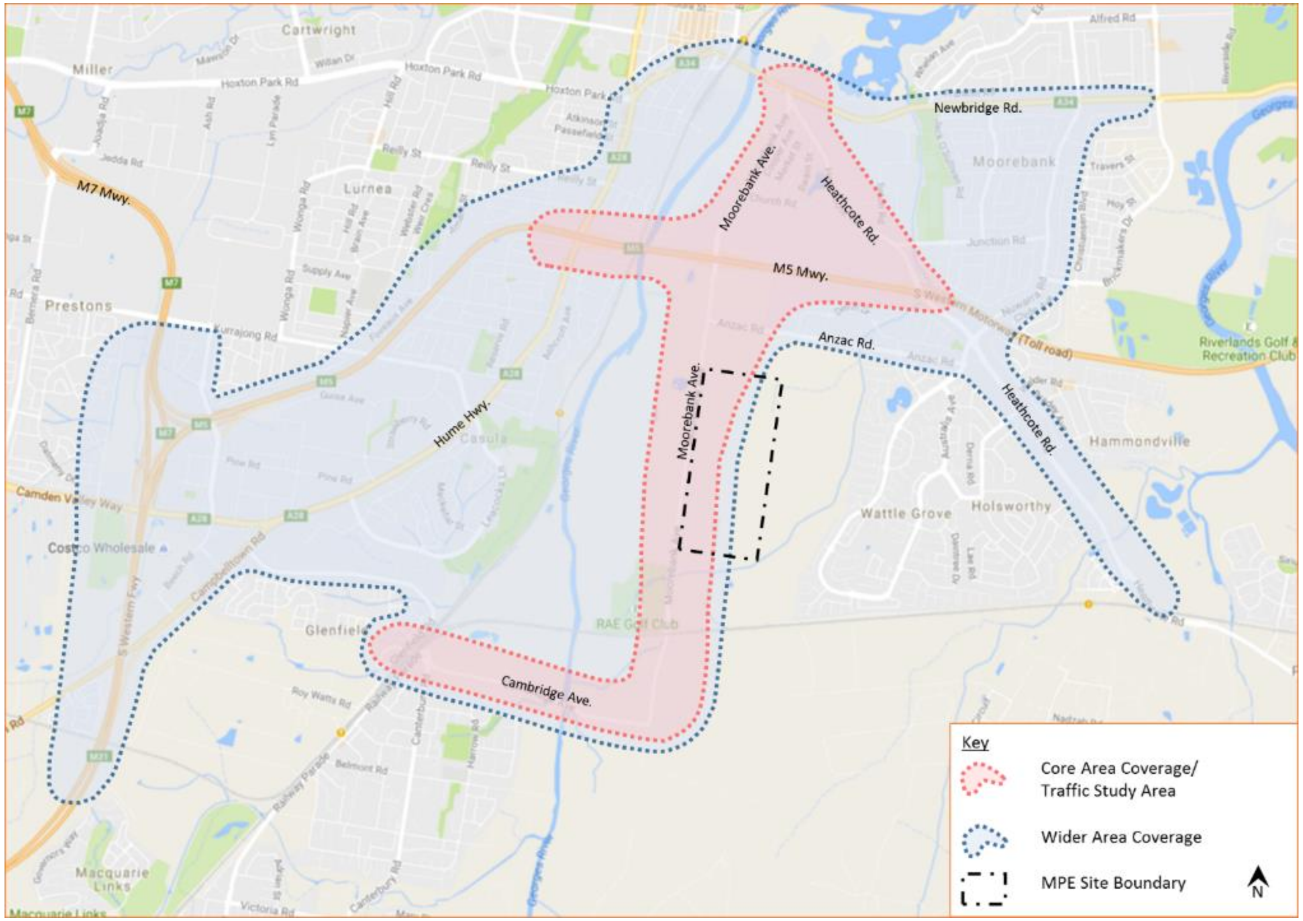

Figure 2-1 Study Area Coverage

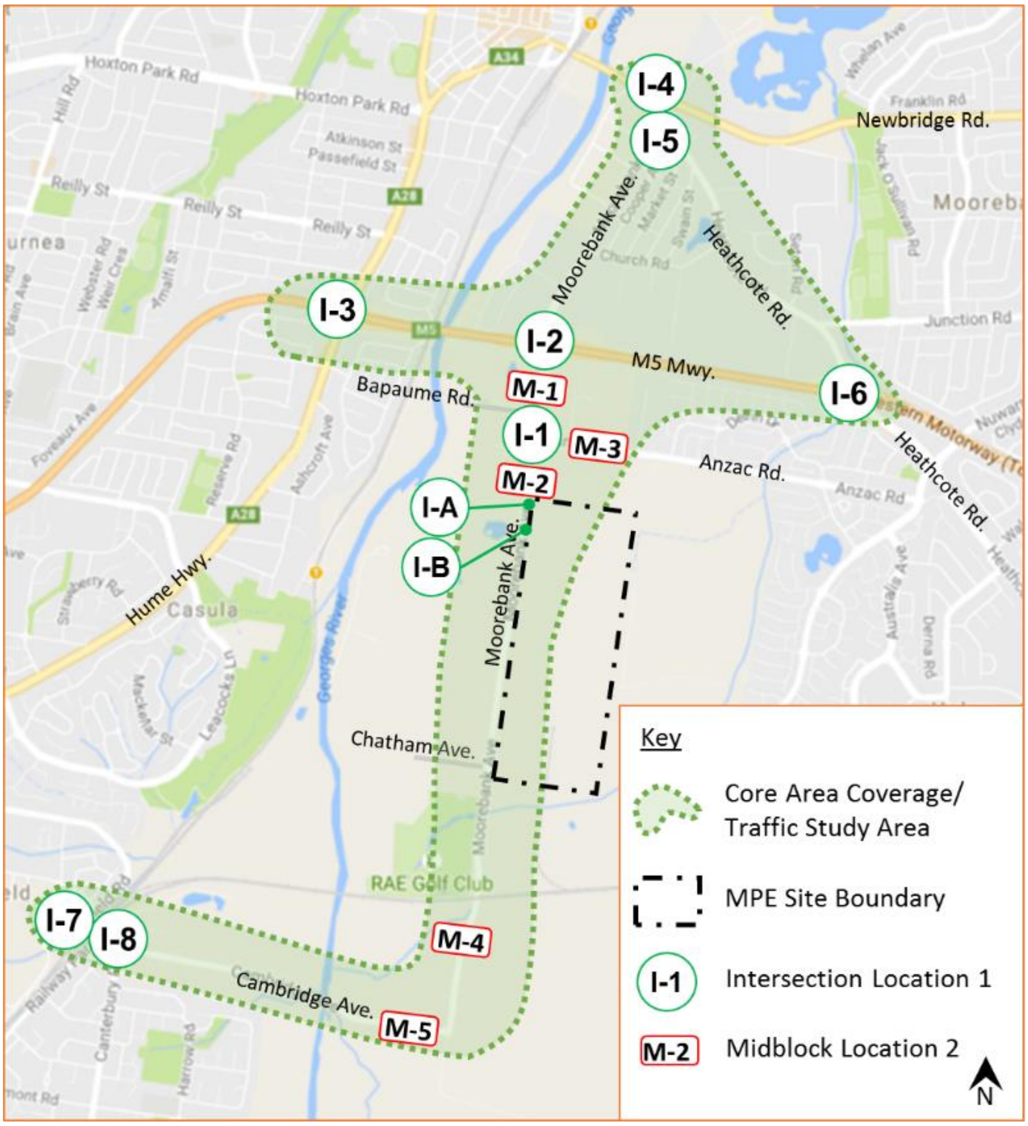

Figure 2-2 Key Intersections and Road Links in the Core Area

2.2 Road hierarchy

Roads and Maritime defines the functional road hierarchy in an urban area to establish a consistent basis for traffic management and planning. There are three key categories within this hierarchy:

- State Roads, typically comprising freeways/ motorways and primary arterials.
- Regional Roads, including secondary or sub-arterials.
- Local Roads which comprise 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, the 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.

A hierarchy of state (motorway), local and private roads surround the Proposal site. Table 2-1 and Figure 2-3 describes the current road hierarchy that provides access to/from the Proposal site.

It is expected that more than half of the traffic associated with the construction and operation of the Proposal would travel to the Proposal site from the west along the M5 Motorway then south down Moorebank Avenue to the Proposal site. Similarly, the majority of the traffic will travel north from the site to the M5 then travel west along the M5 Motorway.

Table 2-1 Existing key roads on the road network adjacent to the Proposal site

Road	Road Hierarchy	Characteristics
M5 South West Motorway	Motorway	The M5 South West Motorway (M5 Motorway) is a 22 km tolled road, with generally three lanes in each direction between Camden Valley Way, Prestons and King Georges Road, Beverly Hills. The M5 Motorway It is operated by Interlink Roads and forms part of the M5 transport corridor, which is the main passenger, commercial and freight route between Sydney Airport, Port Botany and south west Sydney. The M5 Motorway is also a key part of the Sydney Orbital Network; a series of interconnected roads that link key areas of the Greater Sydney Metropolitan Region (GMR).
Moorebank Avenue	Local Road / Private Road	Moorebank Avenue is currently a two lane undivided road (one lane in each direction) between the M5 Motorway and Cambridge Avenue to the south of the Proposal site. To the north of the M5 Motorway, Moorebank Avenue is generally a four lane undivided road. Moorebank Avenue provides a north-south link between Liverpool and Glenfield, and also forms a grade separated interchange with the M5 Motorway, north of the Proposal site. North of the M5 Motorway, Moorebank Avenue is a State Road. Moorebank Avenue between theM5 Motorway and Anzac Road is owned and maintained by Liverpool City Council. Moorebank Avenue between Anzac Road and Cambridge Avenue (including the portion of Moorebank Avenue in Moorebank Avenue site) is a privately owned road located on Commonwealth land that is publicly accessible.
Anzac Road	Local Road	Anzac Road is an east-west oriented local road that connects Moorebank Avenue and Heathcote Road. It provides access to Moorebank Business Park and the residential area of Wattle Grove. Anzac Road is generally a two-lane undivided road.

Road	Road Hierarchy	Characteristics
Bapaume Road	Local Road	Bapaume Road is an east-west local road that connects Moorebank Avenue to the industrial complex (ABB site). Bapaume Road is generally a two-lane undivided road, which is owned and maintained by Liverpool City Council.
Cambridge Avenue	Local Road	Cambridge Avenue is a local road which connects Moorebank Avenue from the south to Macquarie Fields through to Campbelltown. It is generally a two lane road (one lane each direction) and is owned and maintained by Campbelltown City Council. Cambridge Avenue crosses the Georges River via a low level narrow bridge (subject to flooding).

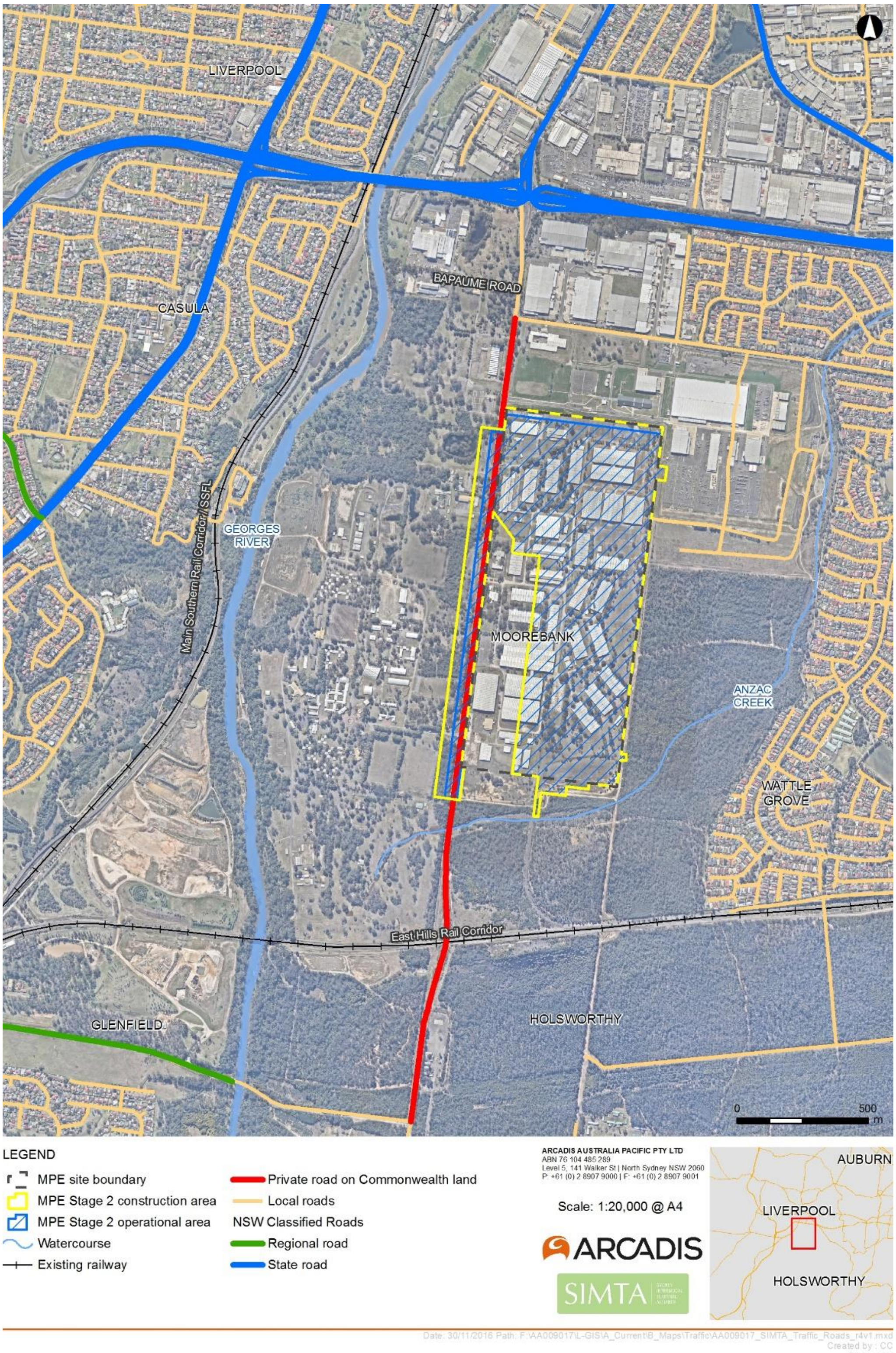

Figure 2-3 Existing Road Hierarchy surrounding the Proposal site

2.3 Historical Traffic Volumes

The historical traffic data in this section presents annual average daily traffic (AADT) and average daily traffic (ADT) for key roads in proximity to the Proposal site between 2002 and 2015. The ADT data for 2010 and 2014 were sourced from traffic surveys undertaken for the MPE project[45]. The daily traffic data for 2015 were estimated from actual 2014 ADT counts and traffic count data sourced from the Roads and Maritime's wider Liverpool Moorebank Arterial Road Investigations (LMARI) traffic model.

Table 2-2 show historical traffic data reported at key roads including the M5 Motorway, Moorebank Avenue and Anzac Road between 2002 and 2015. The data in Table 2-2 provides an understanding of the background traffic volumes on the M5 Motorway, Moorebank Avenue and Anzac Road between 2002 and 2015, over a 13-year period and suggests that:

- Traffic on the M5 Motorway at the bridge over the Georges River has grown consistently between 2002 and 2010. It is expected that the future traffic on the M5 Motorway will continue to grow as a result of the additional capacity provided from the recent M5 West Widening upgrade.
- Since 2010, traffic volumes on Moorebank Avenue and Anzac Road have not substantially changed. Between 2010 and 2015, traffic on this section of Moorebank Avenue was found to be consistent and ranging between 16,700 and 17,200 vehicles per day.
- Traffic volumes on Anzac Road have increased slightly from 9,500 vehicles per day in 2010 to 10,400 vehicles per day in 2015.

2.4 Historical Traffic Growth

The following section documents the historical traffic growth analysis undertaken. Table 2-3 below shows historical traffic growth for key roads and intersections observed on the study area road network based on recent available data. The growth is estimated based on available data reported as AADT and ADT.

The historical traffic data indicates the following plausible trends:

- Consistent traffic growth was observed on the M5 Motorway of about 4.3% per annum (2002 – 2010).
- Historical traffic volumes on Moorebank Avenue (between the M5 Motorway and Cambridge Avenue) are relatively stable with fluctuations of 0.3% between 2002 and 2015. This could be attributed to numerous factors, including increases in traffic due to new residential developments in Glenfield and Macquarie Fields, as well as reductions in traffic due to the relocation of the DNSDC and the M5 West Widening (i.e. less 'rat-running" of traffic on Moorebank Avenue due to increased motorway capacity).
- The last five years of data (between 2010 and 2015) suggests traffic increases on Anzac Road of about 1.8% per annum which may have been attributed to the development of the nearby industrial estate at Yulong Close; however, the specific cause of this increase is unclear at this time.

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[4] MPE Concept Plan, Traffic and Accessibility Impact Assessment, Hyder Consulting, 2013.
[5] MPE Intermodal Terminal Facility – Stage 1, Traffic and Accessibility Impact Assessment, Hyder Consulting, 2015.

On average, the last 13 years of traffic data suggests average traffic growth of approximately 1.3% per annum to 2015 on all key roads near the Proposal. This growth rate appears to be consistent with the regional growth rate of between 1% and 2% per annum observed on the adjacent State Road network.

Table 2-2 Historical Traffic Volumes on Key Roads between 2002 and 2015

Roads/ Locations	AADT – all vehicles						
	2002(1)	2005(1)	2009(1)	2012(2)	2010(3)	2014(4)	2015(5)
M5 Motorway, at bridge over Georges River	91,849	98,194	113,759	119,800	128,500	n.a	n.a
Moorebank Avenue, north of Cambridge Avenue	14,348	15,903	14,098	n.a	16,500	16,460	16,760
Moorebank Avenue, south of Anzac Road	n.a	n.a	n.a	n.a	17,500	16,900	17,200
Anzac Road, east of Moorebank Avenue	n.a	n.a	n.a	n.a	9,500	10,230	10,410

Note: n.a= Data is not available.
Source: RMS count data, 2010 and 2014 traffic survey data
(1) AADT obtained from RMS.
(2) AADT obtained from RMS http://www.rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/map/index.html. The M5 West Widening project commenced in August 2012.
(3) ADT obtained from 2010/10 traffic survey for MPE Concept Approval.
(4) 2014 ADT obtained from 2014 November traffic survey for MPE Stage 1 Proposal traffic assessment.
(5) 2015 ADT traffic volumes have been estimated from 2014 actual ADT traffic counts and traffic count data sourced from the Roads and Maritime's wider Liverpool Moorebank Arterial Road Investigations (LMARI) traffic model.

Table 2-3 Historical Traffic Growth between 2002 and 2015

Roads/Locations	Annual Average Growth Rate (%)		
	Between 2002-2009	Between 2002-2010	Between 2010-2015
M5 Motorway, at bridge over Georges River	n.a	▲4.3%	n.a
Moorebank Avenue, north of Cambridge Avenue	▼0.3%	n.a	▲0.3%
Moorebank Avenue, south of Anzac Road	n.a	n.a	▼0.3%
Anzac Road, east of Moorebank Avenue	n.a	n.a	▲1.8%
Average for all roads (last 13 years)	▲1.3%		

Note: n.a= Data is not available.

2.5 Crash data

This assessment is based on recent crash data supplied by Roads and Maritime for the five-year period from 1st July 2010 to 30th June 2015 inclusive. The crash data has been reported for a wider road network including the M5 Motorway (and its three interchanges with Moorebank Avenue, Hume Highway and Heathcote Road), Moorebank Avenue (north and south of M5 Motorway), Anzac Road, Cambridge Avenue, Moorebank Avenue/Newbridge Road intersection, and Moorebank Avenue/Heathcote Road intersection (refer to Figure 2-4 below).

A total of 444 crashes were recorded in the five-year period. Of these, 210 (47%) crashes resulted in injuries, 232 (52%) crashes resulted in non-casualty and two crashes (1%) were recoded as fatalities.

Figure 2-4 shows injury, non-casualty and fatal crashes occurred across a wider road network in the last five years. The crash data appears to be more concentrated at State Roads and the M5 Motorway including its associated interchanges with Moorebank Avenue, the Hume Highway and Heathcote Road. Some crash prone locations include:

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

From the analysis of the crash data between 2010 and 2015, the following points are noted:

- The majority of crashes were rear end (45.7%) and are concentrated on the M5 Motorway between Hume Highway and Heathcote Road. Table 2-4 shows crashes by crash type.
- There were 27 crashes (6.1%) involving articulated vehicles with the majority occurring on the M5 Motorway.
- A low number of crashes occurred on Moorebank Avenue (south of the M5 Motorway), Anzac Road and Cambridge Avenue compared to State Roads crash sites e.g. on the M5 Motorway.

Table 2-4 Crashes by Type (2010 to 2015)

Crash Type	Number of Crashes	Percentage of total crashes
Rear-end	203	45.7%
Intersection, adjacent approaches	55	12.4%
Lane change	38	8.6%
Opposing vehicles; turning	33	7.4%
Off road on straight, hit object	32	7.2%
Parallel lanes, turning	15	3.4%
Head-on (not over-taking)	12	2.7%
Other crash type	56	12.6%
Total crash	**444**	**100%**

Source: RMS Crash Data 2010-2015

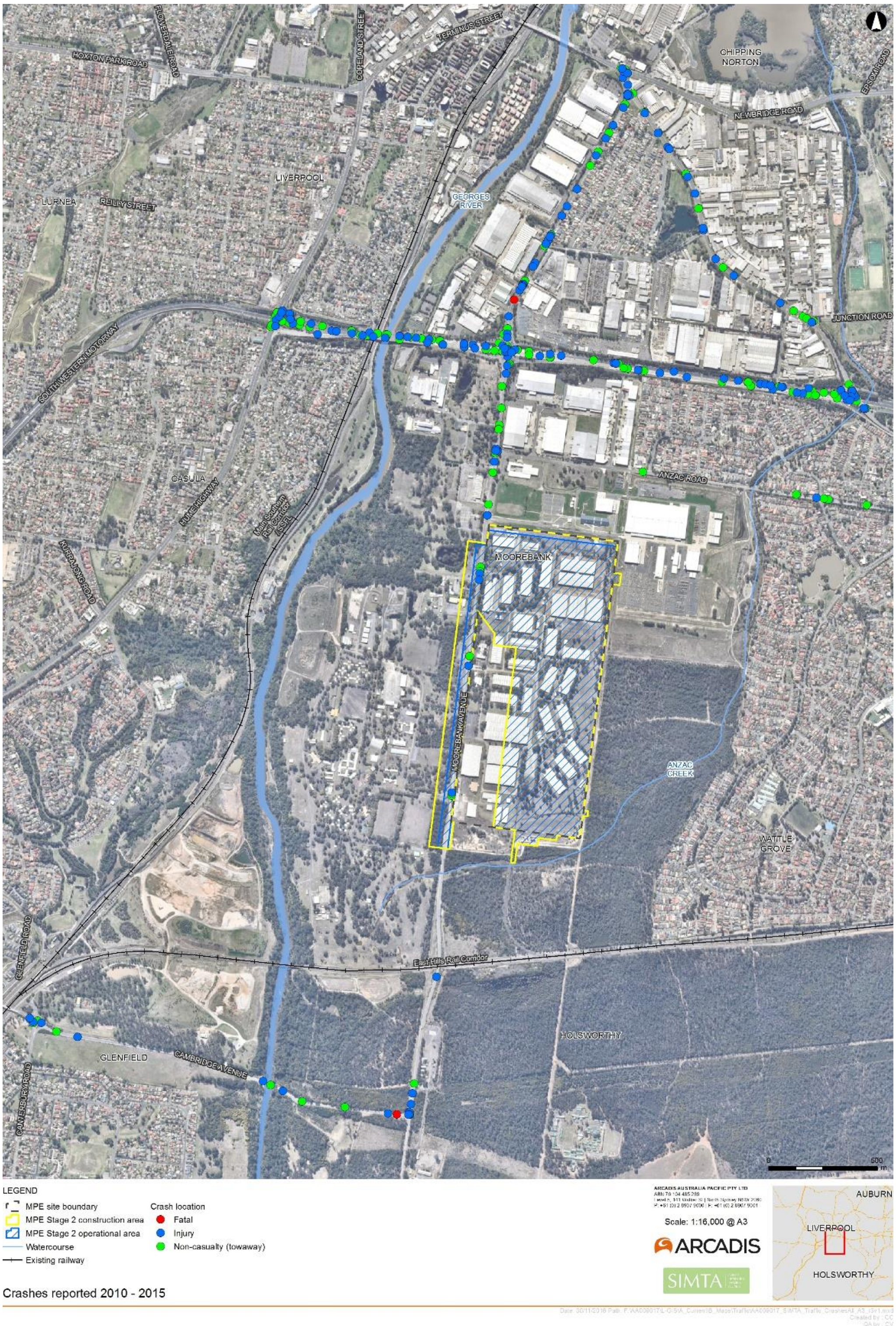

Figure 2-4 Distribution of Crashes on Key Roads between 2010 and 2015 (5 Years)

Source: RMS Crash Data 2010-2015

2.6 Transport mode share

2.6.1 Liverpool Local Government Area

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 2011 Census. Work trip origin and destinations are coded to the 2011 travel zones.

