MOOREBANK INTERMODAL COMPANY

Moorebank Intermodal Terminal Project Environmental Impact Statement

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PARSONS BRINCKERHOFF

Technical Paper 16
Health Impact Assessment

Technical Paper 16 – Health Impact Assessment

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Moorebank Intermodal Terminal Health Impact Assessment

Prepared for : Parsons Brinckerhoff

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Limitations

Environmental Risk Sciences has prepared this report for the use of Parsons Brinckerhoff (PB) in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

It is prepared in accordance with the scope of work and for the purpose outlined in the Section 1 of this report.

The methodology adopted and sources of information used are outlined in this report. Environmental Risk Sciences has made no independent verification of this information beyond the agreed scope of works and assumes no responsibility for any inaccuracies or omissions. No indications were found that information contained in the reports provided by PB for use in this assessment was false.

This report was prepared from May to September 2014 and is based on the information provided and reviewed at that time. Environmental Risk Sciences disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

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Glossary of Terms

CHETRE	Centre for Health Equity Training, Research and Evaluation
DoD	Department of Defence
DoE	Commonwealth Department of the Environment
DoFD	Commonwealth Department of Finance and Deregulation
DP&E	Department of Planning and Environment
DP&I	NSW Department of Planning and Infrastructure
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act (NSW) 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
HIA	Health Impact Assessment
IMEX	Import-Export
IMT	Moorebank Intermodal Terminal
LCC	Liverpool City Council
SEARs	Secretary for the NSW DP&E's Environmental Assessment Requirements
SEWPaC	Australian Department of Sustainability, Environment, Water, Population and Communities
SIMTA	Sydney Intermodal Terminal Alliance
SME	School of Military Engineering
SSD	State significant development
SSFL	Southern Sydney Freight Line
SSWAHS	Sydney South West Area Heath Service
TEU	Twenty-foot equivalent unit

Executive Summary

Introduction

The Moorebank Intermodal Terminal (IMT) Project (the Project) involves the development of freight terminal facilities linked to Port Botany and the interstate freight rail network. It also includes associated commercial infrastructure, a rail spur connecting the site to the Southern Sydney Freight Line (SSFL) and road entry and exit points from Moorebank Avenue. The Project proponent is Moorebank Intermodal Company (MIC), a government business enterprise set up to facilitate the development of the Project..

This Technical Paper has been prepared by Environmental Risk Sciences Pty Ltd (enRiskS) to address the Commonwealth Department for the Environment (DoE)'s Environmental Impact Statement (EIS) Guidelines and the Secretary for the NSW Department of Planning & Environment (NSW DP&E)'s Environmental Assessment Requirements (NSW SEARs). More specifically, this Technical Paper presents a Health Impact Assessment (HIA) associated with the proposed Moorebank IMT.

The requirement to conduct a HIA is outlined in the NSW SEARs and Guidelines for the content of a Draft EIS provided by the Commonwealth Department of the Environment (DoE).

The overall objective of the HIA is to provide a structured assessment of the direct and indirect impacts of the proposed Moorebank IMT on the health of the surrounding (local and regional) community. Outcomes of the HIA are used to determine recommendations for the collection of further data and/or measures that may be able to be implemented during construction and/or operation of the Project to minimise or mitigate identified negative impacts and maximise positive impacts.

Assessment Approach

The HIA assessment has been conducted as a rapid (desktop) assessment in accordance with national guidelines available from the Centre for Health Equity Training, Research and Evaluation (CHETRE) (Harris et al. 2007) and enHealth (2001). The HIA has been undertaken on the basis of the information provided in the specialist studies commissioned for completion of the EIS, published data (on the existing population and health) available for the local area and feedback from community consultation. This information has been initially reviewed and evaluated using a screening HIA assessment approach to identify potentially significant positive and negative impacts on the community that require further detailed evaluation. These potentially significant impacts have been further evaluated in the detailed HIA.

The methodology adopted for the HIA has been presented to and discussed with a Stakeholder Reference Group, with feedback from these discussions incorporated into this report.

The HIA has been undertaken to evaluate both direct and indirect impacts of all aspects of the Project on the health and wellbeing of the community, both regional and local (including at sensitive receivers such as schools, residential areas and retirement homes).

The conduct of an HIA is intended to provide a structured, solution-focused and action-oriented approach to maximising the positive and minimising the negative health impacts of a proposed

project. This HIA has therefore been conducted to identify and address potential social, economic and environmental impacts of the Project on health, communicate these impacts to stakeholders and provide recommendations to enhance positive impacts and mitigate negative impacts.

Outcomes of the HIA

The HIA has considered construction and operational phases of the Project that include Early Works and Phases A to D (where Phase D represents the Project at Full Build in 2030), as well as the potential for both the Moorebank IMT and the SIMTA project to function simultaneously (with three scenarios considered). These phases of operation have also considered three options for rail access to the site, described as the northern, central and southern rail access options. The HIA has identified a number of potential impacts (both positive and negative) on the health and wellbeing of the local community (including sensitive receivers). These impacts relate to the economic environment, transport, the natural environment (including light spill, noise, vibration, local and regional air quality, human health risks associated with local air quality impacts, remediation of contaminated land, landscape and visual character, local ecology, flood control and water quality and waste management), sustainability, lifestyle and the social environment.

Based on the assessment undertaken, it is expected that the negative impacts identified can be effectively mitigated through a wide range of measures, some of which require further evaluation in the detailed design phase of the Project, and others that can be implemented throughout the Project.

In addition, there are a number of areas where further refinement of the Project during the detailed design phase would further mitigate identified impacts (including addressing impacts of locomotive headlights, visual impacts associated with the proposed light poles and refinements of proposed water and waste management systems). For four key areas of identified impacts (air quality, noise, traffic and community consultation), specific recommendations have been made with the aim of enhancing positive impacts and mitigating negative impacts of the Project. These recommendations are outlined in the next section.

Recommendations

Air Quality and Health

Regionally, the Project will have a small effect on total emissions to air within the Sydney Basin. The Project does involve the removal of a large number of heavy vehicle movements from the roads and road networks in and around Port Botany (where the existing roads are heavily congested), which may have some positive impacts on the health and wellbeing of residents in these areas of Sydney.