Table 2-5 summarises some of the key transport indicators for the Liverpool LGA and the Sydney Statistical Division sourced from the 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 (86% vs. 69%).

Table 2-5 Existing Model Share Liverpool LGA

Indicator	Sydney	Liverpool
Population	4,551,000	168,000
Households	1,689,000	54,000
Trips per person	2.7	3.3
Total travel per person (km)	31.9	38.3
Model of travel (%):		
- Car Driver	47%	59%
- Car passenger	22%	27%
Car combined	69%	86%
- Train	5%	10%
- Bus	6%	2%
- Walk	18%	2%
Vehicles per Household	1.6	1.8
Ave. trip length [km]	8.7	11.7
VKT per person	18.5	22.6
Ave. work trips (mins)	35	37
Daily travel time (per person)	81	83

Source: BTS HTS 2012/13 Sydney Greater Metropolitan Area (GMA)

2.6.2 Moorebank Catchment Area

Transport mode share data was further investigated for the Moorebank catchment area, i.e.travel zone 3824, in the vicinity to the Proposal. The 2011 JTW data relates to trips to places of employment within travel zone 3824 in Moorebank. The travel zone boundary is shown in Figure 2-5.

Figure 2-5 Travel Zone as per JTW2011

In 2011, about 2,100 employees travelled to the Moorebank catchment area for work. Table 2-6 shows existing mode share within the Moorebank catchment area. Around 80% of people surveyed travelled to work by private vehicle (driver and passenger), while 2% of workers travelled by public transport. The remainder of trips comprised walk/cycle trips (6%), indicating that a proportion of employees live locally. The remainder worked from home, did not travel, or not stated (6%).

Table 2-6 Daily Work Trips and Model Share for Moorebank Catchment Area

Travel Mode	Study Area as Workplace (Inbound trips)	% Study Area as Workplace
Car Driver	1,695	80%
Car Passenger	118	6%
Public Transport	40	2%
Others (walk, cycle, etc.)	127	6%
Work at home, did not travel, or not stated	128	6%
Total	2,108	100%

The current low public transport usage (2%) within the Moorebank catchment area is due to the fact that the Proposal site is poorly serviced by public transport. The public transport currently servicing the Proposal site is further discussed in Section 2.7.

2.7 Public and Active Transport

Figure 2-6 shows the public (bus) and active transport services and routes within the general vicinity of the Proposal site.

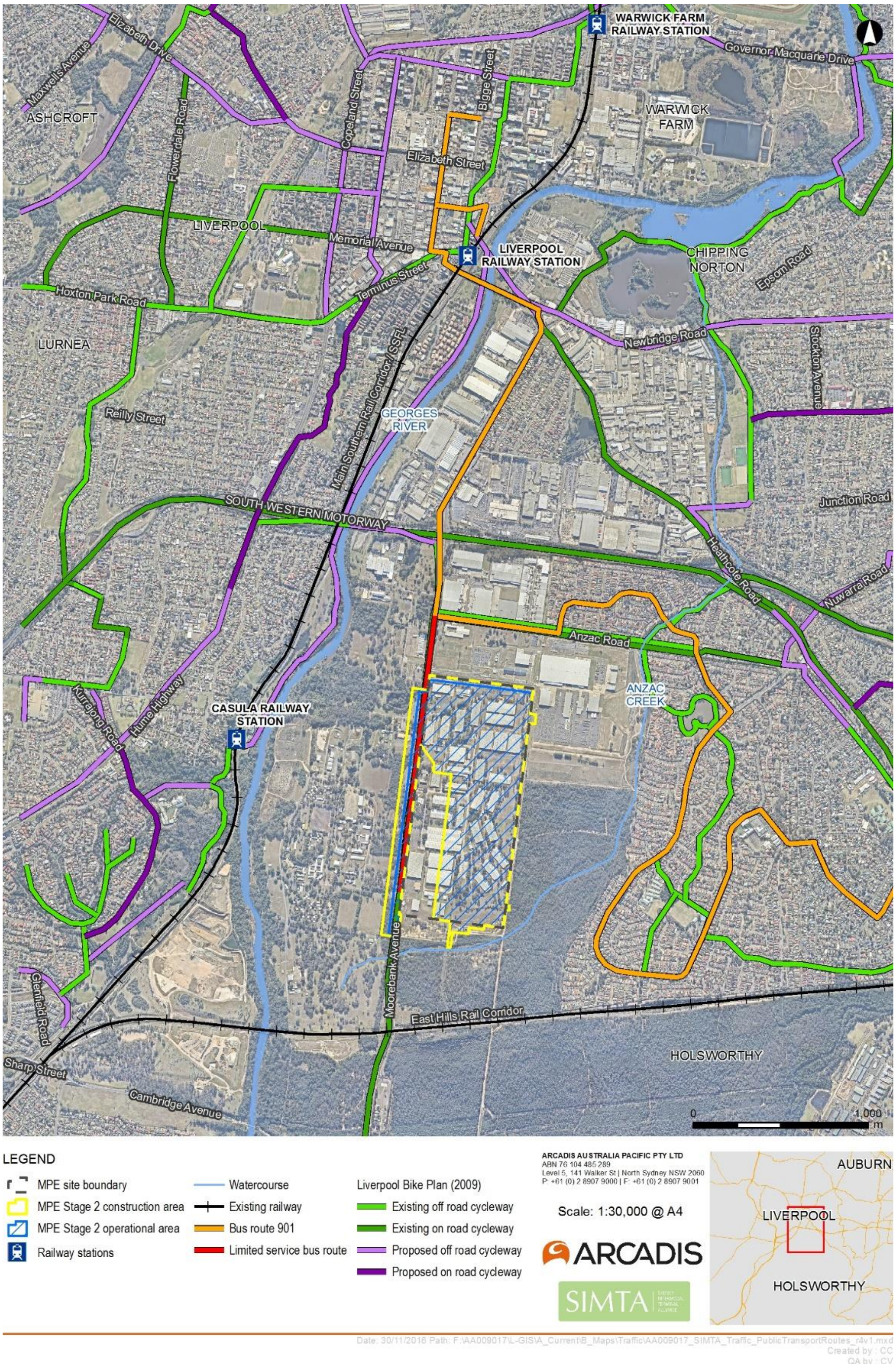

Figure 2-6 Local public transport and pedestrian/cycleway network

2.7.1 Public Transport

As shown in Figure 2-6, the Proposal site is serviced by a single bus service (i.e. route 901). Three train stations are also located approximately four to seven kilometres from the Proposal site (i.e. Liverpool, Holsworthy or Casula railway stations).

While bus stops are located on Moorebank Avenue, including at the Proposal site frontage, these are limited service bus-stops which are supported by a single 901 bus service during the AM and PM peak periods only. Regular service bus stops, supported by all 901 route bus services, are located at the Moorebank Ave/Anzac Road intersection (north of Anzac Road) and along Anzac Road with all bus services stopping at these stops.

The regular service bus stop (north of Anzac Road) is located approximately 750 metres north of the Proposal site, which is considered the upper limit of what is an acceptable walking distance. It is also noted that the stops are poorly identified with signage that is not consistent with current Sydney bus branding, as shown in Figure 2-7.

Figure 2-7 Photo of bus stop signage located on Moorebank Avenue south of Bapaume Road (looking north)

Overall, the 901 bus route operates as a feeder service to the Liverpool and Holsworthy train stations. The train services provide good transit connectivity to major destinations in the South West Sydney area and the wider Sydney metropolitan region. However due to the extended walking distance from the Proposal to the 901 bus service’s regular service bus stops, and only the limited services bus stops being readily accessible to the Proposal, connectivity of the Proposal to Liverpool and Holsworthy train station is considered to be limited.

A summary of the service details for each public transport service operating in the general vicinity of the Proposal site (both bus and train) is provided in Table 2-7.

Table 2-7 Public Transport Services operating in the vicinity of the Proposal site

Mode	Stop/station	Route Description	Significant destinations on route	Service Frequency
Bus	Moorebank Ave / Anzac Rd junc.	Route 901 (standard route) Liverpool to Holsworthy	Liverpool train station, Liverpool Westfield shopping centre, Wattle Grove shops, Holsworthy train station	30 mins (peak) 60 mins (off-peak)
	Moorebank Ave (site frontage)	Route 901 (via Proposal site) Liverpool to Holsworthy		One service during AM and PM peaks
Train	Liverpool train station	T2 Inner West & South Line	Strathfield, Sydney CBD	8 mins (peak) 30 mins (off-peak)
		T3 Bankstown Line	Bankstown, Sydney CBD	15 mins (peak) 30 mins (off-peak)
		T5 Cumberland Line	Parramatta, Blacktown, Glenfield, Campbelltown	30 mins (peak) 30 mins (off-peak)
	Holsworthy train station	T2 Airport & South Line	Airport, Sydney CBD, Glenfield, Campbelltown	8 mins (peak) 20 mins (off-peak)

2.7.2 Active Transport

2.7.2.1 Cycle infrastructure

On-street cycling is permitted on Moorebank Avenue, with sealed and lane-marked shoulders of varying width (approximately 1.5-2.5 metre width, refer to Figure 2-8) provided on both sides of the road. However, the sealed shoulders are not marked as on-street cycle lanes. The posted speed limit on Moorebank Avenue is 60 km/h, which is amenable for cycling.

Figure 2-8 Sealed & marked road shoulders on Moorebank Avenue – permitted for on-street cycling

Moorebank Avenue connects to a series of cycle routes in the surrounding area, as shown in Figure 2-6, in the form of either on-street cycle lanes, shared pedestrian-cycle paths or along local roads. As an example, a cycle route from the Proposal to Holsworthy train station is possible via a connection of shared-paths and local streets in the Wattle Grove residential area (cycling distance of approximately 5.6 km).

In addition to the above:

- The NSW Bike Plan (June 2010) has identified bike routes (to be constructed) around Liverpool on Moorebank Avenue, Heathcote Road and Newbridge Road
- Sydney's Cycling Future (Transport for NSW, 2013) commits to completing missing links in the existing bicycle network to the Liverpool CBD. This would include improving bicycle access to the Liverpool City Centre from the south by completing the missing sections of the off-road walking and cycling corridor along Glenfield Creek, between Casula and Liverpool. This improved access would integrate with the cycling routes proposed in the Liverpool Bike Plan (Liverpool Council, 2009). Moorebank Avenue is also considered a strategic bicycle corridor.

2.7.2.2 Pedestrian infrastructure

A sealed footpath is provided on the western (northbound) side of Moorebank Avenue with pedestrian crossing facilities located at signalised T-intersections which are spaced approximately 250 metres to 600 metres apart, as shown in Figure 2-9. Sightlines along Moorebank Avenue are generally clear, providing motorists suitable opportunity to see pedestrians.

Overall pedestrian connectivity is considered good for the area, given the relatively low pedestrians volumes.

Figure 2-9 Locations of existing pedestrian crossing facilities on Moorebank Avenue

3 EXISTING ROAD NETWORK PERFORMANCE

This section establishes the traffic capacity and operational performance of intersections and the road network at key sites near the Proposal under existing conditions, including:

- I-1 Moorebank Avenue / Anzac Road
- I-2 M5 Motorway / Moorebank Avenue
- I-3 M5 Motorway / Hume Highway
- I-4 Moorebank Avenue / Newbridge Road
- I-5 Moorebank Avenue / Heathcote Road
- I-6 M5 Motorway / Heathcote Road
- I-7 Cambridge Avenue / Glenfield Road
- I-8 Cambridge Avenue / Canterbury Road
- I-A Moorebank Avenue / DJLU Access
- I-B Moorebank Avenue / MPE Stage 2 Site Access

As discussed in Section 2.1, a detailed traffic assessment was undertaken for these intersections as part of this OTTIA, including relevant road sections of Moorebank Avenue, Anzac Road and Cambridge Avenue.

Traffic count surveys undertaken for the Roads and Maritime's LMARI traffic model in 2015, supplemented by 2014 traffic surveyed undertaken for the MPE Stage 1 Project have been used to determine the existing base traffic count data and capacity assessment at key roads, and intersections analysed within this section.

3.1 Daily traffic volumes

Table 3-1 summarises the 2015 daily traffic volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue.

The 2015 data shows that Moorebank Avenue (south of the M5 Motorway) carried between 21,300 and 16,800 vehicles per day, of which 5 to 6% comprised heavy vehicles. Anzac Road (east of Moorebank Avenue) carried approximately 10,400 vehicles per day, with a heavy vehicle proportion of approximately 5% of total traffic. Cambridge Avenue (west of Moorebank Avenue) carried approximately 15,700 vehicles per day of which 4% comprised heavy vehicles. The majority of the heavy vehicles on these roads (approximately 90%)include small trucks (Austroads Classes 3-5)

Table 3-1 Daily Traffic Volumes and Heavy Vehicle Volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue - 2015

ID	Roads	Locations	Daily Volumes (all vehicles)	Heavy Vehicle Volume (%)
M-1	Moorebank Avenue	North of Anzac Road	21,300	1,100 (5%)
M-2	Moorebank Avenue	South of Anzac Road	17,200	890 (5%)
M-3	Anzac Road	East of Moorebank Avenue	10,410	480 (5%)
M-4	Moorebank Avenue	North of Cambridge Avenue	16,760	930 (6%)
M-5	Cambridge Avenue	West of Moorebank Avenue	15,700	550 (4%)

3.2 Peak hour volumes

Table 3-2 below shows existing peak hour traffic volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue.

In the AM peak, the highest traffic volumes on Moorebank Avenue, south of Anzac Road was observed in the northbound direction, and were more than double the number of vehicles travelling southbound. In the PM peak, the highest traffic volume Moorebank Avenue, south of Anzac Road was observed in the southbound direction, and were almost double the number of vehicles travelling northbound. Similarly, northbound traffic in the AM peak was greater than southbound along Moorebank Avenue to the north of Anzac Road. During the PM peak, traffic volumes along Moorebank Avenue to the north of Anzac Road were greater in the southbound direction.

The peak traffic flows on Cambridge Avenue (east of Canterbury Road) were found to be similar to Moorebank Avenue. During the AM peak, traffic movements along Anzac Road were considerably greater in the eastbound direction than the westbound direction. However, in the PM peak, similar traffic movements were observed in the eastbound and westbound directions,

Table 3-2 Peak hour traffic volumes on key roads in 2015

ID	Roads/Locations	AM Peak		PM Peak	
		NB/EB(1)	SB/WB(1)	NB/EB(1)	SB/WB(1)
M-1	Moorebank Avenue, north of Anzac Road	910	780	680	940
M-2	Moorebank Avenue, south of Anzac Road	950	430	450	840
M-3	Anzac Road, east of Moorebank Avenue	720	490	510	520
M-4	Moorebank Avenue, north of Cambridge Avenue	920	360	350	920
M-5	Cambridge Avenue, west of Moorebank Avenue	960	330	340	930

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

3.3 Existing Network Performance

The existing operational performance of the study intersections was assessed using the LMARI AIMSUN traffic model provided by Roads and Maritime. Arcadis has further locally updated the LMARI AIMSUN traffic model at the key intersections for this assessment. Arcadis supplemented the traffic analysis with SIDRA Network modelling.

Table 3-3 shows the existing 2015 AM and PM peak LoS results for the key intersections within the study area. Existing (2015) AM and PM peak hour turning volumes at the key study intersections are included in Appendix A of this report.

The results show that study intersections I-1 to I-3, I-6 to I-8, and I-A operate at an acceptable LoS in 2015, and intersections I-4 and I-5 operate at LoS E which is unsatisfactory and highlights that the intersections require upgrades to cater for traffic demand under existing conditions.

The existing Moorebank Avenue / MPE Stage 2 Site Access intersection (I-B) is not operational and as such, the existing performance of this intersection has not been reported.

Table 3-3 Existing 2015 Level of Service for AM and PM Peak Traffic Condition

ID	Intersection	2015 Existing			
		AM Peak (8-9 am)		PM Peak (5-6 pm)	
		Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road#	18	B	17	B
I-2	M5 Motorway / Moorebank Avenue#	31	C	31	C
I-3	M5 Motorway / Hume Highway#	48	D	36	C
I-4	Moorebank Avenue / Newbridge Road#	61	E	60	E
I-5	Moorebank Avenue / Heathcote Road#	66	E	63	E
I-6	M5 Motorway / Heathcote Road#	24	B	53	D
I-7	Cambridge Avenue / Glenfield Road#	14	B	15	B
I-8	Cambridge Avenue / Canterbury Road#	15	B	12	A
I-A	Moorebank Avenue / DJLU Access#	6	A	6	A
I-B	Moorebank Avenue / MPE Stage 2 Site Access#	Intersection currently not operational			

Note: (#) Existing intersection layout modelled

4 FUTURE ROAD NETWORK PERFORMANCE WITHOUT THE PROPOSAL

The Proposal represents the second stage of the MPE Project, which includes the construction and operation of 300,000 sq. m GFA warehousing, a freight village and an upgrade to Moorebank Avenue. The traffic assessment has assumed that the Proposal will be open to traffic in 2019. The following section presents the impact of future background traffic volumes at the study intersections for opening year in 2019 and ten years after opening in 2029 i.e. without the Proposal.

4.1 Future background traffic growth

The road network in and around the Proposal site including the M5 Motorway, Moorebank Avenue, Cambridge Avenue, Newbridge Road and the Hume Highway carry a significant volume of regional and local traffic. The population and employment growth projected in Liverpool LGA and the Southwest Sub-region will increase traffic volumes on these roads and associated intersections.

For the purpose of this assessment, future background traffic growth at the intersections within the study area was sourced from the Roads and Maritime's wider LMARI AIMSUN traffic model. At the time of undertaking the assessment, Arcadis were provided with the AIMSUN traffic model for 2015 and 2026 AM and PM peak.

The average peak hour background traffic growth between 2015 and 2026 at the intersections within the study area was found to be between 1.0% and 1.9% per annum (compound growth). Table 4-1 shows average peak hour background traffic growth between 2015 and 2026 at the intersections within the study area.

Table 4-1 Average Peak Hour Traffic Growth (2015-2026)

ID	Intersection	Average Peak Hour Traffic Growth Per Annum (2015-2026)
I-1	Moorebank Avenue / Anzac Road	1.9%
I-2	M5 Motorway / Moorebank Avenue	1.2%
I-3	M5 Motorway / Hume Highway	0.9%
I-4	Moorebank Avenue / Newbridge Road	1.4%
I-5	Moorebank Avenue / Heathcote Road	1.5%
I-6	M5 Motorway / Heathcote Road	1.2%
I-7	Cambridge Avenue / Glenfield Road	1.8%
I-8	Cambridge Avenue / Canterbury Road	1.8%
I-A	Moorebank Avenue / DJLU Access	1.9%
I-B	Moorebank Avenue / MPE Stage 2 Access	1.9%

4.2 Future intersection performance without the Proposal

The traffic impact from background traffic growth on the operation of the road network near the Proposal in both the AM and PM peak has been considered for the key intersections in the study area for the year of opening of the Proposal, i.e. 2019, and ten years after opening in 2029. In the event that the predicted background traffic growth is realised at the study intersections in 2019 and 2029, the model predicts worsening of the LoS of those intersections identified near or at capacity (see Section 1.11 for more information).

Table 4-2 shows predicted intersection level of service (LoS) results without the Proposal for the 2019 AM and PM peaks. Table 4-3 shows predicted intersection LoS) without the Proposal for the 2029 AM and PM peaks.

The results show that the following intersections perform unsatisfactorily at LoS E/F in the peak periods and need to be upgraded to cater for the growth in background traffic demand:

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

No other upgrades are required at the other key intersections within the study area due to background traffic in 2019 as they are expected to perform satisfactorily at LoS D or better.

By 2029, all study intersections (i.e. I-1 to I-8 and I-A) are expected to perform unsatisfactory at LoS E/F and need to be upgraded to cater for the growth in background demand by 2029.

Table 4-2 Intersection Level of Service without the Proposal - 2019

ID	Intersection	2019 without the Proposal			
		AM Peak (8-9 am)		PM Peak (5-6 pm)	
		Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road#	16	B	15	B
I-2	M5 Motorway / Moorebank Avenue#	24	B	25	B
I-3	M5 Motorway / Hume Highway#	86	F	37	C
I-4	Moorebank Avenue / Newbridge Road#	36	C*	34	C
I-5	Moorebank Avenue / Heathcote Road#	56	E	42	D
I-6	M5 Motorway / Heathcote Road#	50	D	37	C
I-7	Cambridge Avenue / Glenfield Road#	10	A	15	B
I-8	Cambridge Avenue / Canterbury Road#	11	A	7	A
I-A	Moorebank Avenue / DJLU Access#	9	A	8	A
I-B	Moorebank Avenue / MPE Stage 2 Access#	Intersection currently not operational			

Note: (*) The performance of the Moorebank Avenue / Newbridge Road intersection and the Moorebank Avenue / Heathcote Road intersection are inter-related and behave as one intersection due to the proximity of both intersections to one another and the high level of congestion on the road network. Therefore, the performance of the Moorebank Avenue / Newbridge Road intersection is more aptly reflected by the performance of the Moorebank Avenue / Heathcote Road intersection i.e. at LoS E in the AM and LoS D in the PM.
(#) Existing intersection layout modelled

Table 4-3 Intersection Level of Service without the Proposal - 2029

ID	Intersection	2029 without the Proposal			
		AM Peak (8-9 am)		PM Peak (5-6 pm)	
		Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road#	56	E	105	F
I-2	M5 Motorway / Moorebank Avenue#	53	D	141	F
I-3	M5 Motorway / Hume Highway#	148	F	124	F
I-4	Moorebank Avenue / Newbridge Road#	39	C	73	F
I-5	Moorebank Avenue / Heathcote Road#	65	E	146	F
I-6	M5 Motorway / Heathcote Road#	131	F	190	F
I-7	Cambridge Avenue / Glenfield Road#	11	A	61	E
I-8	Cambridge Avenue / Canterbury Road#	19	B	60	E
I-A	Moorebank Avenue / DJLU Access#	53	D	155	F
I-B	Moorebank Avenue / MPE Stage 2 Access#	Intersection currently not operational			

Note: (#) Existing intersection layout modelled

5 IMPACT ASSESSMENT

5.1 Trip Generation from the Proposal

Table 5-2 below summarises trip generation assumptions for the Proposal. These assumptions have previously been provided to Roads and Maritime (refer to Section 1.12 of this report) and were sourced from the following:

- *Moorebank Intermodal Terminal Precinct – Traffic Generation and Underlying Assumptions, Memorandum, Parsons Brinckerhoff, 1 September 2016* (provided in Appendix C of this report)
- *MPE Stage 2 Proposal / MPW Stage 2 Proposal – Container Handling Movements, Neil Matthews Consulting Pty Ltd, 4 August 2016* (provided in Appendix D of this report)

Table 5-1 Proposal Trip Generation Assumptions

Components	Assumptions
Warehouse	• The warehousing would operate 52 weeks of year, 7 days a week and 24 hours a day. • Containers will arrive every day of the year. In a typical week 95% of containers will be processed on weekdays (Monday – Friday), with the remaining 5% being processed on Saturday and Sunday. • Containers are loaded onto either B-doubles, semi-trailers or rigid trucks. On average a semi-trailer is equivalent to 1.6 TEUs, a B-double equivalent to 2.4 TEUs, and a rigid truck is equivalent to 0.8 TEUs • About 65% of deliveries will be made by semi-trailers, 30% will be made by rigid trucks and 5% will be made by B-doubles.
Intermodal Terminal	• The intermodal terminal facility would operate 52 weeks per year, 7 days a week and 24 hours a day. • Containers will arrive every day of the year. In a typical week, 85% of containers will be processed on weekdays (Monday – Friday), with the remaining 15% being processed on Saturday and Sunday. • The containers arriving by rail will be transferred on to trucks for transport on-site and off-site. In some instance containers will be unloaded from trains into the container storage area (i.e. stacked) and then transferred onto trucks. • Containers are loaded onto either B-doubles or semi-trailers. On average a semi-trailer is equivalent to 1.6 TEUs and a B-double equivalent to 2.4 TEUs • About 80% of container deliveries will be made by semi-trailers and 20% by B-doubles.
Staff shift work	• Three shifts per day

Table 5-2 summarises the development parameters, the resultant trip generation from the combination of these parameters and the trip generation assumptions.