More locally, if all of the mitigation measures considered in the Local Air Quality Impact Assessment are incorporated into the final design of the Project, then impacts on local air quality – and hence the health of the local community – are expected to be negligible. Nonetheless, the following measures are recommended to further mitigate emissions to air and improve communication about risks in the local community:

- Investigate the potential to provide incentives for freight (road and rail) operators accessing the site to incorporate up-to-date emissions controls (either using newer heavy vehicles/locomotives or fitting aftermarket emission control systems, where available and effective).
- Undertake ambient air quality monitoring in the local community, including:
    - on-site monthly dust deposition monitoring to measure dust fallout from the Project's operation at boundary points and selected sensitive receiver locations with reference to the air quality criteria;
    - ongoing operation of the existing on-site air quality monitoring station (that records continuous measurements of NO_x, PM_{10} and $PM_{2.5}$) to ensure that the ambient air quality criteria are met. The existing station may need to be relocated, depending on site construction works and regulator recommendations;
    - placement of an air monitoring station (that records continuous measurements of NO_x, PM_{10} and $PM_{2.5}$) in a key sensitive receptor location in the off-site community; and
    - ongoing operation of the existing on-site meteorological monitoring station, and review of location to ensure compliance with relevant Australian Standards if the monitoring station is required to be relocated.
- There is concern in the local community in relation to the impact of the Project on rates and severity of asthma in children. The available information on existing levels of asthma in the local community indicates that these levels are lower than the NSW average. However, the local area has a higher rate of reliever medication use and lower rate of preventer medication use, suggesting the management of asthma in the local area is poorer when compared with the NSW average. Perceptions of asthma problems in children in the local area as a result of the Project may result in increased visits to local GPs and requests for further asthma medication. It is recommended that Sydney South West Area Health Service provide advice to local GPs, advising them of the potential for increased requests for asthma medication and encouraging review and effective communication of asthma management plans in the area.
- Communicate nuisance issues associated with any noticeable dust deposition that may occur in the local area (particularly during construction works).

Noise

The Noise Impact Assessment identified the potential for elevated noise levels in the local community and consequent adverse health effects, particularly close to the IMT site and rail access (particularly for northern rail access option).

A range of mitigation measures have been identified that, if fully implemented, are likely to effectively mitigate these impacts. These measures include the following:

- **Further assessment**: The assessment identified the potential for noise levels to exceed sleep disturbance criteria under the northern rail access option. It is important that a more detailed assessment of sleep disturbance, including the frequency and level of peak noise generating events, is conducted during the detailed design phase of the assessment. Further detailed assessment of mitigation measures proposed during operations is also required, as outlined in the following point.
- **Mitigation during Project Operations**: During Project operation, the predicted intrusive noise levels would need to be reduced. It is recommended that noise control measures such as source noise reduction (e.g. enclosures or silencers), noise control design for the rail lines, acoustic walls/barriers and earth mounds all be considered for inclusion at the site (as detailed in the Noise Impact Assessment). Specific mitigation measures should be evaluated in the detailed design phase of the project to demonstrate their effectiveness.

  It is important that the noise mitigation measures implemented be based on clear principles that include consideration of the geographical location/demographics of the impacts, and preference for noise reduction at source where possible. In areas with a higher proportion of young families, it is important that the controls effectively address impacts on sleep disturbance (which have the greatest potential to affect children's attention, memory and performance in school). In these areas, targeted mitigation measures may be appropriate.

- **Construction works**: The current proposal is that construction works would only occur during standard construction (daytime) hours unless absolutely necessary (i.e. required by Police or RMS or to maintain safety) or where works are not audible at receivers. Residents particularly close to specific works are to be given adequate notice of works commencing. Site establishment and work method statements are to be designed to minimise noise during construction. A community liaison phone number and a process for keeping the community informed regularly throughout the Project are to be provided.
- **Noise Monitoring**: The ambient noise monitoring surveys within Casula, Wattle Grove and Glenfield will continue throughout the construction and operation of the Project. The noise surveys will quantify any potential noise from the Project and identify any trends/changes in the ambient noise environment during the progressive development.

  The measured noise levels will be continually applied to the detailed design of the Project to ensure the design includes appropriate mitigation to reduce and control noise during construction and operation. The monitoring data will also include any changes to the ambient noise environment from other new developments, such as the SIMTA project.

Traffic

Impacts on traffic and local congestion, and the associated health impacts, have been evaluated and identified to include positive impacts associated with the upgrade of Moorebank Avenue (assuming all proposed mitigation measures are implemented) and provision of upgraded pedestrian and cycle way facilities, as well as negative impacts associated with traffic impacts during the construction of the Moorebank Avenue Upgrade and construction of the rail access spur to the SSFL.

The following measures are recommended for inclusion in the final design of the Project to enhance/mitigate the impacts identified:

- Particular focus on mitigation measures during the first two years of the Project, when the Moorebank Avenue upgrade will be under construction concurrent with initial construction at the Project site. This includes the design and scheduling of the Moorebank Avenue upgrade works to minimise disruption of local traffic, and scheduling other construction vehicle movements for the Project outside peak hours.
- Maximise use of the Moorebank IMT site for the construction of the Georges River rail bridge to minimise heavy vehicle movements through Casula residential roads.
- Investigate opportunities with relevant stakeholders to alleviate current local congestion issues associated with Cambridge Avenue (access to Moorebank Avenue from Glenfield).
- Advocate for the improvement of bus services to the area, to cater for the additional workforce and to avoid overloading existing services. Such advocacy could also evaluate the potential for bus routes to provide local community access to existing and planned recreational areas.
- Evaluate the proposed upgraded pedestrian and cycleway facilities on Moorebank Avenue to ensure that they connect to existing or proposed facilities. This will enhance the usability and access of these alternative forms of transport in the local area.
- Community consultation on traffic issues should include building relationships with businesses along Moorebank Avenue so that they are fully aware of potential issues during construction. Broader community consultation considerations are addressed in the following section.

Community Consultation

A key aspect of the proposed Project relates to the potential for impacts on stress and anxiety levels in the local community. These health impacts relate to a range of specific issues evaluated in the HIA, as well as broader issues of local community perception and trust. It is therefore important that the positive impacts associated with the Project are enhanced within the local community, and that community consultation is continuous and uses a range of techniques tailored to the various groups to address particular areas of concern or preferred communication modes. The following measures are recommended:

- The local population has a high level of non-English speaking residents. It is therefore important that information related to the Project is provided in a number of languages relevant to the population in the area.