The Proposal is expected to generate approximately 564 truck trips (2-way) and 3,993 car trips (2-way) to and from the MPE Stage 2 site each weekday. In the cumulative development scenario with the addition of traffic from MPE Stage 1 and MPW Stage 2, approximately 2,540 truck trips (2-way) and 6,808 car trips (2-way) are estimated to and from the precinct each week day.

Table 5-2 Development Parameters

Trip Generation Assumptions	Development Scenarios	
	Proposal Only	Cumulative Development = Proposal + MPE Stage 2 + MPW Stage 2
Development Parameters		
Total Intermodal Terminal Capacity	MPE Stage 2 does not include Terminal facilities.	750,000 TEU per annum (500,000 TEU attributed to MPW Stage 2 and 250,000 TEU attributed to MPE Stage 1)
Total Warehousing GFA	300,000 sq.m	515,000 sq.m (215,000 sq.m for MPW Stage 2 and 300,000 sq.m for MPE Stage 2)
Trip Generation		
Daily Truck Trips (to and from, 24 hours)	564 truck trips/day	2,540 truck trips/day
Daily Car Trips (to and from, 24 hours)	3,993 car trips/day	6.808 car trips/day

5.1.1 Warehouse Truck Generation Profile

The proposed warehouse facilities are planned to operate 24 hours per day, 7 days a week. Figure 5-1 shows the temporal profile for the warehouse truck generation assumed for the Proposal.

Deliveries to and from warehouse will be made by B-doubles, semi-trailers and rigid trucks. The majority of deliveries will be made by semi-trailers and rigid truck are anticipated during the middle of the day. However, the majority of deliveries made by B-doubles are anticipated outside the AM and PM peak hours.

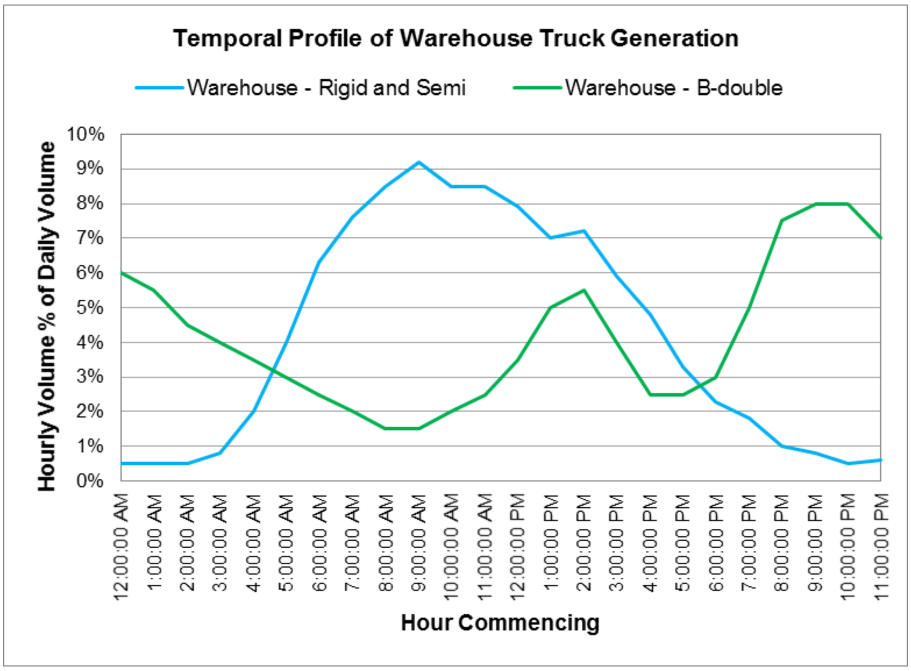

Figure 5-1 Temporal Distribution for Warehouse Trucks

5.1.2 Employee Traffic Generation Profile

For the purpose of this assessment, it is assumed that at opening year in 2019, the Proposal will operate with three shifts per day.

Figure 5-2 shows the hourly car generation profile for the Proposal with three shifts per day. The hourly data shows that the AM and PM peak hour for car movements will occur at 5-6 am and 9-10 pm with an inter-peak period occurring at 1-2 pm. During the employee AM and PM peak hour, employee car movements represent about 9% and 10% of total daily car movements, respectively.

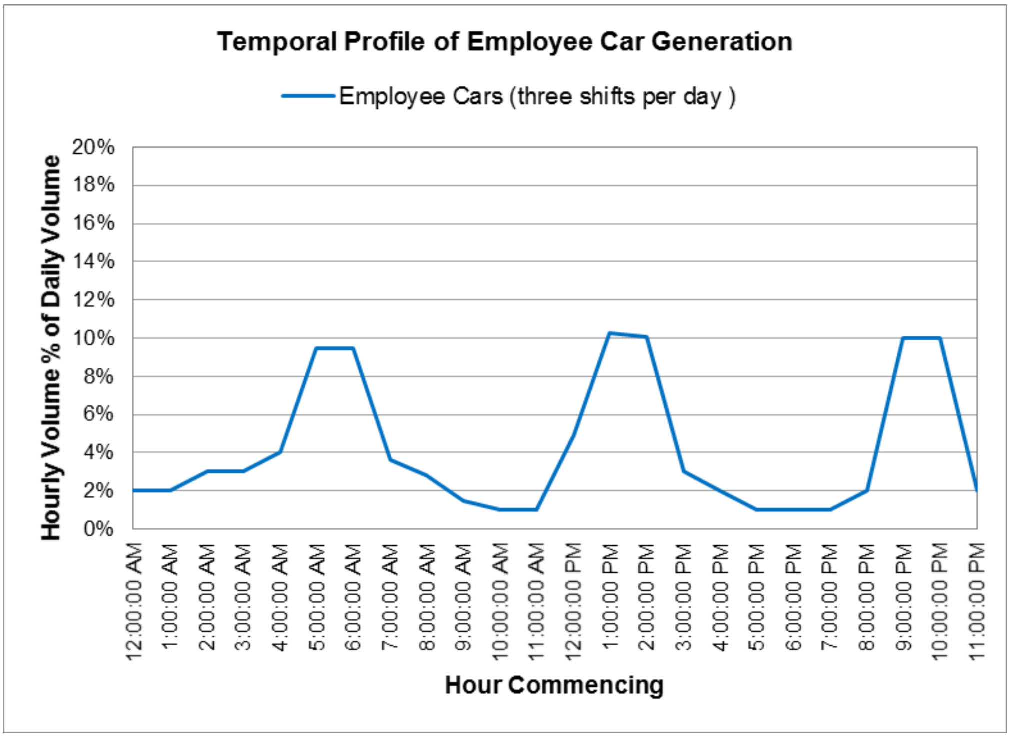

Figure 5-2 Weekday Temporal Distribution of Employee Car Trips – Three Shifts per Day

5.2 Traffic Distribution

The distribution of additional traffic (both heavy and light vehicles) generated by the Proposal is a key factor in determining the impact of the Proposal on roads and intersections in the study area.

5.2.1 Heavy vehicles

Figure 5-3 shows the estimated truck (including semi-trailers, B-doubles and rigid trucks) distribution of the Proposal on roads and intersections in the study area road network in the AM peak.

About 56% of heavy vehicle movements generated by the Proposal would travel to the Proposal site via the M5 Motorway from the west. The remainder of traffic travelling to the Proposal site would be via the Hume Highway, Moorebank Avenue from the north of the M5 Motorway. Of this 25%, 12% would originate from Newbridge Road East and 5% from Newbridge Road West.

In general, all trucks would travel via Moorebank Avenue to the north of the Proposal site. No container trucks would travel to the Proposal site via Anzac Road (east of Yulong Close) or Cambridge Avenue.

The traffic distribution in the PM peak (outbound trips) is assumed to be similar to AM peak inbound trip distribution.

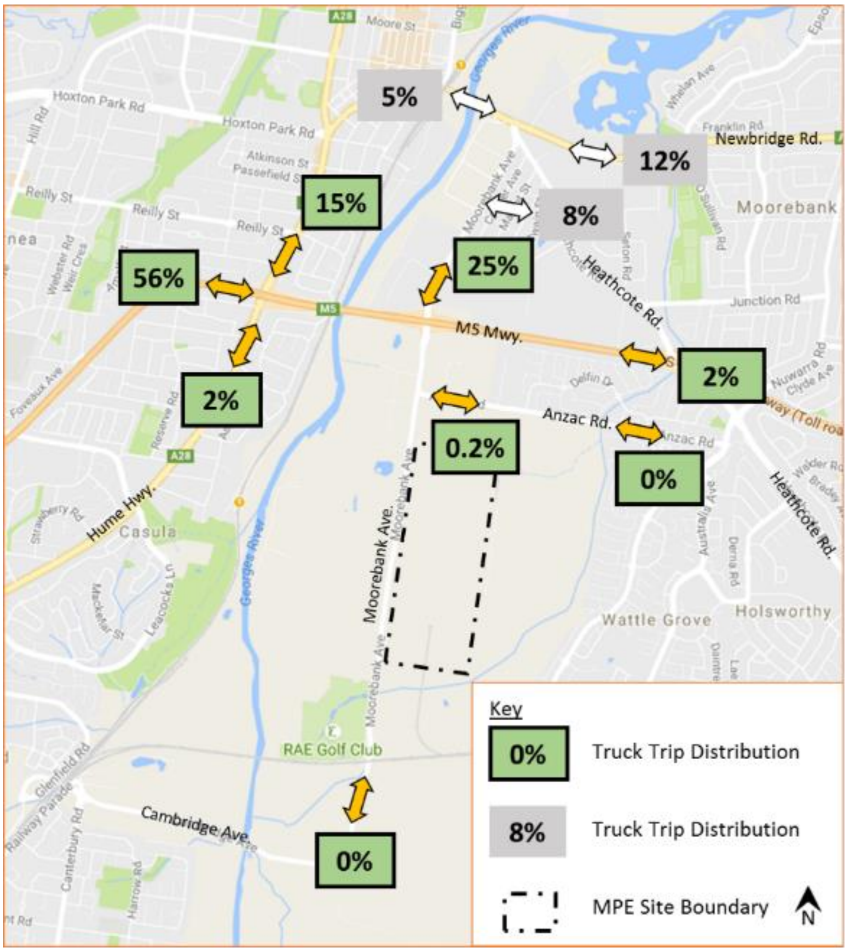

Figure 5-3 Truck Traffic Distribution to Precinct in the AM Peak

5.2.2 Light vehicles

Figure 5-4 shows the trip distribution for light vehicles in the AM peak. The majority of light vehicle traffic associated with the Proposal are forecast to travel to the Proposal site via Moorebank Avenue. More than 50% of light vehicle movements related to the Proposal are forecast to travel to the Proposal site via the M5 Motorway from the east and west, respectively. The remainder of light vehicle movements would travel via the Hume Highway from the west and Moorebank Avenue from the north during the AM peak. Minor employee car traffic is expected to travel to Proposal site via Anzac Road (8%) and Cambridge Avenue (3%).

The traffic distribution in the PM peak (outbound trips) is assumed to be similar to AM peak inbound trip distribution.

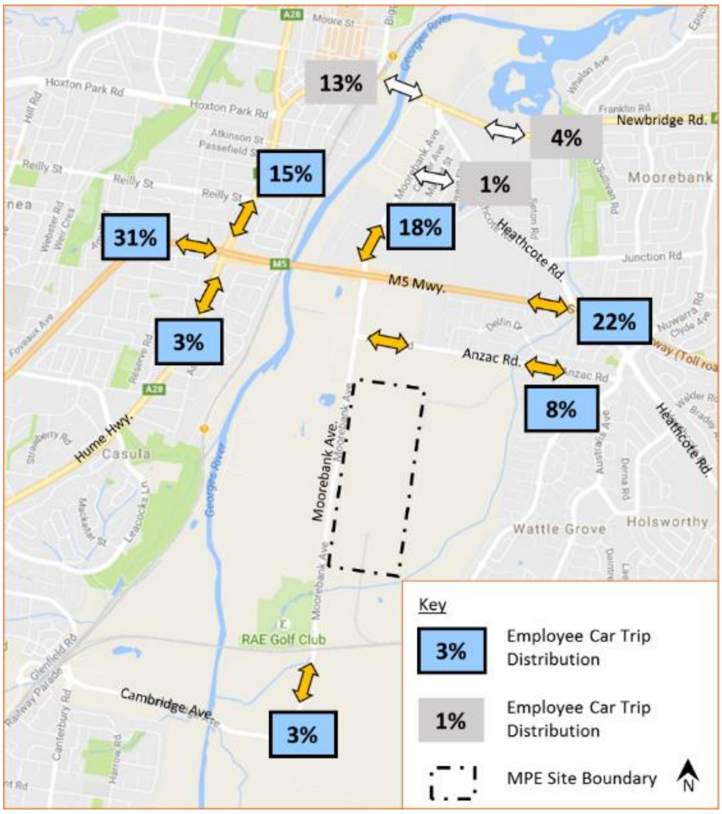

Figure 5-4 Employee Car Traffic Distribution to Precinct in the AM Peak

5.3 Regional Benefits of the Proposal

The Proposal, which includes the construction of warehouse and distribution facilities to support an IMT at Moorebank, would provide freight distribution functionality from the IMT, thereby minimising the need for heavy vehicles to travel to Port Botany and assist in reducing road congestion. Additional capacity on the freight transport network would also be generated by including warehouses and distribution facilities at the same location as the IMT. This maximises the capacity of Port Botany and encourages more efficient business operations of the freight logistics supply chain.

From a strategic perspective, the MPE Project, including the Proposal, is considered to be in the public interest, and would result in wider regional benefits by generating a number of economic, social and environmental benefits for the community and economy, including:

- Economic benefits: The unit costs of transporting containers by rail would be reduced, thereby increasing the share of freight movements by rail. This would improve productivity, reduce operating costs, increase reliability, reduce costs associated with road damage, congestion and accidents, and lead to better environmental outcomes. The Proposal would increase cost efficiencies for the handling, storage and distribution of freight
- Job creation: The Proposal would result in the creation of approximately 200 construction employment opportunities during the peak construction period of the Proposal and 1,408 full time equivalent staff for the operation of the warehousing area
- Improved environmental outcomes by contributing to reducing road congestion: the introduction of an IMT at Moorebank would result in fewer truck journeys every day (to and from Port Botany), resulting in reductions in greenhouse gas emissions, fuel consumption and other air pollution and potential increases in road network performance around Port Botany
- Social benefits through reducing road traffic and associated noise along key road freight routes between Moorebank and Port Botany
- Easing the Port Botany bottleneck to enable the Port to more effectively cope with future growth in container trade and provide large scale freight capacity.

5.4 Proposed Site Access and Network Upgrades

The Proposal would include one site access point, with traffic circulating through the site using internal roads, service roads and internal transfer roads. A description of site access and traffic circulation throughout the Proposal site is described below.

5.4.1 MPE Stage 2 site access

Access to and from the Proposal site would be via the existing DNSDC northern access, to the north of the MPE Stage 1 Project. Site access at this location would allow for vehicular access to warehouse and distribution facilities to enable the direct delivery and dispatch of goods to the warehouses. The site access point is shown on Figure 5-5.

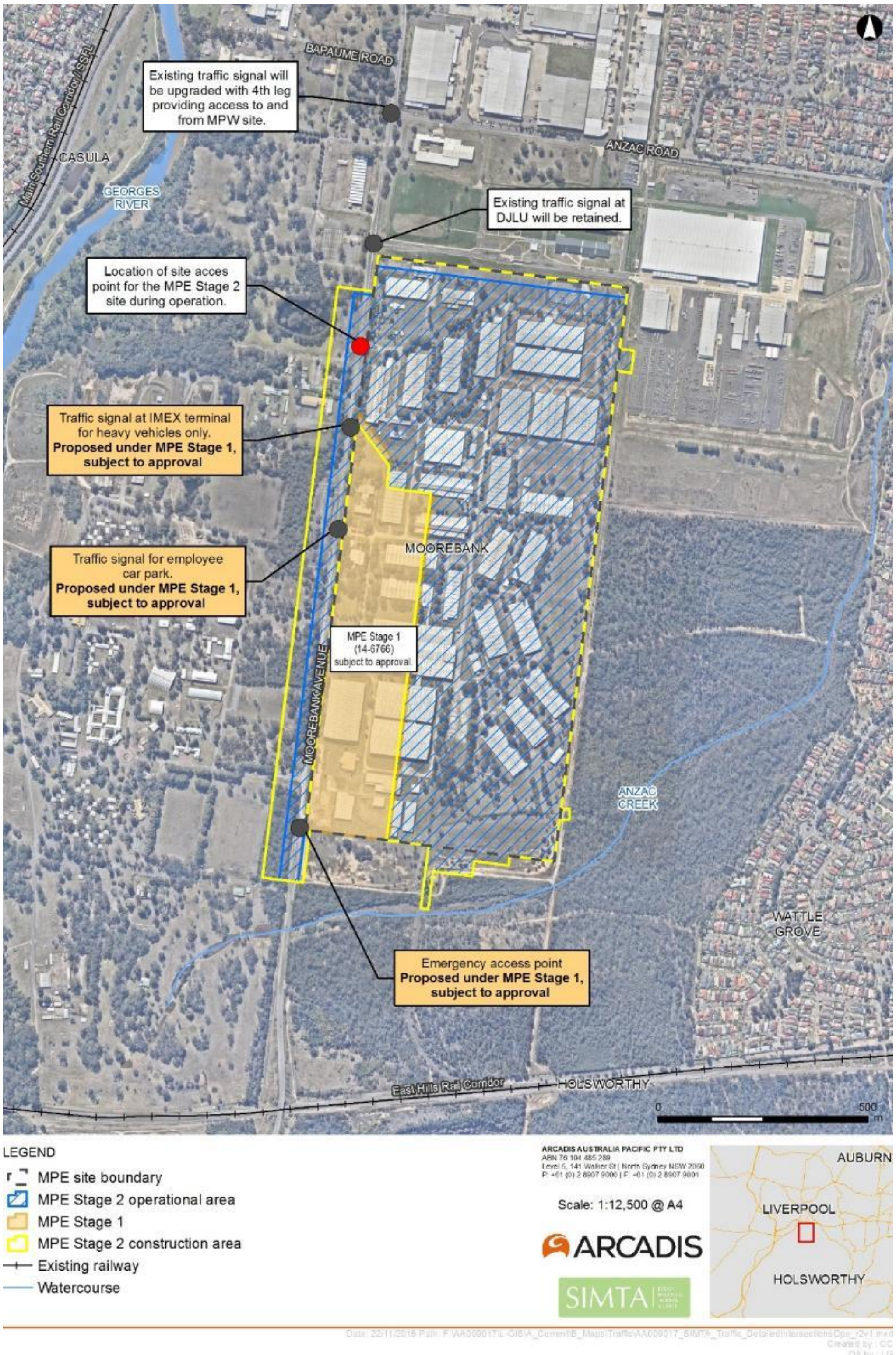

Figure 5-5 Moorebank Avenue Access Strategy for MPW Stage 2 Operation

5.5 Traffic circulation within the MPE Stage 2 site

During the interim stages of operation, the traffic circulation throughout the MPE Stage 2 site would be via a combination of the roads described below (i.e. the final configuration), as shown in Figure 5-6, and the use of modified existing roads. Interim vehicle movement and access throughout the MPE Stage 2 site would be included in the relevant environmental management plans for operation of the Proposal, including the Construction Traffic Management Plan and Operational Traffic Management Plan.

5.5.1 Internal roads

The MPE Stage 2 site includes two main internal roads, which provided the main east-west and north-south traffic movements throughout the MPE Stage 2 site. On entering the MPE Stage 2 site, light and heavy vehicles would travel along an east-west oriented internal road (internal road 1). Internal road 1 would connect at its easternmost point to a second north-south oriented internal road (internal road 2).

Internal roads 1 and 2 would connect to three service roads which would provide vehicle access to warehouses, loading docks and car parking.

Internal road 2 would provide for traffic movements along the entire eastern perimeter of the Proposal, and would have a cul-de-sac at both the northern and southern ends to allow vehicles to turn around. The internal roads would be two lanes wide (one lane in each direction) and would be wide enough to accommodate heavy vehicle turning movements, including B-doubles.

5.5.2 Service roads

Three service roads would connect to the internal roads within the MPE Stage 2 site. The service roads would provide access to loading docks at warehouses for heavy vehicles to park and be packed with materials which have been received and stored within the warehouses. Service roads would also enable access to light vehicle parking for users of the warehouses. Each service road would have a cul-de-sac for vehicles to turn around, which would be able to accommodate turning movements of B-doubles.

Service road 1 would connect to internal road 1 via a T-intersection, and would provide access to Warehouse 1, Warehouse 2 and the ancillary freight village. Two additional service roads would connect to internal road 2 via t-intersections; service road 2 would provide access for warehouses 3, 4 and 5, and service road 3 would provide access to warehouses 6, 7 and 8.

5.5.3 Transfer roads

There would be three Transfer roads within the MPE Stage 2 site. These roads would provide connections between the warehouses and the MPE Stage 1 IMT. It is intended that the transfer of freight between the Stage 1 IMT and warehouses would be via an internal fleet of vehicles which would remain on the MPE Stage 2 site and would not use the external road network.

Transfer road 1 would travel mostly along the same path as internal road 1 and provide access between the Stage 1 IMT facility and Warehouses 1, 2 and 3. Transfer road 2 would travel through the centre of the MPE Stage 2 site and would provide access between the Stage 1 IMT facility and Warehouses 4, 5, 6 and 8. Transfer road 3 would travel along the southern boundary of the MPE site, and provide access between the Stage 1 IMT facility and Warehouses 7 and 8.

With the exception of transfer road 1, which travels along the same path as internal road 1, the movement of internal fleet vehicles along transfer roads would be separated from light and heavy vehicles entering and exiting the MPE Stage 2 site to maintain efficiency and to provide for a safe internal road network.