- Evaluation of a wide range of communication methods so that all members of the community (which includes a range of ages, education/literacy levels and ethnicities) have access to information relevant to the Project. These methods may include providing information through local community centres and on the internet (including the use of social media).
- Monitoring data (air quality, noise and water quality) that has been collected on the site has been made available on the Project website. It is recommended that the collection and provision of this data be continued, with data made available to the community on the website, along with information to assist in understanding the data.
- Monitoring data for air quality, noise and traffic should be regularly reviewed against the guidelines developed in the specialist studies supporting this EIS as they relate to protecting the health of the community. Should exceedances be identified in key indicators as a result of the Project, then it is recommended that a further and more targeted monitoring and management program be developed.
- The local area has a higher level of unemployment compared with the Sydney average. Links should be established with the local TAFEs to facilitate opportunities to deliver courses directly relating to trades and services required during the construction and operational phases of the Project. This initiative could result in an increase in enrolments, and potentially increase employment opportunities for local workers.
- A complaints process should be set up for the duration of the construction works, and for the initial years of Full Build operation (after 2030). It is recommended that a permanent employee (who has a good understanding of the Project and is effective at communicating and following up concerns) be employed to monitor and handle complaints from the local community during this period. All complaints and responses should be logged during this period. This process will assist in providing a measure of community concern (and potential levels of anxiety) and a mechanism for consistent communication with concerned individuals.

Consideration of these recommendations (including timing, resource allocation and responsibility) will take place during the detailed design phase of the Project.

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Section 1. Introduction

1.1 The Moorebank Intermodal Terminal Project

The Moorebank Intermodal Terminal (IMT) Project (the Project) involves the development of approximately 220 hectares (ha) of land at the Project site (refer to **Figure 1.1**) for the construction and operation of an IMT and associated infrastructure, facilities and warehousing. The Project includes a rail link connecting the Project site to the Southern Sydney Freight Line (SSFL) and road entry and exit points from Moorebank Avenue.

The primary function of the IMT is to be a transfer point in the logistics chain for shipping containers and to handle both international IMEX cargo, and domestic interstate and intrastate (regional) cargo. The key aims of the Project are to increase Sydney's rail freight mode share including: promoting the movement of container freight by rail between Port Botany and western and south-western Sydney; and reducing road freight on Sydney's congested road network.

The Project proponent is Moorebank Intermodal Company (MIC), a Government Business Enterprise set up to facilitate the development of the Project.

The Project site is currently largely occupied by the Department of Defence's (Defence) School of Military Engineering (SME). Under the approved Moorebank Units Relocation (MUR) Project, the SME is planned to be relocated to Holsworthy Barracks by mid-2015, which would enable the construction of the Project to commence.

The key features/components of the Project comprise:

- *an IMEX freight terminal* – designed to handle up to 1.05 million TEU per annum (525,000 TEU inbound and 525,000 TEU outbound) of IMEX containerised freight to service 'port shuttle' train services between Port Botany and the Project;
- *an Interstate freight terminal* – designed to handle up to 500,000 TEU per annum (250,000 TEU inbound and 250,000 TEU outbound) of interstate containerised freight to service freight trains travelling to and from regional and interstate destinations; and
- *warehousing facilities* – with capacity for up to 300,000 square metres (m^2) of warehousing to provide an interface between the IMT and commercial users of the facilities such as freight forwarders, logistics facilities and retail distribution centres.

The proposal concept described in the main EIS (refer Chapters 7 and 8) provides an indicative layout and operational concept for the Project, while retaining flexibility for future developers and operators of the Project. The proposal concept is indicative only and subject to further refinement during detailed design.

1.2 Project location

The Project is situated on land in the Sydney suburb of Moorebank, NSW (refer **Figure 1.1**). The Project Site is approximately 220 hectares (ha) in area, and is located within a locality that includes the residential suburbs of Casula, Wattle Grove and North Glenfield, as well as industrial, commercial and Department of Defence (DoD) land. The Project would provide connectivity to Port Botany by rail, and would connect to major regional and interstate roads and highways via the M5 and M7 Motorways.

1.3 Rail access options and layouts

The Project is intended to connect to the SSFL, which was commissioned in January 2013 within the Main South Railway Line corridor. The SSFL connects Port Botany to west and south-western Sydney, and would provide a direct route for freight trains from Port Botany to the Project site.

Three separate rail access options are included as part of the proposal concept as detailed herein and shown in **Figure 1.1**. These options comprise:

- *northern rail access option* — with rail access from the north-western corner of the IMT site, passing through the former Casula Powerhouse Golf Course (which is currently owned by Liverpool City Council (LCC)) and crossing the Georges River and floodplain;
- *central rail access option* — with rail access from the centre of the western boundary of the IMT site, passing through Commonwealth land on the western bank of the Georges River (referred to as the 'hourglass land'); and
- *southern rail access option* — rail access from the south-western corner of the IMT site, passing through the Glenfield Landfill site (owned by Glenfield Waste Services) and crossing the Georges River and floodplain.

In order to maintain flexibility for future developers and operators of the Project, the proposal concept, provides three indicative IMT internal layouts; one for each of three proposed rail access options. Once the selected developer/operator has been appointed, the Project would progress to the detailed design phase and one of the three rail access options identified above would be selected.

1.4 Indicative Project development phasing

The Project is proposed to be phased (staged) in its development, as summarised in **Figure 1.2**. The proposed indicative phasing includes both construction and operational phases, which are likely to overlap at certain times. For the purposes of assessment of the Project, five project development phases have been identified and detailed in the EIS. These are indicative only, but illustrate the type of construction and operation activities that would occur over time at the Project site.

The Project would likely commence in 2015 with the Early Works development phase and would progress with concurrent construction and operation through to the Project Full Build Phase (operation of full IMEX terminal, warehousing and interstate terminal) by approximately 2030.

The development phasing is proposed in line with the forecast market demand for processing of containers through the Project.

1.5 Road access to the site

Freight trucks would access the Project site from Moorebank Avenue, via the M5 Motorway. Trucks would then access the M7 Motorway and Hume Highway by the M5 Motorway. An upgrade to Moorebank Avenue would be included as part of the first phase of Project development (Project Phase A) to enable safe and efficient access to the Project site.