5.6 Roadworks – Moorebank Avenue

As part of the Proposal, Moorebank Avenue would be upgraded for about 1.4 kilometres. Details of the proposed roadworks are discussed in Section 1.8

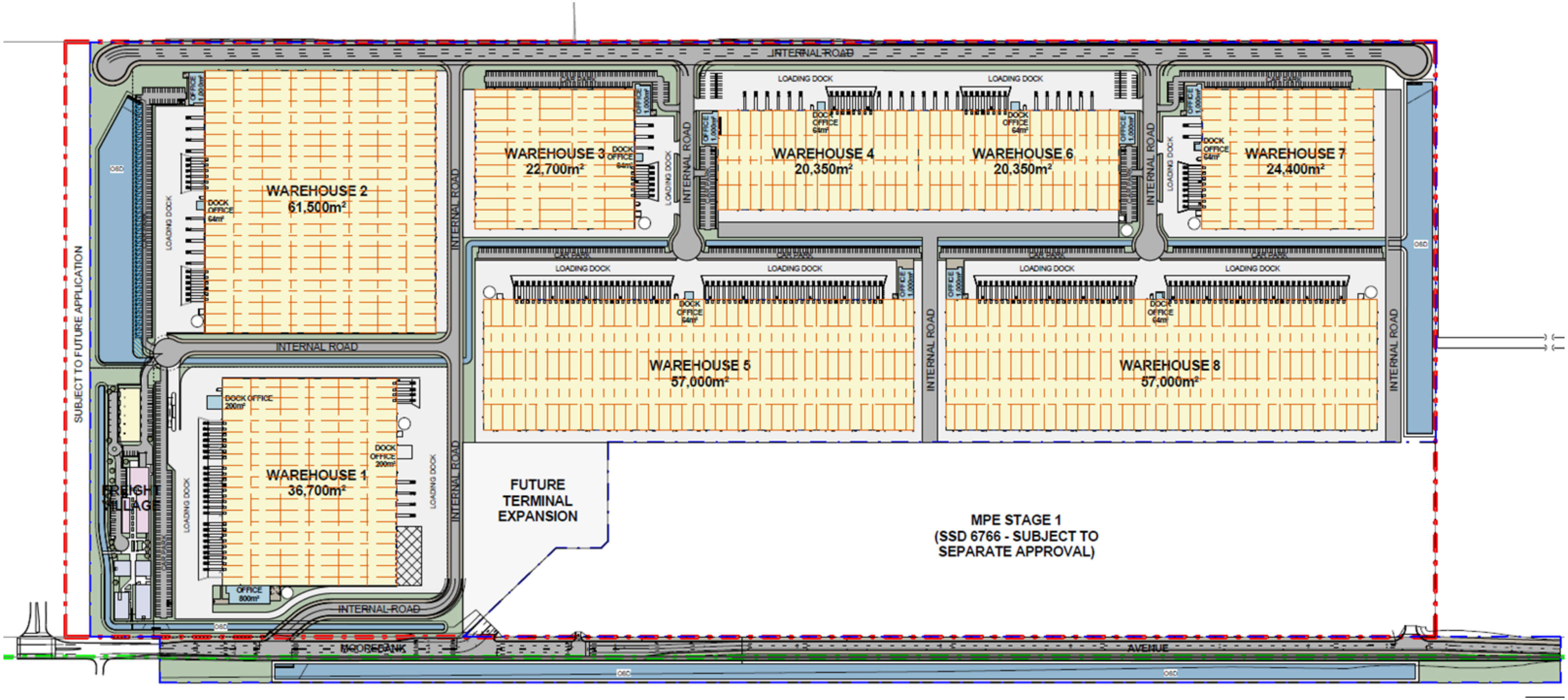

Figure 5-6 Traffic Circulation within MPE Stage 2 site

5.7 Impact on Network Operation with the Proposal

5.7.1 Daily Traffic Volumes with the Proposal

The Proposal would contribute to reducing the existing and potential increase in regional freight traffic movements along the M5 Motorway between Port Botany and Moorebank Avenue, primarily by facilitating a mode transfer from road to rail. Notwithstanding this, operation of the Proposal would increase traffic movements within the vicinity of the Proposal site, particularly on Moorebank Avenue to the south of the M5 interchange. The M5 interchange is the Proposal's primary point of access to the south-western Sydney freight catchment, which is located to the west of the M5 interchange. These increased local traffic movements would be a result of heavy vehicle movements for freight distribution to and from the Proposal site and for light vehicle movements for employees and visitors accessing the Proposal site.

The potential increase in traffic generated by the Proposal on the road network was assessed by comparing forecast 2019 (opening year) and 2029 (10-year horizon) daily traffic volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue with and without the Proposal as shown in Table 5-2 and Table 5-3, respectively.

The results show that increased total traffic volumes from the operation of the Proposal would be the greatest along Moorebank Avenue (to the south of Anzac Road, with traffic volume increases of 23% in 2019 and 19% in 2029. The Proposal would also increase the total traffic volumes along Moorebank Avenue north of Anzac Road with an increase of 18% in 2019 and 15% in 2029. Some low increases in traffic volumes would also be experienced to the east of Moorebank Avenue along Anzac Road and along Cambridge Avenue, west of Moorebank Avenue in 2019 and 2029.

Table 5-3 Daily Traffic Volumes and Heavy Vehicle Volumes in 2019 (Opening Year)

ID	Road Locations	2019 without the Proposal			2019 with the Proposal			Traffic Increase Contributed by the Proposal in 2019 (Opening year)	
		All Vehicles	Heavy Vehicles		All Vehicles	Heavy Vehicles			
			No. of Heavy Vehicles	% of All Vehicles		No. of Heavy Vehicles	% of All Vehicles	All Vehicles	% Increase in total traffic*
M-1	Moorebank Avenue, north of Anzac Road	23,200	1,200	5	27,320	1,760	6	4,120	18
M-2	Moorebank Avenue, south of Anzac Road	19,000	980	5	23,440	1,540	7	4,440	23
M-3	Anzac Road, east of Moorebank Avenue	11,100	510	5	11,420	510	4	320	3
M-4	Moorebank Avenue, north of Cambridge Avenue	19,000	1,050	6	19,120	1,050	5	120	0.6
M-5	Cambridge Avenue, west of Moorebank Avenue	17,900	630	4	18,020	630	3	120	0.7

*Traffic increase contributed by the Proposal equals to Proposal traffic generation divided by background traffic.

Table 5-4 Daily Traffic Volumes and Heavy Vehicle Volumes in 2029 (10-Year Horizon)

ID	Road Locations	2019 without the Proposal			2019 with the Proposal			Traffic Increase Contributed by the Proposal in 2019 (Opening year)	
		All vehicle	Heavy Vehicles		All vehicle	Heavy Vehicles			
			No. of Heavy Vehicles	% of All Vehicles		No. of Heavy Vehicles	% of All Vehicles	All Vehicles	% Increase in total traffic*
M-1	Moorebank Avenue, north of Anzac Road	28,000	1,450	5	32,120	2,010	6	4,120	15
M-2	Moorebank Avenue, south of Anzac Road	23,500	1,220	5	27,940	1,780	6	4,440	19
M-3	Anzac Road, east of Moorebank Avenue	12,800	590	5	13,120	590	4	320	3
M-4	Moorebank Avenue, north of Cambridge Avenue	23,600	1,310	6	23,720	1,310	6	120 0.	0.5
M-5	Cambridge Avenue, west of Moorebank Avenue	22,300	780	3	22,420	780	3	120 0.	0.5

*Traffic increase contributed by the Proposal equals to Proposal traffic generation divided by background traffic.

5.7.2 Peak Hour Traffic Volumes with the Proposal

An assessment of the potential increase in traffic generated by the Proposal at key intersections within the study area was conducted for 2019 and 2029 as shown in Table 5-4.

The highest traffic increase attributable to the Proposal in the peak hour is predicted at the Moorebank Avenue / DJLU Access and Moorebank Avenue / MPE Stage 2 Site Access intersections with increases of approximately 10% in 2019 and reducing to approximately 8% by 2029. The Proposal would increase traffic at Moorebank Avenue / Anzac Road intersection by 7% in 2019 and reduce to 6% by 2029.

The proportion of Proposal traffic in 2029 is less than in 2019 at key intersections within the study area due to a growth in background traffic with Proposal traffic remaining constant from year of opening.

Operation of the Proposal is also predicted to increase traffic at M5 Motorway / Moorebank Avenue intersection by 4% in 2019, reducing to 3.5% by 2029. Increases in traffic due to the Proposal at the M5 Motorway / Hume Highway are less than 0.5% of total traffic movements in 2019 and 2029.

To the north of the M5 Motorway, the analysis found that likely traffic increase attributable to the Proposal at Moorebank Avenue / Newbridge Road and Moorebank Avenue / Heathcote Road intersections would be minor (less than 1.0%). To the east, likely traffic increases at the M5 Motorway / Heathcote Road would be marginal (less than 0.7%). Similarly, to the south on Cambridge Avenue, likely traffic increase at two assessed roundabouts would be marginal (less than 0.2%).

It should be noted that the predicted increase in traffic generated by the Proposal which are less than 5% of the observed are within the limits of the variations in day to day traffic volumes. As such, their impacts are considered marginal.

Table 5-5 Traffic Increase Attributed to the Proposal in 2019 and 2029

ID	Intersections	2019 Opening Year (% of Background Traffic)		2029 Horizon Year (% of Background Traffic)	
		AM Peak	PM Peak	AM Peak	PM Peak
I-1	Moorebank Avenue / Anzac Road	7.0%	3.7%	6.0%	3.0%
I-2	M5 Motorway / Moorebank Avenue	4.0%	2.0%	3.5%	1.7%
I-3	M5 Motorway / Hume Highway	0.4%	0.2%	0.4%	0.2%
I-4	Moorebank Avenue / Newbridge Road	0.5%	0.2%	0.4%	0.2%
I-5	Moorebank Avenue / Heathcote Road	0.8%	0.4%	0.7%	0.3%
I-6	M5 Motorway / Heathcote Road	0.6%	0.3%	0.1%	0.1%
I-7	Cambridge Avenue / Glenfield Road	0.1%	0.01%	0.1%	0.1%
I-8	Cambridge Avenue / Canterbury Road	0.1%	0.07%	0.1%	0.1%
I-A	Moorebank Avenue / DJLU Access	9.5%	5.4%	7.8%	4.3%

ID	Intersections	2019 Opening Year (% of Background Traffic)		2029 Horizon Year (% of Background Traffic)	
		AM Peak	PM Peak	AM Peak	PM Peak
I-B	Moorebank Avenue / MPE Stage 2 Site Access	9.9%	5.5%	8.2%	4.4%

Note: Traffic increase contributed by the Proposal equals to Proposal traffic generation divided background traffic generation in total vehicles.

5.7.3 Impact on Intersection Performance - 2019 and 2029

The impact of traffic attributable to the Proposal on the network operation has been undertaken for the study intersections in 2019 and 2029. Table 5-5 and Table 5-6 show the predicted intersection level of service (LoS) without and with the addition of Proposal traffic in 2019 and 2029, respectively.

In determining the required intersection improvements to mitigate the impact of Proposal traffic on the road network, a "no-worsening of the without Proposal intersection performance" approach has been adopted as this identifies improvements directly attributable to the Proposal i.e. not due to growth in background traffic.

The performance of the proposed road network upgrades attributable to the Proposal has been compared with the "Do-Minimum scenario" as described in Section 1.11. The proposed upgrades to mitigate the traffic impacts of the Proposal and cumulative traffic are discussed in Section 6 of this report.

The modelling results show that the additional Proposal traffic does not have an adverse impact on the performance of the study intersections in 2019 and 2029 (i.e. their performance is similar to the Do-Minimum scenario) and no intersection upgrades are required due to Proposal traffic in 2019 and 2029.

The M5 Motorway / Moorebank Avenue intersection and Moorebank Avenue / Anzac Road intersection (with assumed upgrades per Table 6-1) are expected to perform satisfactorily at LoS B/C with the addition of Proposal traffic in the opening year 2019 and 2029.

The modelling indicated satisfactory operations at both existing Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road roundabouts with LoS A/B with Proposal traffic in 2019 and 2029 (with the proposed network upgrades).

The existing Moorebank Avenue / DJLU Access and proposed Moorebank Avenue / MPE Stage 2 Access intersections are expected to perform satisfactorily with the addition of Proposal traffic in 2019. With the assumed network upgrade at Moorebank Avenue / DJLU Access intersection, and the proposed upgrade at Moorebank Avenue / MPE Stage 2 Access intersection, both intersections provide sufficient capacity to meet the projected traffic demand in 2029.

Table 5-6 Intersection Level of Service with and without the Proposal - 2019

ID	Intersection	Layout	2019 without the Proposal (Do-Min Scenario)				2019 with the Proposal (Do-Min Scenario)				2019 with the Proposal (With assumed network upgrades – See Table 6-1)			
			AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
			Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road	Existing Layout	16	B	15	B	15	B	15	B	27	B	23	B
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	24	B	25	B	22	B	24	B	19	B	26	B
I-3	M5 Motorway / Hume Highway	Existing Layout	86	F	37	C	83	F	32	C	37	C	35	C
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	36	C	34	C	35	C	32	C	28	B	32	C
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	56	E	42	D	57	E	52	D	55	D	37	C
I-6	M5 Motorway / Heathcote Road	Existing Layout	50	D	37	C	47	D	41	C	35	C	41	C
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	10	A	15	B	9	A	15	B	8	A	15	B
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	11	A	7	A	8	A	6	A	8	A	6	A
I-A	Moorebank Avenue / DJLU Access	Existing Layout	9	A	8	A	10	A	10	A	4	A	6	A
I-B	Moorebank Avenue / MPE Stage 2 Site Access	Existing Layout	Existing signalised intersection is not operational				9	A	10	A	9	A	11	A

Table 5-7 Intersection Level of Service with and without the Proposal – 2029

ID	Intersection	2029 without the Proposal (Do-Min Scenario)					2029 with the Proposal (Do-Min Scenario)				2029 with the Proposal (With assumed network upgrades – See Table 6-1)			
		Layout	AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
			Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road	Existing Layout	56	E	105	F	24	B	126	F	29	C	23	B
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	53	D	141	F	46	D	129	F	27	B	40	C
I-3	M5 Motorway / Hume Highway	Existing Layout	148	F	124	F	145	F	116	F	79	F	50	D
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	39	C	73	F	39	C	56	D	32	C	36	C
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	65	E	146	F	56	E	104	F	61	E	54	D
I-6	M5 Motorway / Heathcote Road	Existing Layout	131	F	190	F	96	F	189	F	49	D	79	F
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	11	A	61	E	8	A	79	F	7	A	8	A
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	19	B	60	E	14	B	48	D	12	A	7	A
I-A	Moorebank Avenue / DJLU Access	Existing Layout	53	D	155	F	29	C	336	F	5	A	7	A
I-B	Moorebank Avenue / MPE Stage 2 Site Access	Existing Layout	Existing signalised intersection is not operational				29	C	356	F	9	A	11	A

5.8 Impact on Cambridge Avenue

The Proposal will result in minor increases in peak hour traffic volumes (from employee light vehicle traffic) on Cambridge Avenue with an estimated increase of less than 1.0 % in 2019 and 2029. Heavy vehicles will head north as they are restricted from using Cambridge Avenue. Only a relatively low volume of Proposal traffic (i.e. 120 vehicles per day) uses Cambridge Avenue and comprise of light vehicles (employees).

Due to the relatively low traffic volumes, both roundabouts at Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road are forecast to operate at LoS between A and B with the Proposal in 2019 and 2029.

The majority of the Proposal traffic will travel north along Moorebank Avenue and mitigation measures to reduce travel to the south are implemented via the Operational Traffic Management Plan.

5.9 Cumulative Impact during Operation

For the cumulative scenario, the traffic generated from the MPE Stage 1 Proposal and MPW Stage 2 Proposal was considered in the context of the Proposal and the combined traffic impacts of this cumulative scenario was assessed. It is understood that the MPE Stage 1 Proposal and the MPW Stage 2 Proposal, both subject to separate approvals, are likely to be operational by 2019, the opening year of the Proposal. The MPE Stage 1 Proposal includes the operation of an intermodal (IMEX) terminal facility with a capacity of 250,000 TEU throughput per annum while the MPW Stage 2 Proposal would include an intermodal terminal with a capacity of 500,000 TEU throughput per annum and 215,000m^2 GFA of warehousing.

As a 'worst case' scenario, an assessment of the cumulative development impacts has been conducted in both a 2019 and 2029 full operational scenario. Table 5-8 and Table 5-9 show the predicted intersection level of service (LoS) of the study intersections with the addition of the cumulative development in 2019 and 2029, respectively. Similar to the assessment of the Proposal alone, a "no-worsening of without Proposal intersection performance" approach has been adopted for the assessment of improvements directly attributable to the cumulative scenario.

Of particular importance is that the MPW Stage 2 Proposal which includes the development of an upgraded Anzac Road /Moorebank Avenue intersection from a three leg to a four leg intersection. This upgrade is in part to accommodate the MPW Stage 2 Proposal entrance, operational traffic for the Moorebank Precinct, including MPE Stage 2 and also background traffic. This intersection is to be developed as part of the MPW Stage 2 Proposal however is subject to funding discussions between SIMTA and Roads and Maritime. The construction of this intersection would have a positive impact on operational traffic movements for the Proposal, the greater Moorebank Precinct and background traffic (other Moorebank Avenue road users).

As demonstrated in Section 5.7.3, the impacts from the Proposal related traffic do not result in the need for upgrades to intersections other than the Moorebank Avenue / MPE Stage 2 Access intersection. However, network improvements are required to mitigate the impacts of the cumulative scenario and these are either directly as a result of cumulative developments, or to cater for background traffic growth. As these upgrades are not directly as a result of the Proposal, they have been nominated as assumed network upgrades to complete the modelling and specifics of the upgrades have been included in Table 6-1.

The results of the cumulative scenario traffic modelling are summarised as follows and included in Table 5-8 for 2019 and Table 5-9 for 2029.

The assumed network upgrades at the M5 Motorway / Moorebank Avenue intersection and Moorebank Avenue / Anzac Road intersection are expected to perform satisfactorily at LoS C/D with the addition of cumulative traffic in the opening year 2019 and 2029.

The modelling indicated satisfactory operations at both existing Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road roundabouts with LoS A/B with cumulative traffic in 2019 and 2029 (with the assumed network upgrades).

The existing Moorebank Avenue / DJLU Access and proposed Moorebank Avenue / MPE Stage 2 Access intersections are expected to perform satisfactorily with the addition of Proposal traffic in 2019. With the assumed network upgrade at Moorebank Avenue / DJLU Access intersection, and the proposed upgrade at Moorebank Avenue / MPE Stage 2 Access intersection, both intersections provide sufficient capacity to meet the projected traffic demand in 2029.

Table 5-8 Intersection Level of Service with and without Cumulative Development Scenario – 2019

ID	Intersection	2019 without the Cumulative Development (Do-Min)					2019 with the Cumulative Development (Do-Min)				2019 with the Cumulative Development (With assumed network upgrades – see Table 6-1)			
		Layout	AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
			Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	Existing Layout	16	B	15	B	41	C	47	D	42	D	44	D
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	24	B	25	B	25	B	57	E	20	B	34	C
I-3	M5 Motorway / Hume Highway	Existing Layout	86	F	37	C	107	F	53	D	45	D	39	C
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	36	C	34	C	37	C	40	C	28	C	34	C
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	56	E	42	D	63	E	46	D	50	D	37	C
I-6	M5 Motorway / Heathcote Road	Existing Layout	50	D	37	C	49	D	56	D	38	C	39	C
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	10	A	15	B	9	A	15	B	8	A	14	B
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	11	A	7	A	9	A	6	A	8	A	6	A
I-A	Moorebank Avenue / DJLU Access	Existing Layout	9	A	8	A	5	A	6	A	5	A	6	A
I-B	Moorebank Avenue / MPE Stage 2 Site Access	Existing Layout	Existing signalised intersection is not operational				9	A	13	A	9	A	13	A

Note: Cumulative Development Scenario = Proposal + MPW Stage 2 + MPE Stage 1

Table 5-9 Intersection Level of Service with and without Cumulative Development Scenario - 2029

ID	Intersection	2029 without the Cumulative Development (Do-Min)					2029 with the Cumulative Development (Do-Min)				2029 with the Cumulative Development (With assumed network upgrades – see Table 6-1)			
		Layout	AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
			Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	Existing Layout	56	E	105	F	74	F	421	F	51	D	46	D
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	53	D	141	F	58	E	297	F	34	C	51	D
I-3	M5 Motorway / Hume Highway	Existing Layout	148	F	124	F	156	F	276	F	98	F	44	D
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	39	C	73	F	40	C	115	F	37	C	36	C
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	65	E	146	F	59	E	259	F	56	D	63	E
I-6	M5 Motorway / Heathcote Road	Existing Layout	131	F	190	F	140	F	283	F	68	E	100	F
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	11	A	61	E	8	A	109	F	7	A	8	A
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	19	B	60	E	15	B	90	F	15	B	7	A
I-A	Moorebank Avenue / DJLU Access	Existing Layout	53	D	155	F	83	F	455	F	25	B	7	A
I-B	Moorebank Avenue / MPE Stage 2 Site Access	Existing Layout	Existing signalised intersection is not operational				51	D	307	F	20	B	12	A

Note: Cumulative Development Scenario = Proposal + MPW Stage 2 + MPE Stage 1

5.10 Parking Provisions

5.10.1 Car Parking Provisions

The Roads and Maritime key reference document for guidance on traffic generation and parking provision is the *Guide to Traffic Generating Development (RTA, 2002)*. The Guide makes no specific requirement for minimum parking numbers required for intermodal terminals, in which this warehousing could be included.

For warehouses, it states that "all new warehouses on undeveloped sites must provide on-site parking for all vehicles used by employees. In the case of wholly redeveloped sites each site is treated on its merit."

For warehouse and office land uses, Roads and Maritime recommends the following car parking provision:

- 1 car space per 300 m^2 Gross Floor Area (GFA) for warehouses
- 1 car space per 40 m^2 GFA for offices/commercial
- 1 car space per 20 m^2 GFA for retail.

Based on the Roads and Maritime parking standards and the proposed warehouse, and office gross floor areas (GFAs) for the Proposal, a total of 1,474 car parking spaces is proposed. A detailed breakdown is provided in Table 5-10.

Table 5-10 Parking Provision with the Proposal

Proposed development	Warehouse (m^2)	Office/ Retail/ Commercial (m^2)	Car parking spaces
Warehouse 1	36,700	1,200	152
Warehouse 2	61,500	1,064	232
Warehouse 3	22,700	1,064	102
Warehouse 4	20,350	1,064	94
Warehouse 5	57,000	1,064	217
Warehouse 6	20,350	1,064	94
Warehouse 7	24,400	1,064	108
Warehouse 8	57,000	1,064	217
Freight Village	-	8,010	258
Total	300,000	16,658	1,474

5.10.2 Bicycle Facilities Provisions

Arcadis have undertaken a review of the relevant bicycle facilities guidelines attributed to similar types of development throughout the Greater Sydney Metropolitan Area and NSW. A consideration of the following guidelines was undertaken:

- Liverpool City Council DCP 2008, Part 1, General Controls for All Developments
- *City of Sydney Section 3 - General Provisions*
- DIPNR (referred to currently as the Department of Planning and Environment) *Planning Guidelines for Walking and Cycling 2004*

The *City of Sydney Section 3 – General Provisions* was considered a suitable guideline in that it specified bicycle provisions for individual land uses[6], similar types of development and providing a standard which is mid-range (i.e. did not over or under provide). The *City of Sydney Section 3 – General Provisions* stipulates the following on-site bike parking rates for Industry or Warehouse/Distribution Centres:

- 1 bicycle rack per 10 staff/employees
- 1 personal locker for each bike parking space
- 1 shower and change cubicle for up to 10 bike parking spaces
- 2 shower and change cubicles for 11 to 20 or more bike parking spaces are provided
- 2 additional showers and cubicles for each additional 20 bike parking spaces or part thereof.