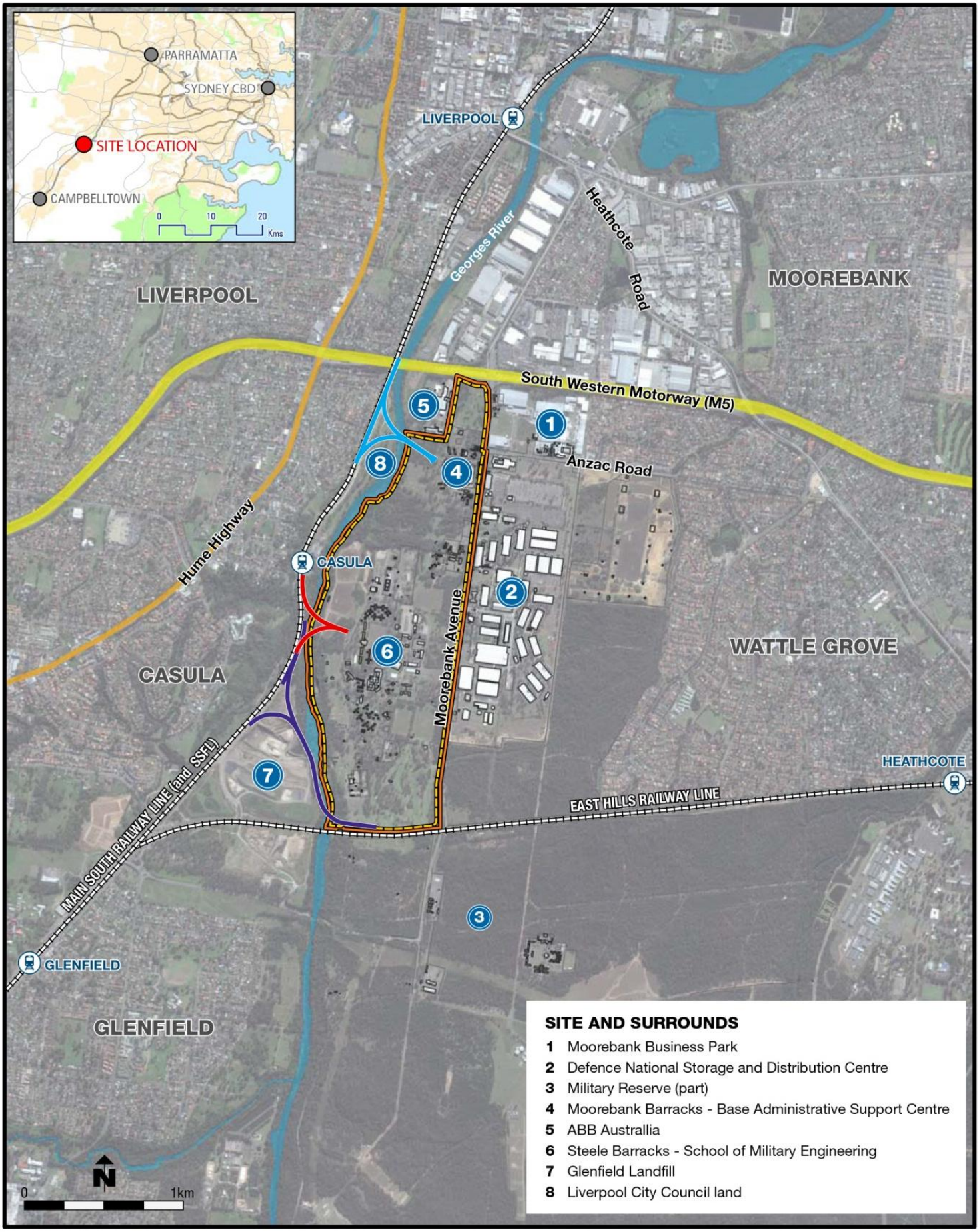


Figure 1.1 Project Site and context

Ref: PB/14/MIMTR004-C

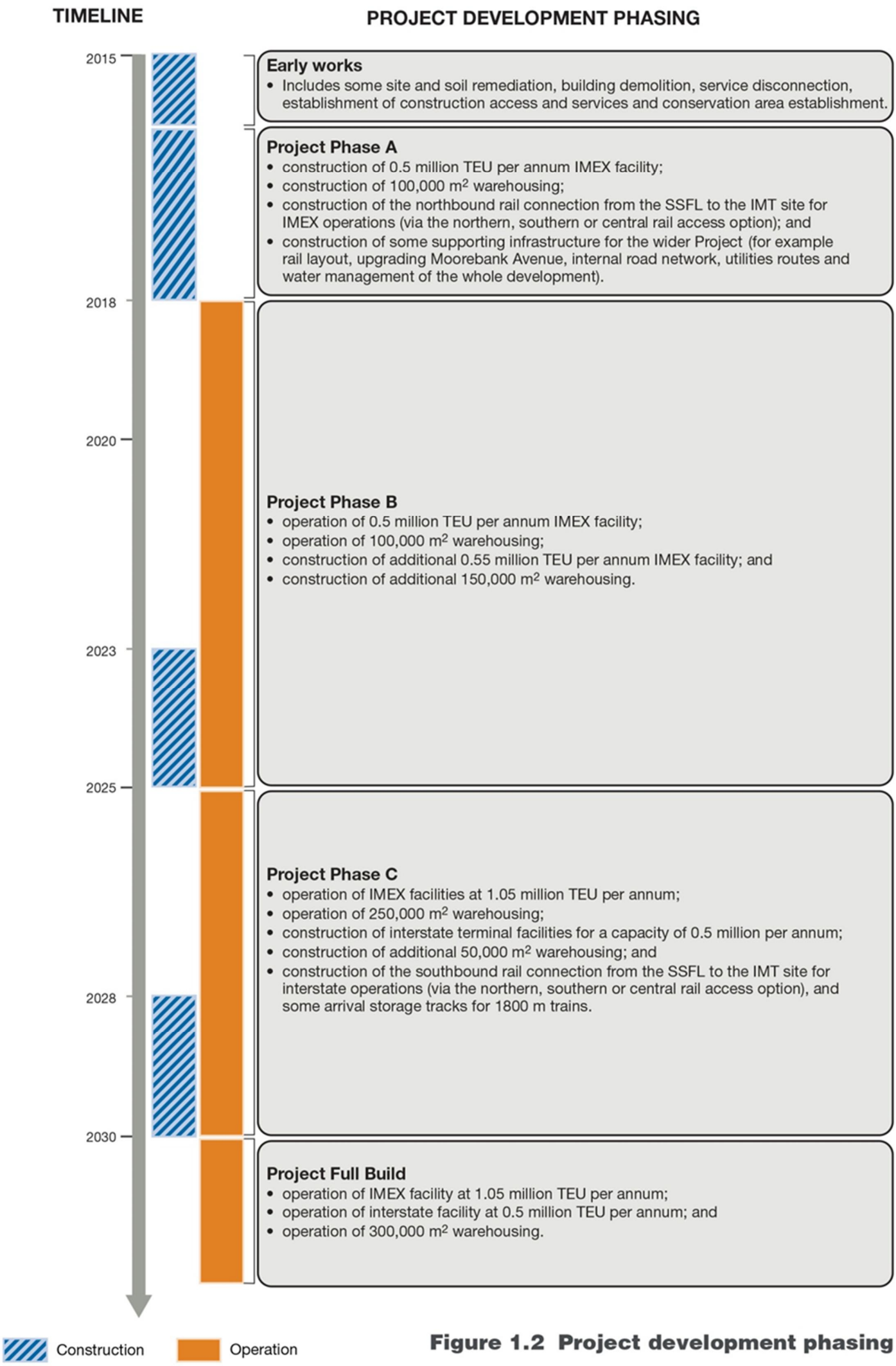


Figure 1.2 Project development phasing

1.6 Planning and environmental approvals

The Project is subject to both Commonwealth and NSW State Government approvals, and the Environmental Impact Statement (EIS) has been prepared to support applications for both approvals (EPBC number 2011/6086 and SSD-5066). The Project is a 'controlled action' under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Therefore, MIC is seeking approval for the construction and operation of the Project from the (Commonwealth) Department of the Environment (DoE) under Part 9 of the EPBC Act.

Under the (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act), MIC is seeking a staged development approval for the Project as State significant development (SSD). At this stage, MIC is seeking Stage 1 SSD approval for the proposal concept (as described in the EIS) from NSW Planning and Infrastructure (NSW P&I) under Part 4, Division 4.1 of the EP&A Act (hereafter referred to as the Stage 1 SSD approval). The Stage 1 SSD approval application also includes a package of 'early works' that comprises remediation, clean-up and demolition or relocation of existing buildings, and establishment of a conservation area. This EIS is seeking approval for these early works without the need for any further approvals. Subject to Stage 1 SSD approval being received, the Project (with the exclusion of the early works) will be subject to further development applications and environmental assessment under the EP&A Act (hereafter referred to as the Stage 2 SSD approvals).

This technical working paper presents the Health Impact Assessment (HIA) associated with local air quality impacts associated with Stage 1 SSD approval (including early works). Both construction and operation phase impacts have been assessed and are presented. Further details of the Project would be the subject of future development applications as those details are developed, with environmental impact assessments to be conducted in detail at that time.

1.7 Environmental impact assessment requirements

This Technical Paper has been prepared by Environmental Risk Sciences Pty Ltd (enRiskS) to address impact assessment requirements of both the Commonwealth Government under the EPBC Act (the 'Final EIS Guidelines'); and the Secretary for the NSW Department of Planning and Environment's (NSW DP&E's) Environmental Assessment Requirements (NSW SEARs). More specifically this Technical Paper presents a Health Impact Assessment (HIA) associated with the proposed Moorebank IMT.

The requirement to conduct a HIA is outlined in the NSW SEARs and Guidelines for the content of a Draft EIS provided by the Commonwealth Department of the Environment (DoE).

The DGRs for the Project require:

> "*A health impact assessment of local and regional health risks associated with the development, including those health risks associated with relevant key exposures*."

In addition the Commonwealth Guidelines require the EIS to:

> "*Provide a detailed and comprehensive Health Impact Assessment outlining the potential impacts of the Moorebank Intermodal Facility on people and communities. The Health Impact Assessment must include an assessment of the likely direct, indirect and consequential impacts of the action on sensitive receivers, including: nearby residences,*

schools; health facilities and community facilities. The Health Impact Assessment must be consistent with the Centre for Health Equity Training, Research and Evaluation's practical guide to impact assessment (August 2007) and must be reviewed by a suitably qualified expert with extensive demonstrated experience in Health Impact Assessments."

The conduct of a HIA is intended to provide a structured, solution-focused and action-oriented approach to maximising the positive and minimising the negative health impacts of the Project. The assessment:

- involves the identification and assessment of the severity and likelihood of positive and negative impacts (either direct or indirect);
- identifies ways in which the Project can enhance or strengthen health;
- identifies and addresses underlying social, economic and environmental impacts of the Project on health; and
- communicates any risks to stakeholders.

This technical report follows on from the HIA Scoping Phase conducted in July 2012, where the scope of the HIA (including methodology, approach and initial screening phase of work) was outlined and discussed with key stakeholders (outlined in **Section 1.9**). The scope of the HIA has been refined to reflect requirements from the key stakeholders, and revisions to the proposed Project.

1.8 Objectives

The overall objective of the HIA is to provide a structured assessment of the direct and indirect impacts associated with the proposed Moorebank IMT on the health of the surrounding (local and regional) community.

Outcomes of the HIA are used to determine recommendations for the collection of further data and/or measures that may be able to be implemented in the Project to minimise or mitigate identified negative impacts, and maximise positive impacts. These may include measures incorporated into the design/construction phase of the assessment or implemented in the site management plan for the operation of the site.

The scope of the HIA relates to the Project at completion, i.e. at full build operations, with consideration included for southern, central or northern rail access onto the site. Impacts associated with construction and operations have been considered in this assessment.

A key approach of the EIS is that construction and operational impact assessments are separately assessed. For most environmental issues assessed as part of this EIS, the following scenarios have been assessed (refer to **Section 2** for further details):

- Early works which would commence in 2015 and includes initial site preparation activities including some site remediation, building demolition, service disconnection and establishment of construction access and services.
- Project Phase A – construction of initial IMEX terminal and warehousing (2015-2018).
- Project Phase B – operation of initial IMEX and warehousing construction and additional capacity (2018-2025).

- Project Phase C – operation of IMEX and warehousing, construction of interstate terminal and additional warehousing (2025-2030).
- Project Phase D – full build (2030).