Based on the proposed warehouse and office GFAs for the Proposal, an indicative total of 47 bicycle parking spaces, 47 lockers and 5 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number and location of each across the various built form would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*.

5.11 Impact on Crashes/Accidents

5.11.1 Moorebank Avenue

There was a total of 51 reported crashes on the section of Moorebank Avenue between the M5 Motorway interchange and Cambridge Avenue (approximately 3.5 km) during the last five years between 2010 and 2015 inclusive. This translates to approximately 10.2 crashes per year and represents the existing condition (refer to Section 2 of this report).

The Proposal will increase daily traffic volumes on Moorebank Avenue (north of Anzac Road) by approximately 18% in 2019 and this will reduce to 15% by 2029. The analysis indicates that daily traffic volumes are expected to increase on Moorebank Avenue (north of Anzac Road) from 21,300 vehicles (2015) to 27,320 vehicles in 2019 and 32,120 vehicles in 2029, with the Proposal. This translates to approximately 4,120 additional vehicles per day predicted to use Moorebank Avenue (north of Anzac Road) due to the Proposal.

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[6] The Liverpool DCP did not break down controls into individual land uses however used a generalised approach which is not considered suitable for this type of development.

Access to and from the Proposal site would be via the existing MPE Stage 2 site northern access (to be upgraded), to the north of the MPE Stage 1. Site access at this location would allow for vehicular access to warehouse and distribution facilities to enable the direct delivery and dispatch of goods to the warehouses. While the Proposal's upgrades of Moorebank Avenue and the associated intersection works would improve Moorebank Avenue to current Road and Maritime Standards and improving overall road safety, the net impact of the Proposal's traffic would still result in an increase from 10.2 crashes per year to 12.1 crashes per year.

5.11.2 Cambridge Avenue

There was a total of 25 reported crashes on the section of Cambridge Avenue between Moorebank Avenue and Canterbury Road roundabout (about 1.8 km) between 2010 and 2015 inclusive. This translates to approximately 5.0 crashes per year and represents the existing condition.

The Proposal will have minor increase of daily traffic volumes on Cambridge Avenue by less than 1.0 %. Approximately 120 additional vehicles per day (employee cars) are predicted to use Cambridge Avenue as a result of the Proposal. The analysis indicates that daily traffic volumes increases on Cambridge Avenue (east of Canterbury Road) from 15,700 vehicles (2015) to 18,020 vehicles (forecast 2019 with the Proposal) and 22,420 vehicles in 2029. With the Proposal, the crash rate on Cambridge Avenue is forecast to increase by approximately 0.3 crashes per year to approximately 5.3 crashes per year total.

5.12 Impact on Bus Public Transport

In general, the Proposal site can be accessed by bus public transport via a feeder bus service (route no. 901) to the train stations at Liverpool and Holsworthy. The existing service arrangements suggest poor service frequencies for the feeder bus service outside peak times and only one service during peak periods servicing Moorebank Avenue to the south of Anzac Road.

The walking distance to the limited-service bus stops along Moorebank Avenue from the warehousing in the north-west of the Proposal site is within the acceptable walking distance (i.e. 400 metres) as shown in Figure 5-7. However the walking distance from the remaining warehousing on the Proposal site increases as the remaining warehousing share the same access point to Moorebank Avenue as the north western warehousing due to the MPE Stage 1 IMT and rail connection completely restricting direct access to these warehouses from Moorebank Avenue.

To improve bus transport access to the Proposal, additional regular service bus stops are proposed in proximity to the Moorebank Avenue / MPE Stage 2 access intersection and on the internal roads in order to ensure a maximum 400m walking distance ("as the crow flies") to all proposed warehouses and offices.

Whilst there would be additional heavy vehicles on Moorebank Avenue, the service frequencies of the buses are considered low and as such the Proposal is not anticipated to have any substantial impacts on bus public transport services.

Overall it is considered that improvements in bus public transport service frequencies and additional stops would be required to ensure adequate accessibility to all proposed warehouses and offices for the Proposal.

The location of these bus stops would be further discussed with TfNSW as part of the detailed design of the Proposal.

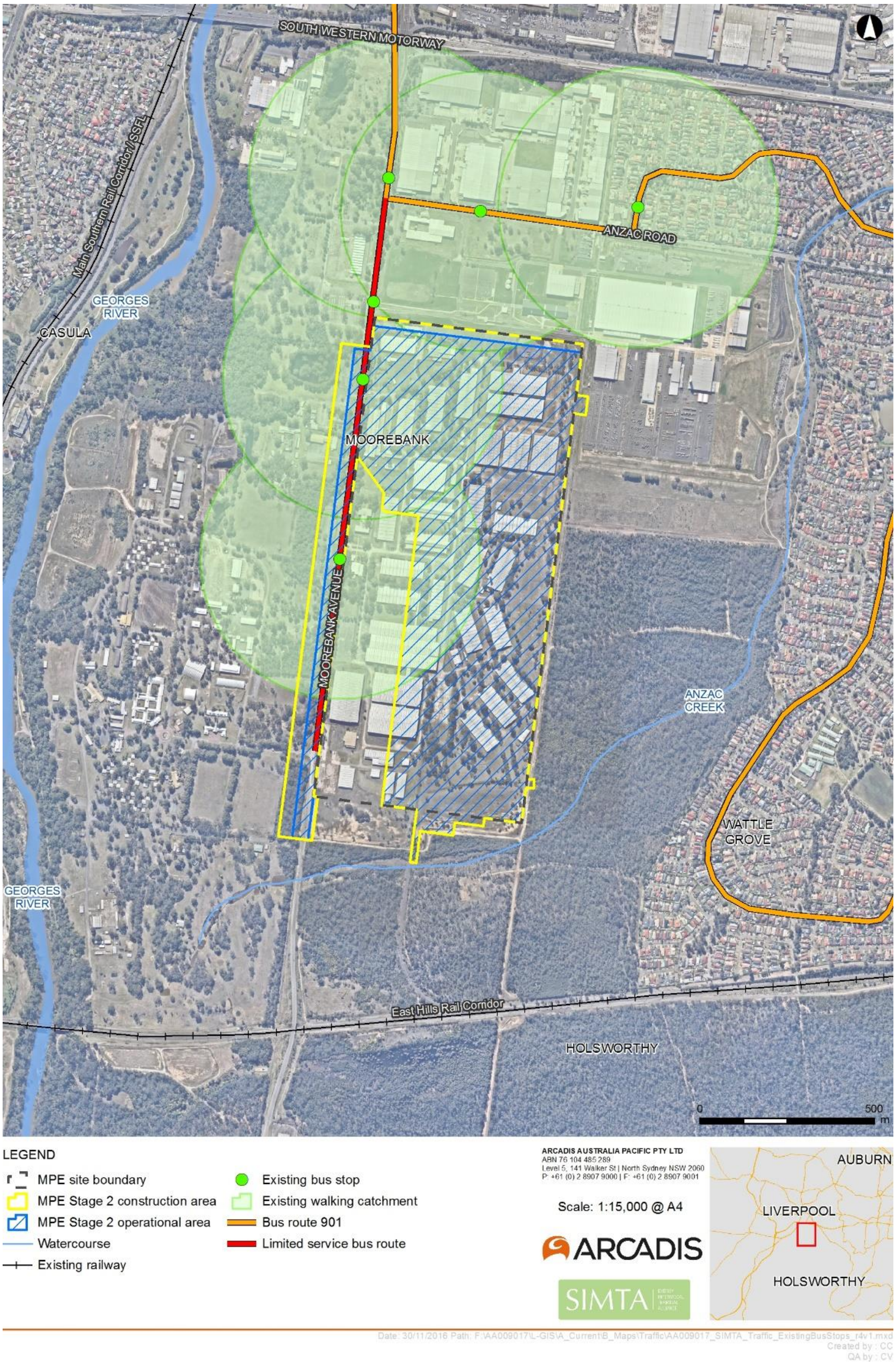


Figure 5-7 Existing Bus Route and Stop Locations

5.13 Impact on Cycling and Walking

5.13.1 Cycling Impacts

The Proposal would not result in any adverse impact to cycle accessibility. To accommodate cyclists shared paths are proposed to be provided on one side of the upgraded Moorebank Avenue (the western side). Off-road cycle provisions will be provided within the Proposal site via shared-paths along the internal roads. Figure 5-8 shows the proposed connectivity between the Proposal site and the surrounding network.

5.13.2 Pedestrian Impacts

The Proposal is considered to have a positive impact on pedestrian links in the area. Shared paths are proposed to be provided on the western side of the upgraded Moorebank Avenue with pedestrian crossing facilities located at signalised T-intersections along Moorebank Avenue. This is similar to the current provisions along Moorebank Avenue.

Direct connection to the surrounding pedestrian paths on Moorebank Avenue and the Proposal site is proposed to be through the proposed Moorebank Avenue / MPE Stage 2 site access intersection. The location of the proposed MPE Stage 1 IMT railway line restricts pedestrian movements directly to the warehousing adjoining the MPE Stage 1 IMT Terminal, however an internal shared path network is provided to allow pedestrians to access the Proposal site via the MPE Stage 2 signalised entrance as shown in Figure 5-8).

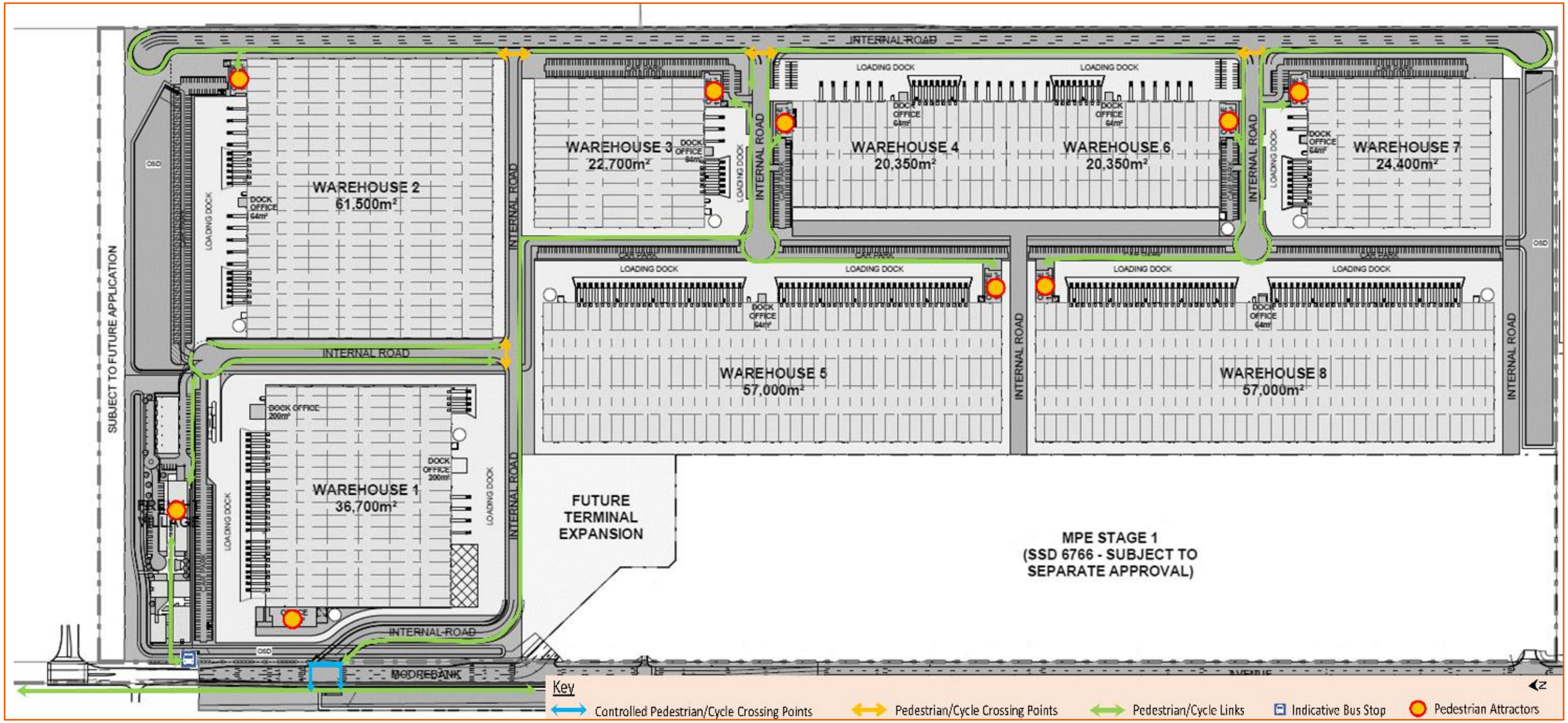


Figure 5-8 Proposed Pedestrian and Cyclist Connectivity

6 NETWORK IMPROVEMENT AND MITIGATION MEASURES

6.1 Potential Infrastructure Upgrade

The analysis examined the traffic impacts of future traffic demand on the surrounding road network from both background traffic growth and the additional traffic generated by the Proposal when the Proposal site is fully developed. This investigation reviewed the existing infrastructure and then identified the required road and intersection improvements needed to mitigate the additional traffic generated by both the Proposal alone, and subsequently by the cumulative scenario in 2019 and 2029.

6.1.1 Mitigation measures for the Proposal

The study identified road network improvements to ensure that satisfactory intersection performance could be achieved based on a “no-worsening of the without development performance” of the study intersections with and without the Proposal. The assessment concluded that the addition of Proposal traffic does not trigger any intersection upgrades in the opening year 2019 and 2029.

For the cumulative scenario, the assessment concluded that upgrades are needed at the M5 Motorway / Moorebank Avenue and the M5 Motorway / Anzac road intersection to cater for the impact of cumulative traffic in 2019 and 2029. The assumed network upgrades noted in Table 6-1 mitigate these cumulative impacts.

In order to provide access for the Proposal, maintain continuity of operations of surrounding proposals after opening, and to minimise the extent of road network impacts arising as a result of the construction of network improvements, the Proposal includes:

Moorebank Avenue Upgrade

The Moorebank Avenue Upgrade would be for approximately 1.4 kilometres commencing approximately 95 metres south of the northern boundary of the MPE site to approximately120 metres south of the southern MPE site boundary. The Moorebank avenue upgrade is located within the existing Moorebank Avenue road corridor and along the eastern boundary of the MPW site.

The Moorebank Avenue upgrade would be comprised of the following key components:

- Modifications to the existing lane configuration as follows:
  - Four lanes from the northern extent of the Moorebank Avenue upgrade to the MPE Stage 1 central access.
  - Two lanes between the MPE Stage 1 central access to approximately 120 metres south of the MPE site.

  The lanes would generally be 3.5m wide central travel lanes, with 4.2m wide kerbside travel lanes with a 4.5 metre verge along both the northbound and southbound carriageways. Signalling and intersection works.
- Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder
- Tie in works at its existing vertical and horizontal alignment near the northern boundary of the MPE site and approximately 120 metres south of the southern MPE site boundary.

Intersection upgrades

The Proposal includes upgrades to four intersections along Moorebank Avenue, including:

- Moorebank Avenue / MPE Stage 2 access (intersection upgrade)
- Moorebank Avenue / MPE Stage 1 northern access (tie in works)
- Moorebank Avenue / MPE Stage 2 central access
- MPW Northern Access / MPE Stage 2 southern emergency access

A preliminary layout of the proposed Moorebank Avenue upgrade is provided in Appendix D of this report. The final details of the layout will be confirmed in the detailed design stage.

6.1.2 Mitigation measures not included in the Proposal (wider network assumed)

The study found that the broader road network in the study area needs to be upgraded to provide increased capacity to cater for the forecast increases in traffic volumes which will result from the general growth in background traffic and cumulative development. An area wide network improvement strategy is needed to ensure the desired functionality of the network of motorways, arterials, collector and local roads in the study area is achieved and provide safe and efficient traffic dispersal. These wider network improvements are required to provide an adequate LoS across the road network to meet the predicted growth in traffic demand in the opening year 2019 and 10-year horizon of 2029.

As discussed in the report, a number of key intersections are currently operating at an unsatisfactory LoS as a result of background traffic and anticipated background traffic growth, i.e. prior to consideration of any impacts of the Proposal or cumulative scenario related traffic. These intersections would need to be upgraded by Roads and Maritime to ensure that the network operates sufficiently and that local traffic in the area does not continue to decline in performance. As outlined in Section 1.11, the modelling has assumed a number of planned and committed network improvements (to be completed by Roads and Maritime) to meet the growth in future demand on the road network and these improvements are not included in the following assumed network improvements.

The analysis has identified the need for a number of intersections to be upgraded (in part or full) in order to address the impacts of background and cumulative traffic i.e. not due to the Proposal. For the purpose of this traffic and transport impact assessment these upgrades (as shown in Table 6-1) have been assumed within the modelling, however are not nominated for delivery for the Proposal.

Table 6-1 Assumed Network Upgrades

ID	Intersection	Recommended Network Improvements to Mitigate Background and Cumulative Traffic	Indicative Timing	Required for
I-1	Moorebank Avenue / Anzac Road	1. Upgrade Moorebank Avenue/Anzac Road signalised intersection to include lane capacity improvements on the northern and southern approaches. The current configuration on Anzac Road (eastern approach) will be retained. 2. Implement vehicle actuated signals 3. Upgraded intersection to comply with relevant RMS design standards	2019	Background and cumulative
I-2	M5 Motorway / Moorebank Avenue	1. Provide additional capacity on M5 westbound on-ramp. 2. Provide additional capacity on M5 eastbound off-ramp 3. Increase the storage lengths of the existing (two-lane) right turn bay on Moorebank Avenue northern approach 4. Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue intersection and Moorebank Avenue/Anzac Road intersection 5. Change the signal to vehicle actuated to improve west and north approaches (See Figure 6-1). 6. Upgraded intersection to comply with relevant RMS design standards	Staged upgrading starting from 2019	Background and cumulative
I-3	M5 Motorway / Hume Highway	Change the signal to vehicle actuation in the PM peak to improve traffic signal operations	2019	Background
I-4	Moorebank Avenue / Newbridge Road	1. Add an additional right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant RMS design standards	2019	Background
I-5	Moorebank Avenue / Heathcote Road	1. Extend right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant RMS design standards	2019	Background
I-6	M5 Motorway / Heathcote Road	Change the signal to vehicle actuated in PM peak to improve traffic signal operations.	2019	Background

ID	Intersection	Recommended Network Improvements to Mitigate Background and Cumulative Traffic	Indicative Timing	Required for
I-A	Moorebank Avenue / DJLU Access	Upgrade intersection capacity on north and south approaches	2029	Background

Figure 6-1 Proposed upgrades at the M5 Motorway/Moorebank Avenue intersection

6.1.3 Developer contributions

The analysis has identified that no intersection upgrades are required as a result of the Proposal, however it is acknowledged that the Proposal will utilise the intersections identified for upgrade in the assumed network improvements outlined above. It is understood from discussions with Roads and Maritime that the Precinct Model, although part of a separate process to the EIS for the Proposal, would be used, and in the case of the Proposal and the information included in Table 6-1, to inform developer contributions for the various stages of the Moorebank Precinct. The intent of the Precinct Model is to provide a whole of precinct based approach which will provide Roads and Maritime with further information on upgrades to be undertaken for each stage of the Moorebank Precinct and the associated timing to ensure that upgrades are completed in a timely and efficient manner.

6.2 Public Transport and Active Transport Provision

In terms of the public transport and active transport provision that is required to cater for the Proposal, that the following mitigation measures are considered suitable:

- SIMTA to undertake consultation with relevant bus provider(s) regarding the potential to extend the 901 bus service (limited bus service along Moorebank Avenue), particularly along Moorebank Avenue fronting the Proposal site and additional bus stops to ensure adequate accessibility to and within the Proposal site.
- Consultation with TfNSW will be conducted regarding the provision for active transport to/from the Proposal site and along the internal roads, as part of detailed design for the Proposal.
- A total of 47 bicycle parking spaces, 47 lockers and 5 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number and location of each across the various built form would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*.

7 CONCLUSION

This Operational Traffic and Transport Impact Assessment Report has been prepared by Arcadis to support the Proposal. This assessment has identified the traffic impacts and required improvements to mitigate the impact on the safety and operation of the adjacent road network. The following key (study) intersections were assessed consistent with the SEARs requirements including:

- Moorebank Avenue / Anzac Road
- M5 Motorway / Moorebank Avenue
- M5 Motorway / Hume Highway
- Moorebank Avenue / Newbridge Road
- Moorebank Avenue / Heathcote Road
- M5 Motorway / Heathcote Road
- Cambridge Avenue and two associated intersections at Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road
- Moorebank Avenue / DJLU Access
- Moorebank Avenue / MPE Stage 2 Site Access

7.1 Existing Network Performance in 2015

The modelling results indicate that the existing Moorebank Avenue / Newbridge Road, and Moorebank Avenue / Heathcote Road intersections are operating at capacity with LoS E in the peak periods. Upgrades are needed at these intersections to cater for existing peak background traffic demand. Future growth in peak demand is expected to worsen the performance of these intersections.

7.2 Network Performance in the Opening Year 2019 and 2029 (without the Proposal and without upgrades)

The analysis results show that the following intersections perform unsatisfactorily at LoS E/F in the peak periods due to background traffic in 2019. These intersections need to be upgraded to cater for the growth in background traffic demand:

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

No upgrades are required at the remaining study intersections due to background traffic in 2019 as they are expected to perform satisfactorily at LoS D or better.

By 2029, all study intersections (i.e. I-1 to I-8 and I-A) are expected to perform unsatisfactory at LoS E/F and need to be upgraded to cater for the growth in background demand in the 10-year design horizon 2029.

7.3 Proposal Traffic Generation

The Proposal is expected to generate approximately 564 truck trips (2-way) and 3,993 car trips (2-way) to and from the precinct each week day. In the cumulative development scenario with the addition of traffic from MPE Stage 1 and MPW Stage 2, approximately 2,540 truck trips (2-way) and 6,808 car trips (2-way) are estimated to and from the precinct each week day.

7.4 Proposal (MPE Stage 2) Site Access

Access to and from the Proposal site would be via the existing DNSDC northern access, to the north of the MPE Stage 1 Project. Site access at this location would allow for vehicular access to warehouse and distribution facilities to enable the direct delivery and dispatch of goods to the warehouses.

During the interim stages of operation, the traffic circulation throughout the MPE Stage 2 site would be via a combination of the roads described below (i.e. the final configuration) and the use of modified existing roads. Interim vehicle movement and access throughout the MPE Stage 2 site would be included in the relevant environmental management plans for operation of the Proposal, including the Construction Traffic Management Plan and Operational Traffic Management Plan.

7.4.1 Roadworks – Moorebank Avenue

As part of the Proposal, Moorebank Avenue would be upgraded for about 1.4 kilometres. The Moorebank Avenue upgrade commences from approximately 95 metres south of the northern boundary of the MPE site to approximately120 metres south of the southern MPE site boundary. The Moorebank avenue upgrade is located within the existing Moorebank Avenue road corridor and along the eastern boundary of the MPW site.

The Moorebank Avenue upgrade would be comprised of the following key components:

- Modifications to the existing lane configuration, including some widening
- Signalling and intersection works.
- Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder

7.4.2 Lane configuration

The Moorebank Avenue upgrade would provide for the integration of the Proposal with the wider Moorebank Precinct works and to tie-in to Moorebank Avenue at its existing vertical and horizontal alignment near the northern boundary of the MPE site.

The arrangement of lanes along Moorebank Avenue as part of the Proposal would include:

- Four lanes from the northern extent of the Moorebank Avenue upgrade to the MPE Stage 1 central access.
- Two lanes between the MPE Stage 1 central access to approximately 120 metres south of the MPE site.

The lanes would generally be 3.5m wide central travel lanes, with 4.2m wide kerbside travel lanes with a 4.5 metre verge along both the northbound and southbound carriageways.

7.4.3 Intersection upgrades

The Proposal includes upgrades to four intersections along Moorebank Avenue, including:

- Moorebank Avenue / MPE Stage 2 access
- Moorebank Avenue / MPE Stage 1 northern access
- Moorebank Avenue / MPE Stage 2 central access
- MPW Northern Access / MPE Stage 2 southern emergency access

7.4.4 Road alignment

The horizontal alignment of Moorebank Avenue is not expected to change significantly as a result of the Proposal, with the upgraded road remaining primarily within the existing Lot 2 of DP1197707.

As part of the Proposal, the vertical alignment of Moorebank Avenue within the operational footprint of the Moorebank Avenue upgrade would be raised by approximately two metres. At the northern and southern extents of this work, the vertical alignment would be graded to tie-in to the remainder of Moorebank Avenue

7.5 Impact at Key Road Sections

The Proposal has the highest impact on Moorebank Avenue (south of Anzac Road) with traffic volume increases of 23% in 2019 and 19% in 2029. This is followed by Moorebank Avenue (north of Anzac Road) with an increase of 18% in 2019 and 15% in 2029. The analysis suggests increases due to the Proposal on the remaining road sections are expected to be low with increases of below 4% in the opening year and 10-year horizon

7.6 Impact at Key Intersections

The highest traffic increase attributable to the Proposal in the peak hour is predicted at the Moorebank Avenue / DJLU Access and Moorebank Avenue / MPE Stage 2 Site Access intersections with increases of approximately 10% in 2019 and reducing to approximately 8% by 2029.

The Proposal would increase traffic at Moorebank Avenue / Anzac Road intersection by 7% in 2019 and reduce to 6% by 2029. The increase is expected to reduce due to the growth in background traffic with Proposal traffic remaining constant from year of opening.

It is also predicted to increase traffic at M5 Motorway / Moorebank Avenue intersection by 4% in 2019 and reduce 3.5% by 2029. Increases in traffic due to the Proposal at the M5 Motorway / Hume Highway are less than 0.5%.

To the north, the analysis found that likely traffic increase attributable to the Proposal at Moorebank Avenue / Newbridge Road and Moorebank Avenue / Heathcote Road intersections would be minor (less than 1.0%). To the east, likely traffic increases at the M5 Motorway / Heathcote Road would be marginal (less than 0.7%). Similarly, to the south on Cambridge Avenue, likely traffic increase at two assessed roundabouts would be marginal (less than 0.2%).

It should be noted that the predicted increase in traffic generated by the Proposal which are less than 5% of the observed are within the limits of the variations in day to day traffic volumes. As such, their impacts are considered marginal.

7.7 Network Performance in the Opening Year 2019 and 2029 (with the Proposal and with assumed network upgrades)

- No upgrades are required at the study intersections due to the Proposal (in the opening year 2019 and 2029) with the exception of the Moorebank Avenue / MPE Stage 2 Site Access intersection which provides access to/from the Proposal site.
- Cumulative traffic would likely exceed the current capacity at the M5 Motorway/ Moorebank Avenue intersection and upgrading of the intersection is required by 2019. A staged upgrade of the intersection is recommended.
- Capacity improvements are required at the signalised intersections of Moorebank Avenue/Newbridge Road and Moorebank Avenue / Heathcote Road due to an existing operational network problem, without consideration of the Proposal. These intersections need to be upgraded to cater for the growth in background traffic demand (i.e. not due to the Proposal)
- Capacity improvements are required at the M5 Motorway / Hume Highway and M5 Motorway / Heathcote Road signalised intersections to cater for the growth in background traffic. These intersections need to be upgraded to cater for the growth in background traffic demand (i.e. not due to the Proposal)
- The analysis identified minor impact to roundabouts of Glenfield Road and Canterbury Road with Cambridge Avenue attributable to the Proposal.

A series committed and anticipated upgrades (Do-Min) are being pursued by Roads and Maritime. These upgrades are needed to cater for the growth in background traffic on the wider road network and is recommended to be implemented as a priority to provide the required additional capacity to meet future demand on the road network.

7.8 Parking Provision

Based on the Roads and Maritime parking standards and the proposed warehouse, and office gross floor areas (GFAs) for the Proposal, a total of 1,474 car parking spaces is proposed to be provided as part of the Proposal.

A total of 47 bicycle parking spaces, 47 lockers and 5 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number and location of each across the various built form would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*

7.9 Public Transport and Active Transport Provision

In terms of the public transport and active transport provision that is required to cater for the Proposal, that the following mitigation measures are considered suitable:

- SIMTA to undertake consultation with relevant bus provider(s) regarding the potential to extend the 901 bus service (limited bus service along Moorebank Avenue) and additional bus stops to ensure adequate accessibility to and within the Proposal site
- Consultation with TfNSW will be conducted regarding the provision for active transport to/from the Proposal site and along the internal roads in the Proposal site, as part of detailed design for the Proposal.

7.10 Regional Network Impacts

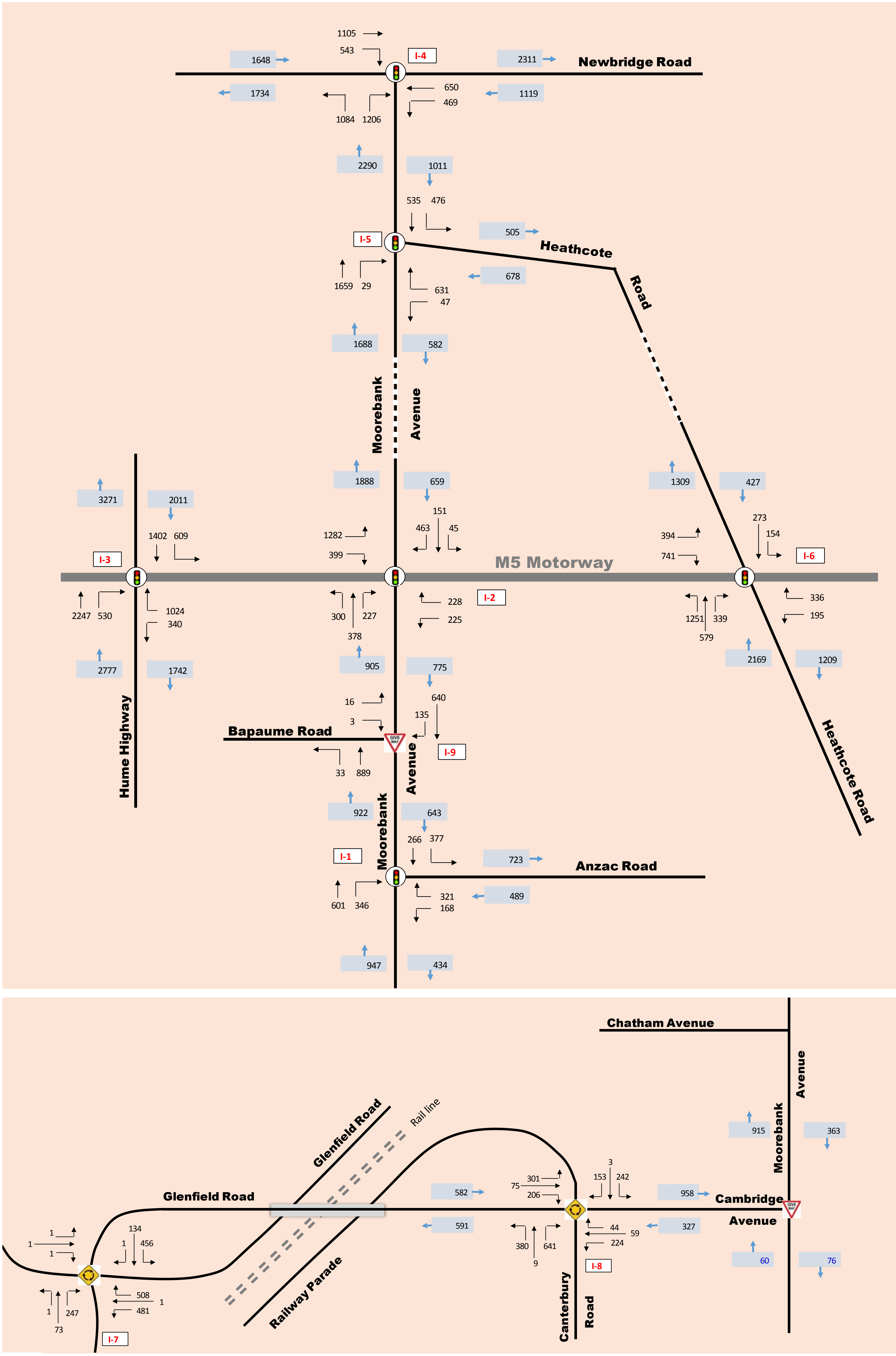
The Proposal, which includes the construction of warehouse and distribution facilities to support an IMT at Moorebank, would provide freight distribution functionality from the IMT, thereby minimising the need for heavy vehicles to travel to Port Botany and assist in reducing road congestion. Additional capacity on the freight transport network would also be generated by including warehouses and distribution facilities at the same location as the IMT. This maximises the capacity of Port Botany and encourages more efficient business operations.

From a strategic perspective, the MPE Project, including the Proposal, is considered to be in the public interest, and would result in wider regional benefits by generating a number of economic, social and environmental benefits for the community and economy, including:

- Economic benefits: The unit costs of transporting containers by rail would be reduced, thereby increasing the share of freight movements by rail. This would improve productivity, reduce operating costs, increase reliability, reduce costs associated with road damage, congestion and accidents, and lead to better environmental outcomes. The Proposal would increase cost efficiencies for the handling, storage and distribution of freight
- Job creation: The Proposal would result in the creation of approximately 200 construction employment opportunities during the peak construction period of the Proposal and 1,408 full time equivalent staff for the operation of the warehousing area
- Improved environmental outcomes by contributing to reducing road congestion: the introduction of an IMT at Moorebank would result in fewer truck journeys every day (to and from Port Botany), resulting in reductions in greenhouse gas emissions, fuel consumption and other air pollution and potential increases in road network performance around Port Botany
- Social benefits through reducing road traffic and associated noise along key road freight routes between Moorebank and Port Botany
- Easing the Port Botany bottleneck to enable the Port to more effectively cope with future growth in container trade and provide large scale freight capacity.

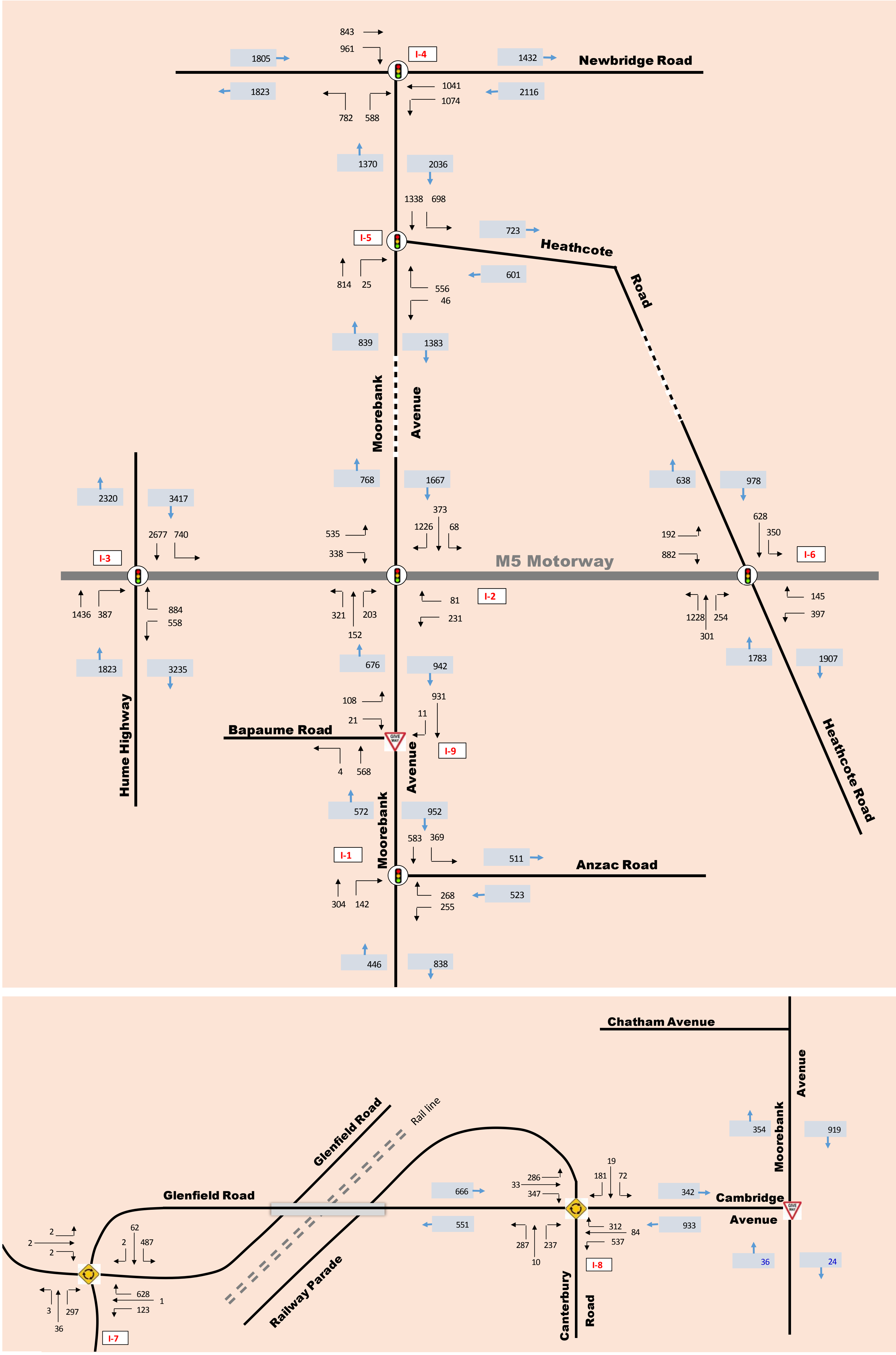
APPENDIX A - TRAFFIC DATA AND ASSUMPTIONS USED IN TRAFFIC AND ACCESSIBILITY IMPACT ASSESSMENT

Existing 2015 AM Peak 8:00 to 9:00



Source: RMS, Arcadis

Existing 2015 PM Peak 17:00 to 18:00



Source: RMS, Arcadis

APPENDIX B- TRAFFIC GENERATION AND UNDERLYING ASSUMPTIONS (WSP | PARSONS BRINKERHOFF)

PARSONS BRINCKERHOFF

Memo

Date	1 September 2016
To	Tony Vaccaro, Steve Ryan
Copy	John Webster
From	Callan Stirzaker
Ref	2189293E-ITP-MEM-002-RevF
Subject	Moorebank Intermodal Precinct: Traffic generation and underlying assumptions

1. Introduction

Parsons Brinckerhoff have been engaged by Moorebank Intermodal Company (MIC) to undertake transport modelling for the assessment of traffic impacts associated with the planned Moorebank Intermodal Terminal.

The Moorebank Intermodal Terminal is a facility is designed to process containers being imported and exported from Australia. The ultimate annual container demand for the site has been calculated as approximately 1.5 million TEUs (Twenty Foot Equivalents). Of the containers which are processed via the site, some will be transferred to onsite warehouses prior to leaving the site. Containers are also transferred as interstate and intrastate movements.

From a traffic perspective there are therefore three distinct components of the site:

1. **Staff demand:** Workers who will travel to/from the facility by car.
2. **Terminal demand:** Freight (truck) demand relating to the import/export of full container load (FCL) and empty (MT) container TEUs for the IMEX and Interstate facilities. Intrastate rail movements also exist.
3. **Warehouse demand:** Freight (truck) demand relating to the import of goods via the onsite warehouses.

The memo will discuss each of the above components separately before combining to present the estimation for the total traffic generation.

1.1 Purpose of memo

The purpose of this memo is to document the revised assumptions relating to traffic generation of the proposed Moorebank Intermodal Terminal. The memo will also summarise the estimated traffic generation for the entire development.

1.2 Memo history

This memo is an updated version to two previous issued memos dated: 22 September 2015 and 8 February 2016. Since the last version of the traffic generation and underlying assumptions, the following changes have occurred:

- Consolidation of information and assumptions between MIC and SIMTA to develop a co-ordinated and consistent assessment of the Moorebank Intermodal Terminal precinct.
- Update to development staging and development timeframes.
- Update to assumptions relating to site operations and container movements within the precinct.
- Update to assumptions relating to warehouse back loading.

1.3 Transport modelling

A traffic assessment of the site as part of the Environmental Impact Statement (EIS) was undertaken utilising assessment techniques suitable for the planning stage of the project. This primarily relied on SIDRA to assess intersection performance and industry parameters for traffic generation. The assessment also assessed only the peak 1 hour commuting period during the AM and PM peak time periods.

The planned mesoscopic modelling activity is the next step assessing impacts across a wider network and at a greater level of detail.

2. Ultimate IMT facility and traffic demand

2.1 IMT demands

Table 2.1 provides a summary of the proposed ultimate site configurations and the resulting TEU demand forecasts per major facility.

Table 2.1 Site development assumptions

Item	Input/Assumption
Total TEU demand	**1,500,000** per annum (2026).
Warehouse facilities	850,000 m^2 ▪ The make-up of the warehouses will be determined by market forces and will be a mix of retail operators and freight forwarders.
Terminal demand Annual – based on NMC calculations	**1,500,000 TEUs (935,000 transferred offsite by road)** ▪ IMEX: 1,000,000 ▪ Interstate: 500,000 *Note: 245,000 containers pass through via rail and not forecast to leave facility via road.*
Warehouse demand Annual – based on Deloitte calculations	**320,000 TEUs (equivalent) as 'de stuffed' goods** Equivalent to 1.38 TEUs per 1,000m^2 GFA warehousing per weekday.

Source: Neil Matthews Consulting (May 2016)

2.2 Development staging

The proposed development has a planned development over three stages. Stage 1, already approved, will be operational by 2018. Stage 2 and Stage 3 (ultimate) are planned for operations in 2022 and 2026 respectively.

2.3 Seasonality

A review of the freight movements at Port Botany was undertaken on the basis of the *Trade Statistics Bulletin (1 July 2013–30 June 2014)* publication by NSW Ports. Analysis of the monthly freight imports (see Figure 2.1) indicated that there were approximately 3,000 TEU/day with a peak demand occurring throughout November of approximately 3,500 TEUs per day. Export demands (see Figure 2.2 and Figure 2.3) however was less seasonal with a peak periods occurring throughout the year.

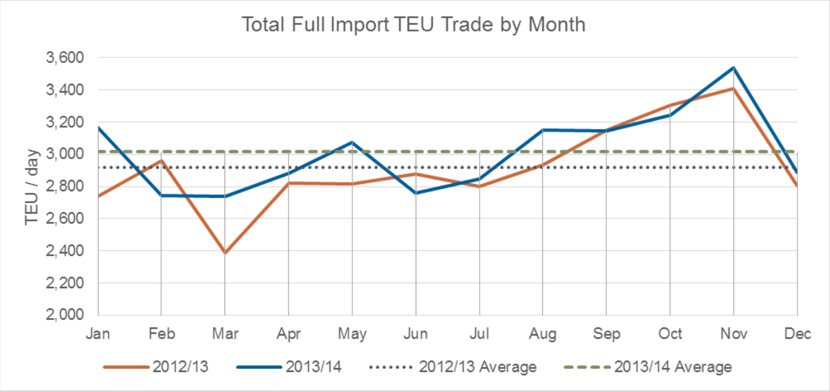


Figure 2.1 Imported full TEUs/day (estimated) by month

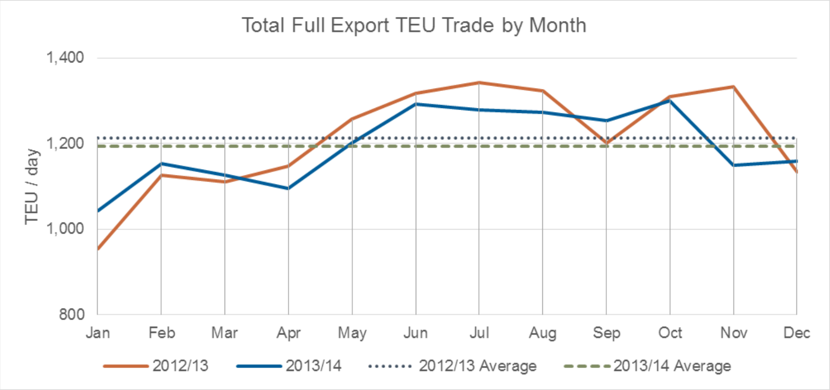


Figure 2.2 Exported full TEUs/day (estimated) by month

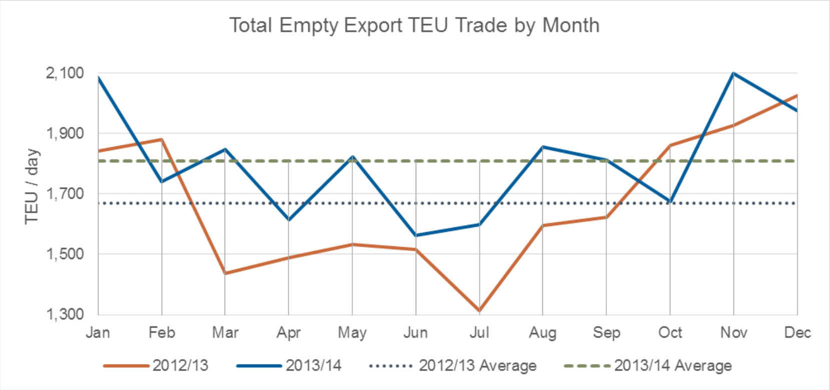


Figure 2.3 Exported empty TEUs/day (estimated) by month

Figures 2.4 to 2.6 highlight that when normalising the import and export demands a 'busy' period factor can be established.

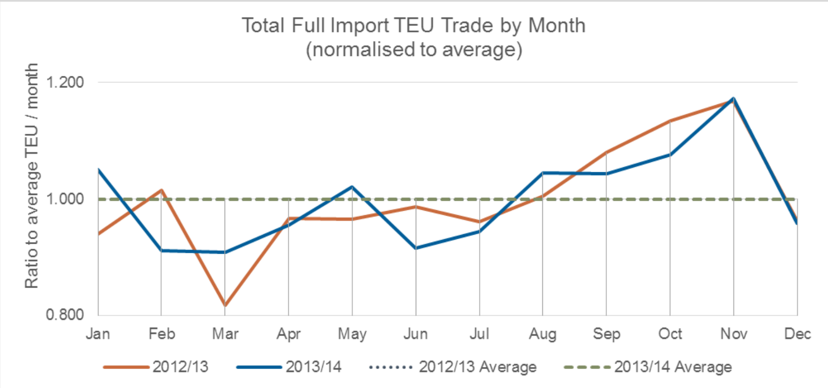


Figure 2.4 Normalised (by average) imported full TEU/day by month

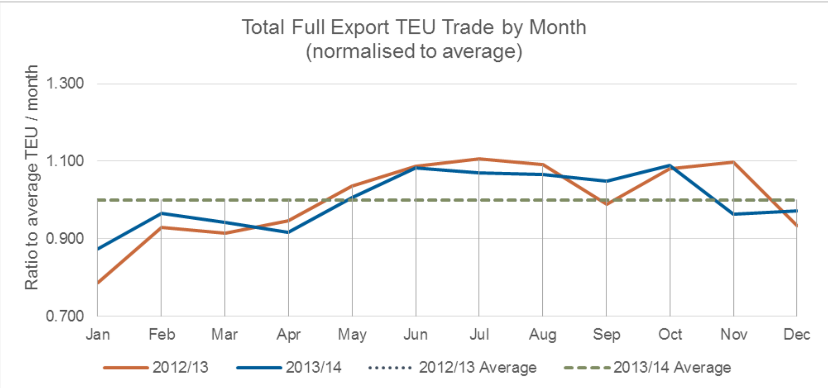


Figure 2.5 Normalised (by average) exported full TEU/day by month

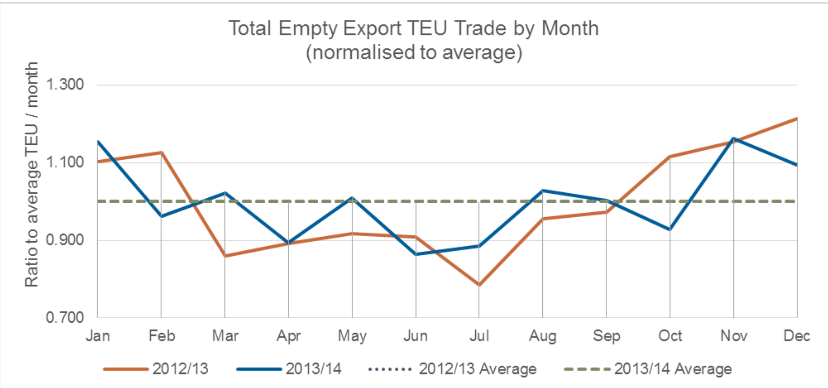


Figure 2.6 Normalised (by average) exported empty TEU/day by month

From a traffic generation assumption we propose two scenarios:

1. *Assessment:* An 'average' weekday where TEU imports and exports are both considered average based on forecast annual TEU demands at the Moorebank facility.