1.9 Approach

Overall, the HIA is in accordance with the following guidance (and associated references as relevant):

- Harris, P., Harris-Roxas, B., Harris, E. & Kemp, L., Health Impact Assessment: A Practical Guide, Centre for Health Equity Training, Research and Evaluation (CHETRE). Part of the UNSW Research Centre for Primary Health Care and Equity. University of New South Wales, Sydney (Harris 2007).
- Health Impact Assessment Guidelines. Published by the Environmental Health Committee (enHealth), which is a subcommittee of the Australian Health Protection Committee (AHPC) (enHealth 2001).

The HIA presented in this report is a desk-top assessment. The term desk-top is used to describe that the HIA has not involved the collection of any additional data (over and above that which will be provided from Project specific EIS technical studies, community consultation and statistics on the existing population), rather the assessment has been conducted on the basis of existing information with additional detail obtained via literature review only.

The scope of work associated with the conduct of the HIA is as follows:

- Review the available specialist/technical reports conducted as part of the EIS for the Project. The available specialist/technical reports considered in this assessment are listed in **Section 1.10**.
- Collate available information to develop a community profile for the community surrounding the Project, where impacts have been evaluated and determined in specialist/technical studies. The community profile compiles data on the population (size, age, income etc.), socioeconomic profile, health profile and concerns. Community concerns have been determined from feedback from the community consultation process conducted as part of the EIS process (Chapter 5 of the EIS provides detail on this process).
- Conduct a screening level HIA where all the available information from the specialist/technical reports are assessed and key outcomes are identified for further evaluation, as outlined in **Section 4**.
- Conduct a detailed assessment of health impacts for key outcomes identified in the screening level HIA, as outlined in **Section 5**.
- Provide recommendations based on the outcomes of the HIA (refer to **Section 7**). These recommendations are aimed at identifying further studies (more detailed) that may be required to further assess or monitor health impacts or determining considerations that will reduce negative impacts or enhance positive aspects of the proposed Project.

This draft HIA has been prepared for review by the independent peer reviewer, Synergia Ltd.

1.10 Definitions

For the conduct of the HIA the following definitions are relevant and should be considered when reading this report.

Health:

The World Health Organisation defines health as "*a (dynamic) state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*".

Hence the assessment of health should include both the traditional/medical definition that focuses on illness and disease as well as the more broad social definition that includes the general health and wellbeing of a population.

Health Hazard:

These are aspects of the Project, or specific activities that present a hazard or source of negative risk to the health or well-being.

In relation to the HIA these hazards may be associated with specific aspects of the proposed development/construction or operational activities, incidents or circumstances that have the potential to directly affect health. In addition some activities may have a flow-on effect that results in some effect on health. Hence health hazards may be identified on the basis of the potential for both direct and indirect effects on health.

Health Outcomes:

These are the effects of the activity on health. These outcomes can be negative (such as injury, disease or disadvantage), or positive (such as good quality of life, physical and mental wellbeing, reduction in injury, diseases or disadvantage).

It is noted that where health effects are considered these are also associated with a time or duration with some effects being experienced for a short period of time (acute) and other for a long period of time (chronic). The terminology relevant to acute and chronic effects is most often applied to the assessment of negative/adverse effects as these are typically the focus of technical evaluations of various aspects of the Project.

Likelihood:

This refers to how likely it is that an effect or health outcome will be experienced. It is often referred to as the probability of an impact occurring.

Risk:

This is the chance of something happening that will have an impact on objectives. In relation to the proposed Moorebank IMT and the conduct of the HIA, the concept of risk more specifically relates to the chance that some aspect of the Project will result in a reduction or improvement in the health and or well-being of the local and regional community. The assessment of risk has been undertaken primarily on the basis of a qualitative basis.

***Equity*:**

Equity relates to the potential for the Project to lead to impacts that are differentially distributed in the surrounding population. Population groups may be advantaged or disadvantaged based on age, gender, socioeconomic status, geographic location, cultural background, aboriginality, and current health status and existing disability.

In relation to the proposed Moorebank IMT, equity has been addressed by:

- assessing the potential for impacts to occur in the existing environment where the existing environment differs from other areas in Sydney;
- determining if there are any impacts that are likely to be more significant for any particular group in the surrounding community (including sensitive receivers) and ensuring that these impacts are effectively assessed;
- considering if these impacts are significant, unfair and can be changed or modified (such that the changes or modifications will improve equity and reduce the chance of unfair and avoidable impacts occurring for specific population groups).

1.11 Stakeholders

The conduct of the HIA has included engagement with the following key stakeholders:

- NSW Department of Health (NSW Health), including the Sydney South West Area Heath Service (SSWAHS);
- NSW DP&I;
- NSW Office of Environment and Heritage;
- Environment Protection Authority;
- Liverpool City Council;
- Campbelltown City Council; and
- SEWPaC.

With the exception of SEWPaC and NSW DP&I (who are the regulators in this process) and the OEH, the Project HIA Reference Group has been established with representatives from these stakeholders. The Project HIA Reference Group met on 26 July 2012 to discuss the scoping phase of the HIA. An Interim Draft HIA was prepared in December 2012 and provided to the Reference Group for discussion. The Interim Draft HIA report was discussed at a meeting on 13 December 2012. All feedback received has been incorporated into this HIA.

Staff from the Centre for Health Equity Training Research and Evaluation at the University of New South Wales have been involved in the Project HIA Reference Group as mentors.

1.12 Technical Reports

In relation to the proposed Project, and potential for impacts within the local community, this Draft HIA has been developed on the basis of information provided within a wide range of specialist/technical reports prepared as part of the EIS process. The following table presents a summary of the specialist/technical reports that will be exhibited (as final versions) in the EIS. The table lists the status of the reports that were provided and available at the time this report was prepared. Note that other sources of information have also been utilised in this document, and these are referenced throughout the report.