2. *Sensitivity:* A 'busy' weekday where daily TEU (full) imports to warehouses (and empty exports to port from ECP) are 20% greater than average and TEU (full and empty) imports and exports between terminal and external depots are 10% greater than average. This would be applied to 1 million of the 1.5 million TEU capacity of the intermodal terminal.

3. Traffic generation assumptions

Table 3.1 provides the summary of all traffic and transport relating assumptions to be used as part of the assessment of the IMT. These assumptions are valid at the time of the development of this memo. They remain subject to change as further information becomes available.

Table 3.1 Revision to traffic assumptions for mesoscopic modelling

Assumption	MIC assumption (2015)	SIMTA assumption (2015)	Revised assumption (31 August 2016)	Commentary for change
Annual to daily conversion factors				
Weeks of operation	52	52	52	No change.
Days of week operation	7	7	7	No change.
Terminal weekday to week relative to week demands	85% occur on weekdays	85% occur on weekdays	85% occur on weekdays	No change.
Warehouse weekday relative to week demands	95% occur on weekdays	95% occur on weekdays	95% occur on weekdays	No change. Over time, there is a high likelihood that this will decrease (i.e. a greater level of operation on weekends).
Terminal seasonality (daily demands)	Flat profile assumed		'busy' period + 10% for imports + 10% for exports	Based Port Botany information shown in section 2.2. Daily imports/exports for a year would be necessary to calculate an 85th percentile demand. *Note: Daily demand profiles are different during the peak period reflecting the distribution across the day. The peak hour demand percentage decrease results in a peak hour increase of approximately 10% for warehouse demands only.*
Warehouse seasonality (daily demands)	Flat profile assumed		'busy' period + 20% for imports + 0% for exports	
Total site daily operation				
IMT hours of operation	24 hours	24 hours	24 hours	No change.
Terminal operations	24 hours	24 hours	24 hours	
Warehouse hours of operation	18 hours, transitioning to 24 hours (2030+)	18 hours, transitioning to 24 hours (2030+)	18 hours, transitioning to 24 hours (2026+)	No change.

<table>
<tr><th>Assumption</th><th>MIC assumption (2015)</th><th>SIMTA assumption (2015)</th><th>Revised assumption (31 August 2016)</th><th>Commentary for change</th></tr>
<tr><td>Staff shift work</td><td colspan="2">Ultimately; Three shifts per day:
6.00 am to 2.00 pm
2.00 pm to 10.00 pm
10.00 pm to 6.00 am</td><td>Based on specific start and end times such as those previously assumed.</td><td rowspan="2">Whilst individual sites will have very specific start and finish times, at a precinct level, the different sites would likely have slightly different shift times. This phenomenon was shown in recent traffic surveys where multiple warehouses were surveyed.</td></tr>
<tr><td>Administration staff</td><td colspan="3">8.30 am to 5.00 pm</td></tr>
<tr><td colspan="5">Staff specific operations (relating to light vehicle traffic generation)</td></tr>
<tr><td>Number of staff</td><td>Back calculated from Roads and Maritime Guidelines.</td><td>N/A</td><td>Back calculated from Roads and Maritime Guidelines.</td><td rowspan="3">A review of the warehouse surveys conducted in June and November showed that while one or two warehouses generate traffic in very specific periods relative to shift times, a group of different warehouse operators (as proposed) will result in a more dispersed arrival and departure profile.</td></tr>
<tr><td>Mode share</td><td>90% car-driver</td><td>N/A</td><td>90% car driver</td></tr>
<tr><td>Traffic profiles</td><td colspan="2">Journey to work trips to occur in hour preceding shift start time and during the hour after shift end time.</td><td>As per the traffic surveys which showed a greater spread in arrival and departure demands.
Peak hour generation approximately 15% of daily generation
(two shifts per day)</td></tr>
<tr><td colspan="5">Terminal specific operations (relating to heavy vehicles)</td></tr>
<tr><td>AM peak period</td><td>7.45 am to 8.45 am
(1 hour)
7.7% of daily generation</td><td>7.7% of daily generation</td><td>6.00 am to 10.00 am</td><td rowspan="2">For the ‘average weekday’, the mesoscopic modelling will consider the time periods and relative proportions outlined below:</td></tr>
<tr><td>Inter peak period</td><td>Not considered</td><td>Not considered</td><td>12.00 pm to 3.00 pm
(school peak)</td></tr>
</table>

<table>
<tr><th>Assumption</th><th>MIC assumption (2015)</th><th>SIMTA assumption (2015)</th><th>Revised assumption (31 August 2016)</th><th>Commentary for change</th></tr>
<tr><td>PM peak period</td><td>4.30 pm to 5.30 pm
(1 hour)
9.3% of daily generation</td><td>9.3% of daily generation</td><td>3.00 pm to 7.00 pm</td><td><table><tr><th>AM peak 6.00 am to 10.00 am</th><th>Interpeak 12.00 pm to 3.00 pm</th><th>PM peak 3.00 pm to 7.00 pm</th></tr><tr><td>3.0%</td><td>5.5%</td><td>8.0%</td></tr><tr><td>6.5%</td><td>6.0%</td><td>8.5%</td></tr><tr><td>6.0%</td><td>7.0%</td><td>8.0%</td></tr><tr><td>5.0%</td><td></td><td>7.0%</td></tr></table></td></tr>
<tr><td colspan="5">Warehouse specific operations (relating to heavy vehicles)</td></tr>
<tr><td>AM peak period</td><td>7.45 am to 8.45 am
(1 hour)
7.7% of daily generation</td><td>7.7% of daily generation</td><td>6.00 am to 10.00 am</td><td rowspan="3">For the ‘average weekday’ the mesoscopic modelling will consider the time periods and relative proportions outlined below:<table><tr><th>AM peak 6.00 am to 10.00 am</th><th>Interpeak 12.00 pm to 3.00 pm</th><th>PM peak 3.00 pm to 7.00 pm</th></tr><tr><td>6.3% (2.5%)</td><td>7.9% (3.5%)</td><td>5.9% (4.0%)</td></tr><tr><td>7.6% (2.0%)</td><td>7.0% (5.0%)</td><td>4.8% (2.5%)</td></tr><tr><td>8.5% (1.5%)</td><td>7.2% (5.5%)</td><td>3.3% (2.5%)</td></tr><tr><td>9.2% (1.5%)</td><td></td><td>2.3% (3.0%)</td></tr></table>Numbers presented in (brackets) are for B-double vehicles only. All other heavy vehicles as per the primary profile</td></tr>
<tr><td>Inter peak period</td><td>Not considered</td><td>Not considered</td><td>12.00 pm to 3.00 pm
(school peak)</td></tr>
<tr><td>PM peak period</td><td>4.30 pm to 5.30 pm
(1 hour)
9.3% of daily generation</td><td>9.3% of daily generation</td><td>3.00 pm to 7.00 pm</td></tr>
<tr><td colspan="5">Vehicle generation, carrying capacity and fleet assumptions</td></tr>
<tr><td>Staff generation rate</td><td colspan="3">As per Roads and Maritime guidelines:
▪ three car based trips per employee:
  ‣ two trips for journey to work
  ‣ one trip during shift.</td><td rowspan="2">No change.</td></tr>
<tr><td>Intermodal terminal TEU vehicle capacity</td><td>2.4 TEU/B-double
1.6 TEU/Semi-trailer</td><td>2.4 TEU/B-double
1.6 TEU/Semi-trailer</td><td>2.4 TEU/B-double
1.6 TEU/Semi-trailer</td></tr>
</table>

Assumption	MIC assumption (2015)	SIMTA assumption (2015)	Revised assumption (31 August 2016)	Commentary for change
Intermodal terminal TEU fleet mix	20% B-double 80% Semi-Trailer	20% B-double 80% Semi-Trailer	20% B-double 80% Semi-Trailer	
Terminal truck back loading	30% for semi-trailers only	30% for semi-trailers only	30% for semi-trailers only	Based on advice received by NMC, For a hub like Moorebank, higher levels of back loading will be achievable due to integration of empty container park and intermodal terminal. Truck schedules will coordination the movement of empty containers for each movement of a loaded container.
Warehouse truck back loading	0%	0%	30% for semi-trailers only	
Warehouse vehicle capacity	20 tonnes/Semi-Trailer (1.6 TEU) 10 tonnes/Rigid Truck (0.8 TEU)	10 tonnes/Rigid Truck (0.8 TEU)	30 tonnes/B-double (2.4 TEU) 20 tonnes/Semi-Trailer (1.6 TEU) 10 tonnes/Rigid Truck (0.8 TEU)	Changes based on traffic surveys at existing warehouses in Western Sydney. Refer to the warehouse site surveys technical memo: Name: *Analysis of warehouse traffic surveys* Date: *11 January 2016* Ref: *2189293E-ITP-MEM-Surveys-Updated* Note, a subsequent independent review of tube counts by Tactical Group and Neil Matthews Consulting in August 2016 have revised the fleet mix and updated assumptions accordingly
Warehouse vehicle fleet mix	34% Semi-trailer 66% Rigid	100% Rigid	5% B-double 59% Semi-trailer 36% Rigid	
TEU to de-stuffed vehicle utilisation	-	-	60% - based on 2.4 trucks per TEU and vehicle fleet mix	
Handling capacity of warehouse	1.68 TEU per 1,000 m^2 GFA per day	-	1.38 TEU per 1,000 m^2 GFA per day during average conditions.	Based on calculations provided by Neil Matthews Consulting.

4. Staff traffic (light vehicles)

With the increase in the warehouse GFA from 308,000 m^2 to 850,000 m^2, the number of staff assumed for the warehouse has increased. A breakdown for each facility is provided in Table 3.1. Staffing numbers are consistent with the underlying assumptions of the Traffic and Transport Impact Assessment (TTIA) prepared by Parsons Brinckerhoff in April 2015 and have been calculated by reverse engineering the Roads and Maritime traffic generation rates. The calculations/assumptions include:

- staffing levels calculated through an assumed daily total vehicle trip generation rate of 2.1 trips per 100 m^2 GFA. Assuming that 70% of trips involve light vehicles (as staff trips) and an average staff trip rate of three trips per person, per day
- shift hours for administration, and operations and maintenance staff:
  - administration:
    - 8.30 am to 5.00 pm
  - operations and maintenance:
    - 6.00 am to 2.00 pm
    - 2.00 pm to 10.00 pm
    - 10.00 pm to 6.00 am
- once many warehouses are built, whilst most staff will arrive in the hour prior to the typical shift start time, and depart in the hour after the typical shift end time many will also arrive and depart in other periods. The assumed profile is shown in Figure 4.1. Terminals and office staff, arrival and departure demands are in the hour before and after only.

Table 4.1 Moorebank Intermodal Terminal staff numbers (ultimate)

Staff type	IMEX	Interstate	Warehouse(1)	Total daily
Administration	35	35	59	129
Operations (by shift – 3/day)	104	78	1,329	4,581
Maintenance (by shift – 3/day)	9	7		

(1) *Warehouse staffing sourced via Roads and Maritime Guide to Traffic Generating Developments, 2013*

Staff numbers at Terminals based on Moorebank IMT Staffing Requirements – Version 4, August 18, 2011 (Deloitte) and haven't changed since TTIA

The staff numbers, and the corresponding trip generation, have been divided into an hourly breakdown as summarised in Table 4.2. As stated earlier, this breakdown is based upon the assumption in the TTIA that three trips are made per worker (i.e. 50% of the staff undertaking trips outside of their commute to/from work, or small vehicle deliveries for operations and maintenance) per shift/day.

Journey to work and non-journey to work daily traffic demands were subsequently profiled throughout the day based on traffic profiles recorded by tube counters placed in Eastern Creek in June and November 2015. The average inbound and outbound light vehicle profile based on the surveys showed that:

- For individual sites operating two shifts per day, a peak arrival hourly demand approximately 24% of the daily arrival traffic was surveyed. For departure traffic volumes, a peak departure hourly demand of approximately 20% of the daily departure volumes may occur.

- For precincts, which contained numerous warehouses with different operating patterns the peak arrival and departure demands, do not all occur at the same time, resulting in a spread out profile. Peak hour arrival and departure volumes of approximately 12–13% was recorded in the surveys.

An assumption on arrival and departure profile of staff vehicles surrounding shift start/end times is shown in Figure 4.1. The resultant peak hour arrival and departure demand is approximately 15% of the respective daily arrival and departure demands and is slightly higher than the surveyed results for Eastern Creek.

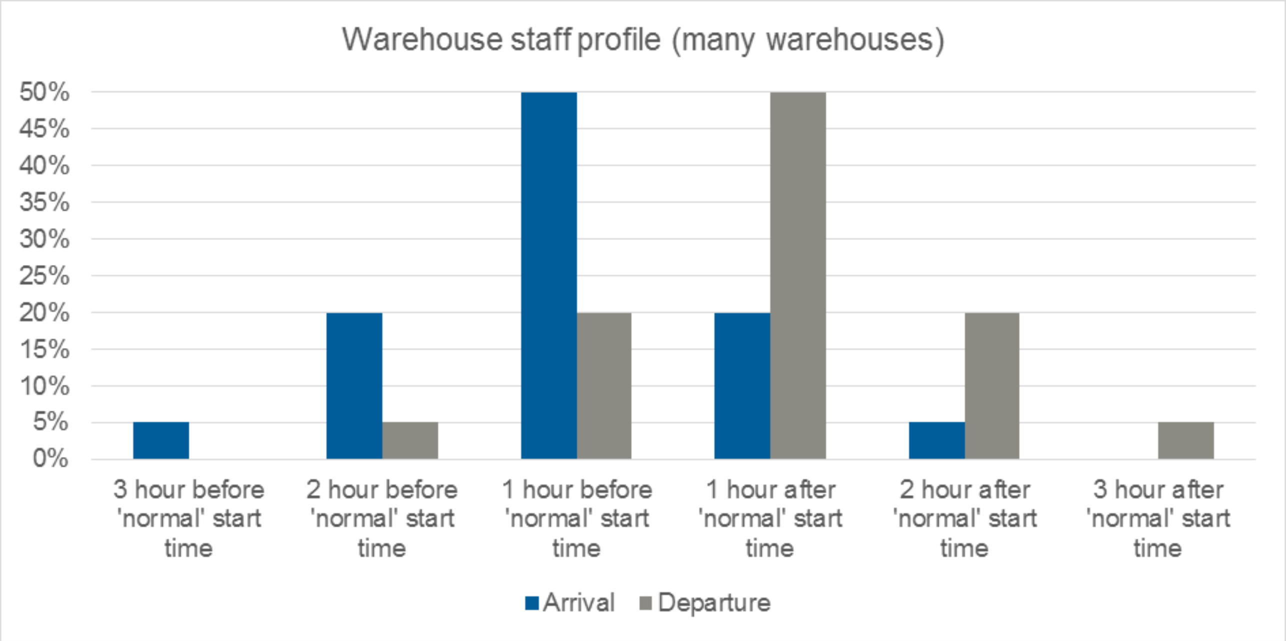


Figure 4.1 Staff (light vehicle) traffic profile near shift start/end times

The resultant breakdown in light vehicle demands for the full Moorebank Intermodal Terminal development is provided in Table 4.2.

Table 4.2 Hourly staff inbound/outbound breakdown

Time	Inbound	Outbound	Two-way
AM peak period			
6.00 am–7.00 am	281	770	1,051
7.00 am–8.00 am	126	281	407
8.00 am–9.00 am	184	126	310
9.00 am–10.00 am	80	80	160
Inter peak period			
12.00 pm–1.00 pm	371	173	544
1.00 pm–2.00 pm	824	317	1,141
2.00 pm–3.00 pm	317	806	1,123

Time	Inbound	Outbound	Two-way
PM peak period			
3.00 pm–4.00 pm	145	300	445
4.00 pm–5.00 pm	74	126	200
5.00 pm–6.00 pm	74	184	258
6.00 pm–7.00 pm	74	74	148
Daily			
Total	**5,564**	**5,564**	**11,128**

In total, the Moorebank Intermodal Terminal is estimated to provide employment for approximately 4,700 workers, which we've assumed will generate approximately 11,000 light vehicle movements per day.

Traffic surveys conducted at Erskine Park (190,000 m^2 GFA) and the Kmart at Eastern Creek (57,000 m^2 GFA) in June show that typical two-way light vehicle demands are approximately 2,580 and 680 vehicles per day respectively. This results in an average light vehicle trip rates of between 1.2 and 1.3 vehicles per day which is comparable to our light vehicle forecast of 1.2 vehicles per day per 100 m^2 GFA of warehousing (which contributes the majority of traffic). Additional traffic surveys conducted in November also validated the daily light vehicle traffic demand of 1.2 vehicles per 100 m^2.

5. Terminal (Interstate and IMEX) traffic

The traffic generation related to the IMEX and Interstate terminals has a direct relationship to the number of TEUs being processed through these facilities. The determination of truck volumes from annual TEU demands was calculated based on the following assumptions consistent with previous documentation:

- 52 week operations *(divide annual TEUs by 52 to get weekly demand)*
- 85% are processed on weekdays *(multiply weekly demand by 0.85 and divide by 5 to get weekday demand)*
- containers are loaded onto trucks; either B-doubles or Semi-trailers. On average, a semi-trailer transports 1.6 TEUs and a B-double transports 2.4 TEUs
- 80% of deliveries will be made by semi-trailers and 20% by B-doubles
- back-loading will occur for 30% of the semi-trailer demands and 0% of the B-doubles.

Table 5.1 contains the resultant average external daily truck generation for the ultimate precinct.

Table 5.1 Daily truck inbound and outbound

Time	Inbound		Outbound		Two-way	
	Semi	B-double	Semi	B-double	Semi	B-double
Total	**1,371**	**255**	**1,371**	**255**	**2,742**	**510**

Source: Neil Matthews Consulting (May 2016)

An assumption which has changed since the RtS (April 2015) relates to the temporal profile of daily truck demands generated by the Interstate and IMEX terminals. The EIS traffic and transport assessment used an Roads and Maritime agreed 7.7% peak for the AM peak and 9.3% peak for the PM peak.

Four scenarios (also shown in Figure 5.1) were considered for the expansion of the temporal profile to include the entire day:

1. An ‘Roads and Maritime aligned’ normal profile of the traffic which align its AM and PM peak to the target values of 7.7% and 9.3% respectively. Succeeding and preceding hours are all incrementally reduced to create a daily profile. *89% of traffic is generated between 6.00 am and 10.00 pm.*

2. An ’18 hour’ profile in which the *95% of trucks are generated between 6.00 am and 10.00 pm* with the majority occurring in the afternoon peak, corresponding to observations made at the warehouses.

3. A ’24 hour’ profile in which trucks will be generated across all 24 hours and a uniform generation during throughout the 6.00 am to 10.00 pm period and reduced demands overnight. In this scenario *77% of demands are generated between 6.00 am and 10.00 pm*.

4. The observed[1] Port Botany truck demands. *72% of trucks are generated between 6.00 am and 10.00 pm*.

For all scenarios, for terminal traffic demands, truck profiles are considered vehicle independent, i.e. the daily profile for semi-trailers and B-doubles are identical.

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1 http://www.freightweek.com.au/Portals/6/Documents/Presentations%20for%20web/Waterfront%20945%20Gunn.pdf

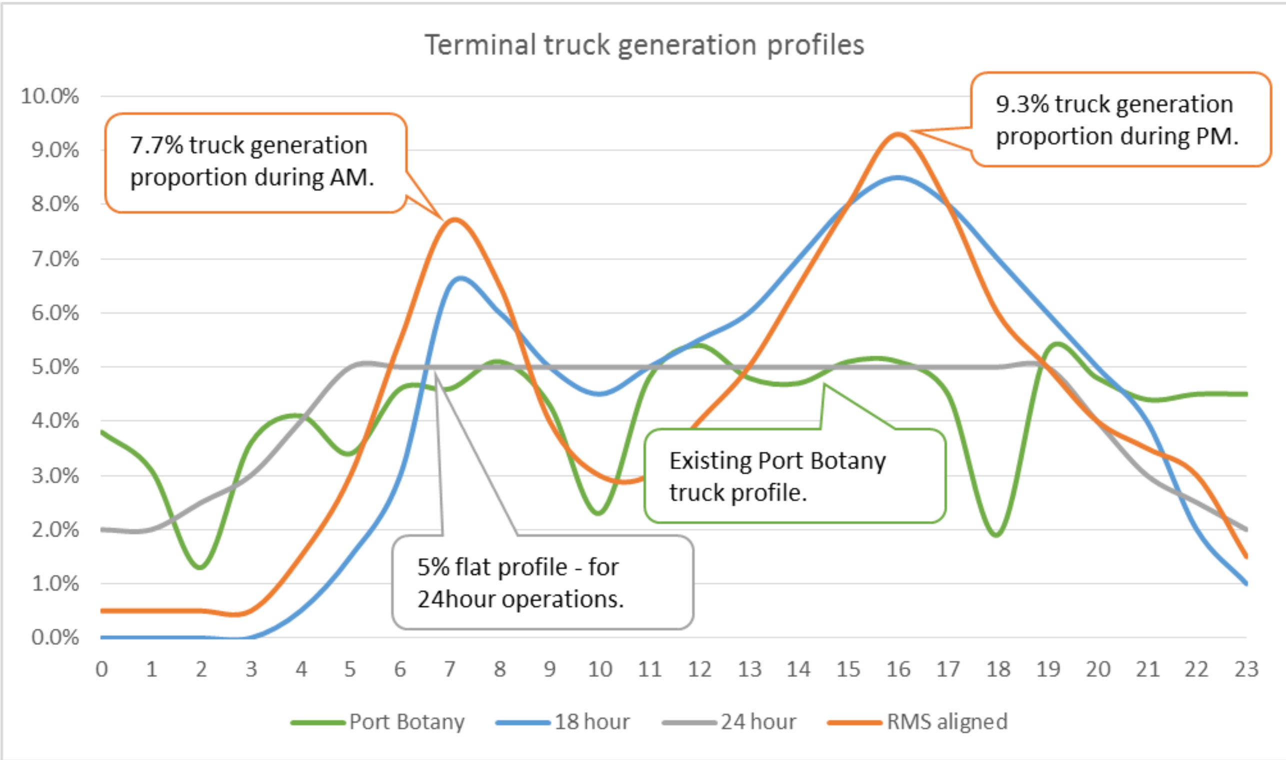


Figure 5.1 Truck profile – Interstate and IMEX terminals

For the purposes of the peak period transport network assessment modelling, Scenario 2 '18 hour' in which 95% of trucks arrive or depart between 6.00 am and 10.00 pm and the peak period generation rates during the AM and PM peak are around 1% lower than that used in the EIS.