Table 1.1 Summary of available specialist/technical reports

Report Title	Status/Date	Technical Areas Addressed in Report
Moorebank Intermodal Terminal Traffic, Transport and Accessibility Impact Assessment Report (PB 2014)	Revised Report May 2014	Traffic (local and regional)
Moorebank Intermodal Terminal Project EIS – Noise and Vibration Impact Assessment Report (SLR 2014)	Final Draft, 24June 2014	Noise (local) and vibration
Proposed Moorebank Intermodal Terminal – Local Air Quality Impact Assessment (AECOM 2014)	Draft June 2014	Local air quality Odour
Moorebank Intermodal Terminal – Human Health Risk Assessment (enRiskS 2013)	Draft January 2013	Human health risks associated with local air quality impacts
Regional Air Quality Impact Assessment, Intermodal Terminal, Moorebank (Todoroski 2014)	Draft 5 June 2014	Regional air quality
Light Spill Impact Assessment (AECOM 2014)	Draft, 27 May 2014	Light spill
Phase 2 Environmental Site Assessment, Moorebank Intermodal Terminal, NSW (PB 2014)	Draft 28 May 2014	Site contamination
Moorebank Intermodal Terminal Project - Social Impact Assessment Technical Paper (PB 2014)	Draft, 13 May 2014	Social impacts
Moorebank Intermodal Terminal – Ecological Impact Assessment (PB 2014)	June 2014	Ecological environment and impacts
Moorebank Intermodal Terminal, European Heritage Assessment (Navin Officer 2014)	June 2014	Heritage
Moorebank Intermodal Terminal, Aboriginal Heritage Assessment (Navin Officer 2014)	June 2014	Heritage
Moorebank Intermodal Terminal Landscape Character and Visual Impact Assessment (Clouston 2014)	Draft 26 May 2014	Visual impacts
Chapters of EIS prepared by PB		
Waste and Resource Management (Chapter 26)	June 2014	Waste
Hazard and risk (Chapter 14)	June 2014	Hazard analysis
Hydrology, groundwater and water quality (Chapter 16)	June 2014	Water quality impacts, local and regional stormwater and flooding
Greenhouse Gas (Chapter 19)	Draft, June 2014	Greenhouse gas emissions
Strategic context and need for the Project (Chapter 3)	June 2014	Economic impacts

Section 2. Project Description

2.1 General

As generally outlined in **Sections 1.1 to 1.3**, the Project involves the development of approximately 220 hectares (ha) of Commonwealth-owned land for the construction and operation of the Moorebank IMT and associated infrastructure. The Project would also include the construction and operation of a rail link to connect the site to the planned SSFL (currently under construction) and vehicle access points to the Moorebank IMT and warehousing area from Moorebank Avenue.

The proposed concept for the Project is presented in detail in Chapters 7 and 8 of the EIS, which provides an indicative layout of the Project, including the proposed IMEX and interstate facilities, rail and road layouts, and locations of warehousing.

The primary function of the Moorebank IMT is to be a transfer point in the logistics chain for shipping containers and to handle both IMEX cargo and domestic interstate and intrastate (regional) cargo. A key role for the terminal will be to promote the movement of container freight by rail between Port Botany and south western Sydney as well as on the interstate rail network.

Beyond these primary functions, the Project may provide a number of services including local distribution and warehousing, cargo and container services, storage, customs clearing facilities and security.

At present, freight distribution operates radially from Port Botany with analysis indicating that nearly two-thirds (64%) of container freight travels to and from western Sydney (mostly via heavy vehicle movements on existing roads with only around 16% of movements via rail) to Liverpool, Fairfield, Blacktown, Holroyd, Auburn, Parramatta, Campbelltown, Penrith and Bankstown LGAs (refer to **Figure 2.1** for existing and proposed IMT network).

The following sections provide an overview of the key operational aspects of each stage of the Project.