This scenario reflects an '18 hour' operational period (16 hours of shift plus an hour either side). The artificial profile draws on the Port Botany observations, but also the warehouse surveys and Figure 5.2 which suggest that the PM peak would remain the 'busier' of the two peak period. It this scenarios it assumes a 6.5%, 7% and 8.5% peak hour proportion of daily demand for the AM, inter and PM peak periods respectively.

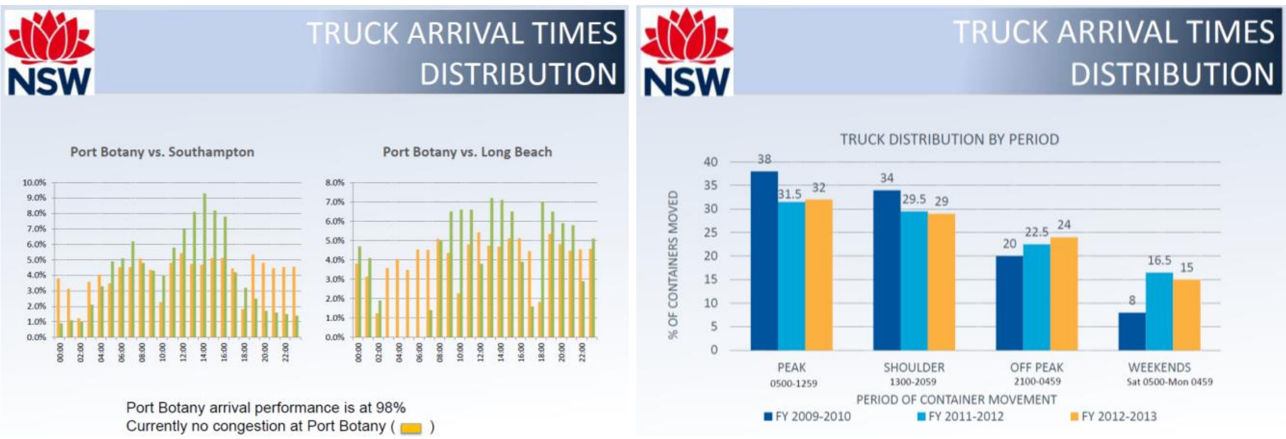


Figure 5.2 Extracts from Port Botany Landside Improvement Strategy Presentation[2]

[2] http://www.freightweek.com.au/Portals/6/Documents/Presentations%20for%20web/Waterfront%20945%20Gunn.pdf

The resultant hourly truck generation for an average weekday is shown in Table 5.2.

Table 5.2 Hourly truck inbound/outbound breakdown – 'average' weekday

Time	Inbound		Outbound		Two-way	
	Semi	B-double	Semi	B-double	Semi	B-double
AM peak period						
6.00 am–7.00 am	41	8	41	8	**82**	**15**
7.00 am–8.00 am	89	17	89	17	**178**	**33**
8.00 am–9.00 am	82	15	82	15	**165**	**31**
9.00 am–10.00 am	69	13	69	13	**137**	**25**
Inter peak period						
12.00 pm–1.00 pm	75	14	75	14	**151**	**28**
1.00 pm–2.00 pm	82	15	82	15	**165**	**31**
2.00 pm–3.00 pm	96	18	96	18	**192**	**36**
PM peak period						
3.00 pm–4.00 pm	110	20	110	20	**219**	**41**
4.00 pm–5.00 pm	117	22	117	22	**233**	**43**
5.00 pm–6.00 pm	69	13	69	13	**137**	**26**
6.00 pm–7.00 pm	96	18	96	18	**192**	**36**
Daily						
	1,371	**255**	**1,371**	**255**	**2,742**	**510**

With the assumption that during 'busy periods', the terminal TEU demands are 10% greater for both imports and exports, the truck volumes will also increase by 10%. Table 5.4 provides the forecast truck generation during 'busy' periods.

Table 5.3 Hourly truck inbound/outbound breakdown – 'busy' weekday

Time	Inbound		Outbound		Two-way	
	Semi	B-double	Semi	B-double	Semi	B-double
AM peak period						
6.00 am–7.00 am	44	8	44	8	**83**	**21**
7.00 am–8.00 am	95	18	95	18	**180**	**45**
8.00 am–9.00 am	88	16	88	16	**166**	**42**
9.00 am–10.00 am	73	14	73	14	**139**	**35**

Time	Inbound		Outbound		Two-way	
	Semi	B-double	Semi	B-double	Semi	B-double
Inter peak period						
12.00 pm–1.00 pm	80	15	80	15	**161**	**30**
1.00 pm–2.00 pm	88	16	88	16	**175**	**33**
2.00 pm–3.00 pm	102	19	102	19	**205**	**38**
PM peak period						
3.00 pm–4.00 pm	117	22	117	22	**234**	**44**
4.00 pm–5.00 pm	124	23	124	23	**249**	**46**
5.00 pm–6.00 pm	73	14	73	14	**146**	**27**
6.00 pm–7.00 pm	102	19	102	19	**205**	**38**
Daily						
	1,462	**272**	**1,462**	**272**	**2,925**	**544**

6. Warehouse traffic

850,000 m^2 of warehousing is proposed for the MIT, an increase from the previous development mix. Traffic surveys conducted at warehouses in Western Sydney has also resulted in a number of revised assumption relating to the daily operating profile. These assumptions are summarised in section 3.The determination of truck volumes from annual TEU demands is calculated based on the following assumptions consistent with previous documentation:

- 52 week operations *(divide annual TEUs by 52 to get weekly demand).*
- 95% are processed on weekdays *(multiply weekly demand by 0.95 and divide by 5 to get weekday demand).*
- Containers are loaded onto trucks; B-doubles, Semi-trailers, or Rigid trucks. B-doubles are assumed to carry 18 tonnes, semi-trailers 12 tonnes and rigid trucks, 6 tonnes of goods each.
- 59% of deliveries will be made by semi-trailers, 36% by rigid trucks and 5% by B-doubles.
- 30% back loading will occur for Semi-trailers and B-doubles.

Table 6.1 contains the resultant average daily truck generation for the ultimate development.

Table 6.1 Daily truck inbound and outbound

Time	Inbound			Outbound			Two-way		
	Rigid	Semi	B-double	Rigid	Semi	B-double	Rigid	Semi	B-double
Total	**308**	**508**	**46**	**308**	**508**	**46**	**617**	**1,015**	**92**

Source: Neil Matthews Consulting (August 2016)

The assumed daily traffic temporal profile for warehouse truck generation is included in Figure 6.1. This temporal profile is based on the observed 16–18 hour operations for warehouses in Western Sydney. Whilst many of the deliveries were made during the middle of the day, the small number of B-doubles were often observed towards the middle of the day or during the later evenings. It is surmised that this reflects the longer distance nature of their journeys and time required to travel to destinations throughout NSW.

The resultant hourly truck generation for an average weekday is shown in Table 6.2.

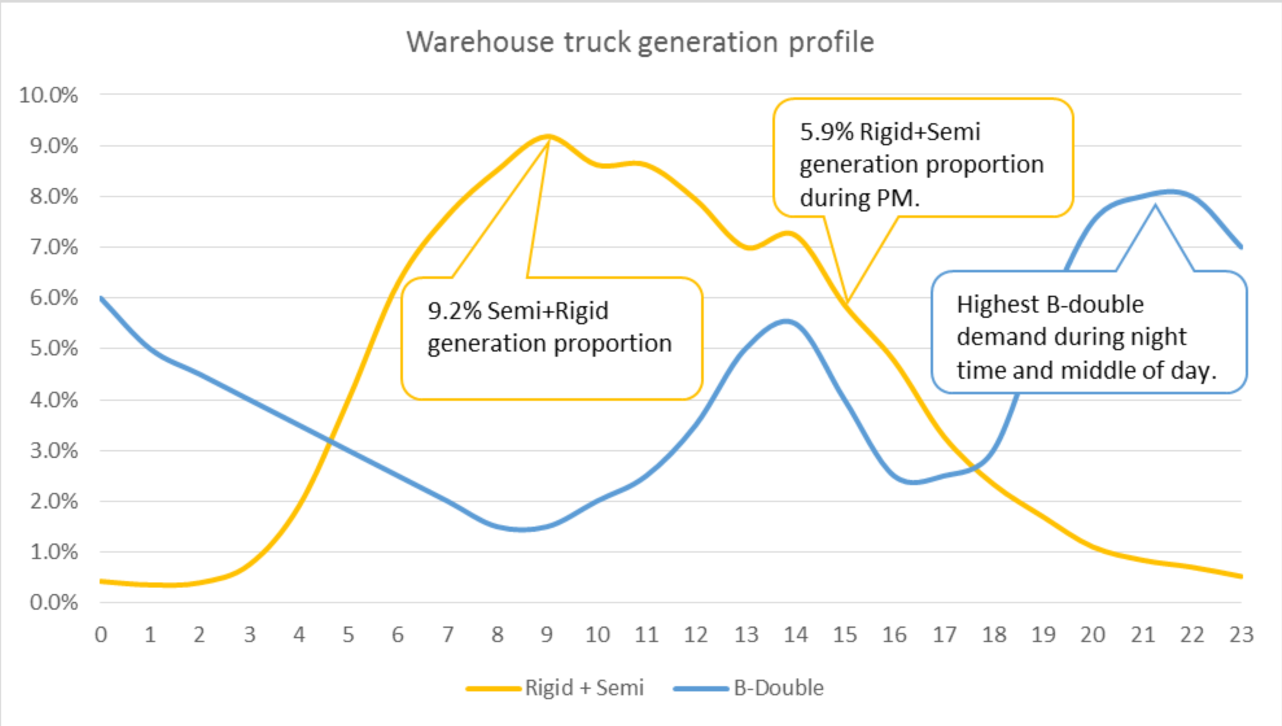


Figure 6.1 Warehouse daily truck profile

Table 6.2 Daily truck inbound and outbound – 'average' weekday

Time	Inbound			Outbound			Two-way		
	Rigid	Semi	B-double	Rigid	Semi	B-double	Rigid	Semi	B-double
AM peak period									
6.00 am–7.00 am	19	32	1	19	32	1	**39**	**64**	**2**
7.00 am–8.00 am	23	39	1	23	39	1	**47**	**77**	**2**
8.00 am–9.00 am	26	43	1	26	43	1	**52**	**86**	**1**
9.00 am–10.00 am	28	47	1	28	47	1	**57**	**93**	**1**
Interpeak period									
12.00 pm–1.00 pm	24	40	2	24	40	2	**49**	**80**	**3**
1.00 pm–2.00 pm	22	36	2	22	36	2	**43**	**71**	**5**
2.00 pm–3.00 pm	22	37	3	22	37	3	**44**	**73**	**5**

Time	Inbound			Outbound			Two-way		
	Rigid	Semi	B-double	Rigid	Semi	B-double	Rigid	Semi	B-double
PM peak period									
3.00 pm–4.00 pm	18	30	2	18	30	2	**36**	**60**	**4**
4.00 pm–5.00 pm	15	24	1	15	24	1	**30**	**49**	**2**
5.00 pm–6.00 pm	10	17	1	10	17	1	**20**	**33**	**2**
6.00 pm–7.00 pm	7	12	1	7	12	1	**14**	**23**	**3**
Daily									
	309	**508**	**46**	**309**	**508**	**46**	**617**	**1,015**	**92**

The warehouse 'busy' traffic generation estimates are shown in Table 6.3. For this scenario, the truck volumes are increased by 20%.

Table 6.3 Daily truck inbound and outbound – 'busy' weekday

Time	Inbound			Outbound			Two-Way		
	Rigid	Semi	B-double	Rigid	Semi	B-double	Rigid	Semi	B-double
AM peak period									
6.00 am–7.00 am	23	38	1	23	38	1	**47**	**77**	**3**
7.00 am–8.00 am	28	46	1	28	46	1	**56**	**93**	**2**
8.00 am–9.00 am	31	52	1	31	52	1	**63**	**104**	**2**
9.00 am–10.00 am	34	56	1	34	56	1	**68**	**112**	**2**
Interpeak period									
12.00 pm–1.00 pm	29	48	2	29	48	2	**58**	**96**	**4**
1.00 pm–2.00 pm	26	43	3	26	43	3	**52**	**85**	**6**
2.00 pm–3.00 pm	27	44	3	27	44	3	**53**	**88**	**6**
PM peak period									
3.00 pm–4.00 pm	22	36	2	22	36	2	**44**	**72**	**4**
4.00 pm–5.00 pm	18	29	1	18	29	1	**36**	**58**	**3**
5.00 pm–6.00 pm	12	20	1	12	20	1	**24**	**40**	**3**
6.00 pm–7.00 pm	9	14	2	9	14	2	**17**	**28**	**3**
Daily									
	370	**609**	**55**	**370**	**609**	**55**	**740**	**1,218**	**110**

7. Summary and application

7.1 Summary

This memo provides a summary of the calculated traffic generation for the ultimate Moorebank Intermodal Terminal and the assumptions underlying these generation calculations.

7.2 Assumptions

Where possible assumptions made are based on evidence, Roads and Maritime guidelines, or accepted Roads and Maritime values. Assumptions made in this technical note are subject to change based on more up to date and/or relevant data.

7.3 Total site generation

The revised total average weekday site traffic generation estimates for the ultimate scenario are provide in the tables below.

Table 7.1 Light vehicles (average day)

Model period	Hour	Terminals		Warehouses		Total Site	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak	6.00–7.00	29	208	252	562	**281**	**770**
	7.00–8.00	29	29	97	252	**126**	**281**
	8.00–9.00	93	29	91	97	**184**	**126**
	9.00–10.00	31	31	49	49	**80**	**80**
Interpeak	12.00–1.00	90	47	281	126	**371**	**173**
	1.00–2.00	240	43	584	274	**824**	**317**
	2.00–3.00	43	222	274	584	**317**	**806**
PM peak	3.00–4.00	36	36	109	264	**145**	**300**
	4.00–5.00	29	29	45	97	**74**	**126**
	5.00–6.00	29	93	45	91	**74**	**184**
	6.00–7.00	29	29	45	45	**74**	**74**
Daily		865	865	4,699	4,699	**5,564**	**5,564**

Table 7.2 Rigid heavy vehicles (average day)

Model period	Hour	Terminals		Warehouses		Total Site	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak	6.00–7.00	0	0	19	19	**19**	**19**
	7.00–8.00	0	0	23	23	**23**	**23**
	8.00–9.00	0	0	26	26	**26**	**26**
	9.00–10.00	0	0	28	28	**28**	**28**
Inter peak	12.00–1.00	0	0	24	24	**24**	**24**
	1.00–2.00	0	0	22	22	**22**	**22**
	2.00–3.00	0	0	22	22	**22**	**22**
PM peak	3.00–4.00	0	0	18	18	**18**	**18**
	4.00–5.00	0	0	15	15	**15**	**15**
	5.00–6.00	0	0	10	10	**10**	**10**
	6.00–7.00	0	0	7	7	**7**	**7**
Daily		0	0	309	309	**309**	**309**

Table 7.3 Semi-trailer (Heavy) vehicles (average day)

Model period	Hour	Terminals		Warehouses		Total Site	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak	6.00–7.00	41	41	32	32	**73**	**73**
	7.00–8.00	89	89	39	39	**128**	**128**
	8.00–9.00	82	82	43	43	**125**	**125**
	9.00–10.00	69	69	47	47	**115**	**115**
Inter peak	12.00–1.00	75	75	40	40	**115**	**115**
	1.00–2.00	82	82	36	36	**118**	**118**
	2.00–3.00	96	96	37	37	**133**	**133**
PM peak	3.00–4.00	110	110	30	30	**140**	**140**
	4.00–5.00	117	117	24	24	**141**	**141**
	5.00–6.00	69	69	17	17	**85**	**85**
	6:00–7.00	96	96	12	12	**108**	**108**
Daily		1,371	1,371	508	508	**1,879**	**1,879**

Table 7.4 B-double (Heavy) vehicles

Model period	Hour	Terminals		Warehouses		Total Site	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak	6.00–7.00	8	8	1	1	**9**	**9**
	7.00–8.00	17	17	1	1	**17**	**17**
	8.00–9.00	15	15	1	1	**16**	**16**
	9.00–10.00	13	13	1	1	**13**	**13**
Inter peak	12.00–1.00	14	14	2	2	**16**	**16**
	1.00–2.00	15	15	2	2	**18**	**18**
	2.00–3.00	18	18	3	3	**20**	**20**
PM peak	3.00–4.00	20	20	2	2	**22**	**22**
	4.00–5.00	22	22	1	1	**23**	**23**
	5.00–6.00	13	13	1	1	**14**	**14**
	6.00–7.00	18	18	1	1	**19**	**19**
Daily		255	255	46	46	**301**	**301**

APPENDIX C - MPE STAGE 2 / MPW STAGE 2 – CONTAINER HANDLING MOVEMENTS, NEIL MATTHEWS CONSULTING PTY LTD

Date	4/08/2016
To	Nathan Cairney (Tactical Group)
From	Neil Matthews (Neil Matthews Consulting)
Copy to	Westley Owers (Arcadis)
Subject	MPE Stage 2 Proposal/ MPW Stage 2 Proposal – Container handling movements

NMC is a consultancy providing advisory services to the public and private sectors regarding land transport and regional freight systems, policy development, value chain analysis, demand and capacity forecasting, infrastructure assessment, supply chain design, quantitative analysis, operations management and governance. A capability statement is shown attached, and provides a synopsis of recent projects undertaken.

NMC was engaged to work with Arcadis Traffic and Transport team to establish an appropriate basis of assumptions for the combined Moorebank Precinct. This information cascaded into the Operational Traffic Impact Assessment for the Moorebank Precinct West (MPW) Stage 2 Proposal and will also inform other stages of development for the Moorebank Precinct. The assumptions combine, revise and update the existing road freight forecasts previously produced by the Sydney Intermodal Terminal Alliance (SIMTA) (MPW Concept Plan Approval (SSD 5066)) and the Moorebank Intermodal Terminal Company (MIC) (MPE Concept Plan Approval (MP 10_0193) to produce forecasts for a combined approach to the Moorebank intermodal freight precinct facility operations (i.e. the Ultimate development scenario).

At the heart of the Moorebank Intermodal freight precinct are two rail terminals each with different functions and end markets, being:

- The MPE Import Export (IMEX) terminal which services trains operating to/from Port Botany carrying import-export containers
- The MPW Intermodal terminal facility which services trains operating to/from interstate, as well as to/from regional NSW and to/from Port Botany.

The assumptions used throughout this process were as follows:

- Pathways: Four discrete container and truck pathways were identified as being relevant to the site, as shown over page in Table 1.
- Types of movements:

  Four movement types to, from and within the precinct were identified. These are:

  1. Loaded containers – an internal or external movement carrying a loaded container
  2. Empty containers – an internal or loaded movement carrying an empty container
  3. Distribution – for non-containerised consignments being moved from onsite warehouses to offsite metro customers
  4. Empty truck running – of vehicles not carrying any containers or goods.

Table 1 Pathway assumptions

Pathway		Import	Export (IMEX)	Domestic/Interstate
Internal	Rail terminal to/from warehouse	Full container to warehouse for unloading, with empty returned back to IMEX terminal	Empty container from IMEX to warehouse for loading, then loaded container returned to IMEX terminal	None
	Rail terminal to/from warehouse	Not relevant as imports rarely get moved to country	Transfer of empty containers from IMEX to MPW, then move loaded export container within the precinct rail operations for forwarding to Port Botany	None
External	Rail terminal to/from offsite customer	Full container to warehouse for unloading, with empty container return back to IMEX	Empty container from IMEX to warehouse for loading, then loaded container returned to IMEX	Collection and delivery of domestic containers to/from offsite customers, with a corresponding empty truck move
	Onsite warehouse to/from offsite customer	Goods de-stuffed from containers and loaded onto pallets, then moved on pallets to offsite third parties	Palletised goods moved from offsite third parties to Moorebank warehouses. These goods may be held in storage for dispatch against export orders, or may be consignments which are less than a full container and consolidated as FAK (Freight All Kinds)	Consignments to/from onsite warehouses forwarded to the rail terminal for movement to/from interstate destinations

Operational considerations

The logistics industry seeks to schedule transport activities to optimise back loading activities where ever possible. While vehicle movements to/from Port Botany do not achieve a high level of back-loading, transport operations through a hub, such as the Moorebank Precinct, will provide significantly higher back-loading, especially due to the integration of an empty container park within the MPE Intermodal terminal facility. This reduces the overall truck movements of the Moorebank Precinct, when operating collectively (i.e. as one precinct, rather than two separate sites).

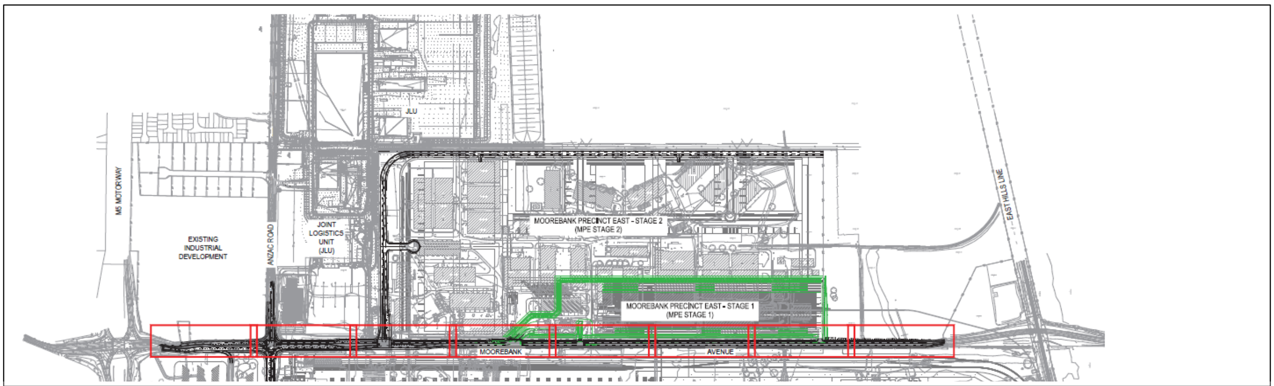
I am confident in the accuracy, validity and appropriateness of the assumptions adopted for the precinct container movements and associated road based traffic volumes and can confirm that they are based on my detailed understanding of freight logistics.

Please find attached my capability statement and CV for your reference.

Neil Matthews

Director

APPENDIX D- PRELIMINARY LAYOUT OF THE PROPOSED MOOREBANK AVENUE UPGRADE



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01	ISSUE FOR INFORMATION	15/07/2016

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Status: PRELIMINARY ONLY
NOT TO BE USED FOR CONSTRUCTION

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		Drawn A.ZHAO	
Original Size	A1	Designed S. MAKIREDDI	
Height Datum	AHD	Checked C. McCLELLAND	
Grid	MGA	Approved B. LUSTY	

Filename: PREC-ARC-CV-SKC-0026-MoorebankAvenueRedOptionOverallPlan.dwg

Project: MOOREBANK INTERMODAL OVERALL PRECINCT

Title: MOOREBANK AVENUE RED OPTION OVERALL PLAN

ARCADIS
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Project No. AA009335

Drawing No. PREC-ARC-CV-SKC-0026- Issue 02

Date Plotted: 26 Jul 2016 - 11:53AM File Name: C:\SharePoint\AA009335 - Moorebank - 0_PREC\CV\SKC\PREC-ARC-CV-SKC-0026-MoorebankAvenueRedOptionOverallPlan.dwg V1

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