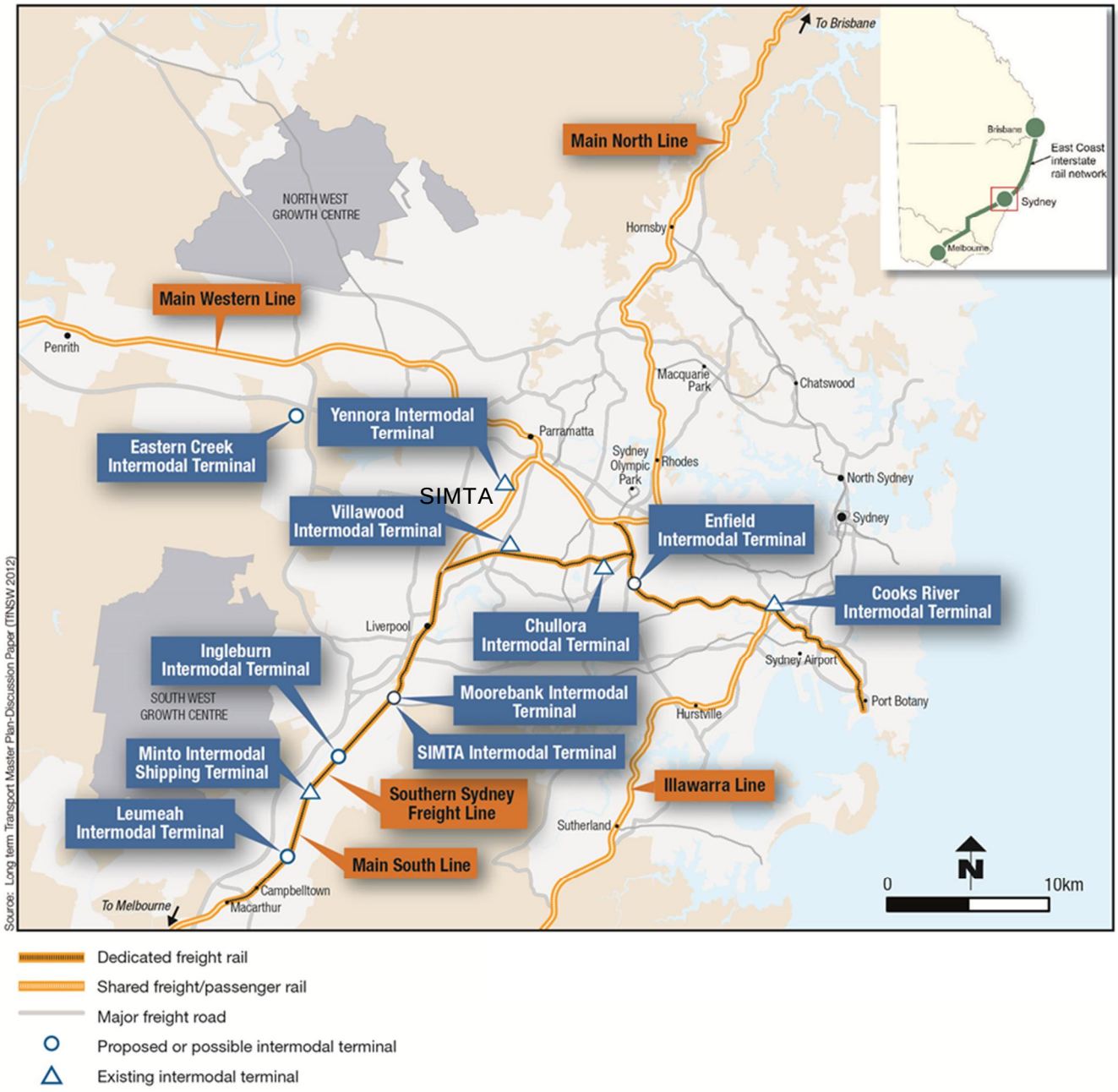


Figure 2.1 Planned and existing IMT Network

2.2 Early works (2015)

The first phase of the Project would consist of site preparation activities, referred to as the Early Works Project development phase. This phase, which would commence in 2015, would include some site remediation, building demolition, service disconnection and establishment of construction access and services. Section 8.3 of the EIS provides a detailed description of the works included within the Early works development phase.

Construction would commence in July 2015 and is likely to continue for 6 months. Construction hours would be 7.00 am to 6.00 pm Monday to Friday, 8.00 am to 1.00 pm Saturday and no work on Sunday and public holidays.

2.3 Project Phase A – Construction of initial IMEX terminal and warehousing (2015–2018)

Project Phase A – Construction of initial IMEX terminal and warehousing (Project Phase A) is likely to commence in 2015, at which time construction of the initial IMEX freight terminal facilities and warehousing would be undertaken. In particular, this project development phase involves construction activities associated with the development of the initial IMEX terminal (catering for a capacity of 0.5 million twenty-foot equivalent units (TEUs)) and the provision of 100,000 square metres (sq. m) of warehousing. In addition, construction of some supporting infrastructure for the wider Project (for example rail layout, upgrading Moorebank Avenue, internal road network, utilities routes and water management for the whole Project site) would also be undertaken.

The rail connection between the SSFL and the Project site for IMEX operations would also be developed during Project Phase A, including construction of the bridge across the Georges River. In order to adequately assess the impacts of each of the three rail access options included within this proposal concept, separate scenarios have been developed for each option:

- **Scenario N1** assesses the impacts during Project Phase A and is based on the northern rail access option and associated IMT site layout.
- **Scenario C1** assesses the impacts during Project Phase A and is based on the central rail access option and associated IMT site layout.
- **Scenario S1** assesses the impacts during Project Phase A and is based on the southern rail access option and associated IMT site layout.

Standard construction hours would apply. These are 7.00 am to 6.00 pm Monday to Friday, 8.00 am to 1.00 pm Saturday and no work on Sunday and public holidays.

Further details of the construction activities occurring during Project Phase A are provided in section 8.4 of the EIS.

2.4 Project Phase B – Operation of initial IMEX and warehousing, construction of additional capacity (2018–2025)

By 2018 it is expected that the initial IMEX and warehousing component of the IMT would commence operation. This would involve operation of the IMEX terminal at a capacity of 0.5 million TEUs per annum and operation of 100,000 sq. m of warehousing. This Project development phase is referred to as Project Phase B – Operation of initial IMEX terminal and warehousing, construction of additional capacity (Project Phase B).

The IMEX terminal and trains would operate 24 hours a day, 7 days a week. Truck gates to the terminal would be open 16 hours, 5.5 days a week. Operations within the warehousing precinct could occur 24 hours a day, 7 days a week.

During Project Phase B, additional IMEX freight terminal facilities would be constructed to increase the IMT capacity to 1.05 million TEUs per annum, along with an additional 150,000 sq. m of warehousing. Construction of the additional IMEX facilities and warehousing is likely to commence in the latter part of Project Phase B, around 2023.

As with the previous scenarios, Scenarios N2, C2, S2 each represent one of the three rail access options and associated IMT layouts:

- **Scenario N2** assesses the impacts during Project Phase B using the northern rail access option.
- **Scenario C2** the central rail access option.
- **Scenario S2** the southern rail access option.

The scenarios occur at a point of time between 2023 and 2025, when both construction and operation activities are taking place on the Project site.

2.5 Project Phase C – Operation of IMEX and warehousing, construction of interstate terminal and additional warehousing (2025–2030)

Project Phase C – Operation of IMEX terminal and warehousing, construction of interstate terminal and additional warehousing (Project Phase C) would commence in 2025 and would involve the operation of the IMEX terminal at its maximum capacity (1.05 million TEUs per annum) along with 250,000 sq. m of warehousing.

Construction of the interstate terminal (for a capacity of 500,000 TEU per annum) and the southbound rail connection from the SSFL to the IMT for interstate operations (via either the northern, southern or central rail access option) is also likely to occur in the latter part of this phase, around 2028. An additional 50,000 sq. m of warehousing would also be constructed during this time.

As with the previous scenarios, Scenarios N3, C3, S3 each represent one of the three rail access options and associated IMT layouts:

- **Scenario N3** assesses the impacts during Project Phase C using the northern rail access option.
- **Scenario C3** the central rail access option.
- **Scenario S3** the southern rail access option.

The scenarios occur between 2028 and 2030, when both construction and operation activities are taking place on the Project site.

2.6 Project Phase Full Build (2030)

By 2030 it is expected that the IMT would have reached its maximum capacity (i.e. Full Build). This phase would involve operation of the IMEX and interstate terminals and 300,000 sq. m of warehousing. It is expected that there would be no construction activities occurring during this phase, as the Project would have reached its maximum capacity.

The IMEX and interstate facility would operate 24 hours a day, 7 days a week, including truck access to the IMT site.

As with the previous scenarios, Scenarios N4, C4, S4 each represent one of the three rail access options and associated IMT layouts:

- **Scenario N4** assesses the impacts of the IMT at Full Build based on using the northern rail access option.
- **Scenario C4** the central rail access option.
- **Scenario S4** the southern rail access option.

Figures 2.2, 2.3 and 2.4 present the proposed Project layout at Full Build based on using the northern rail access option (**Figure 2.2**), central rail access option (**Figure 2.3**) and the southern rail access option (**Figure 2.4**). **Figure 2.5** presents an artist's impression of what the project will look like when completed.

INDICATIVE NORTHERN RAIL CONNECTION CONCEPT LAYOUT
MOOREBANK INTERMODAL TERMINAL

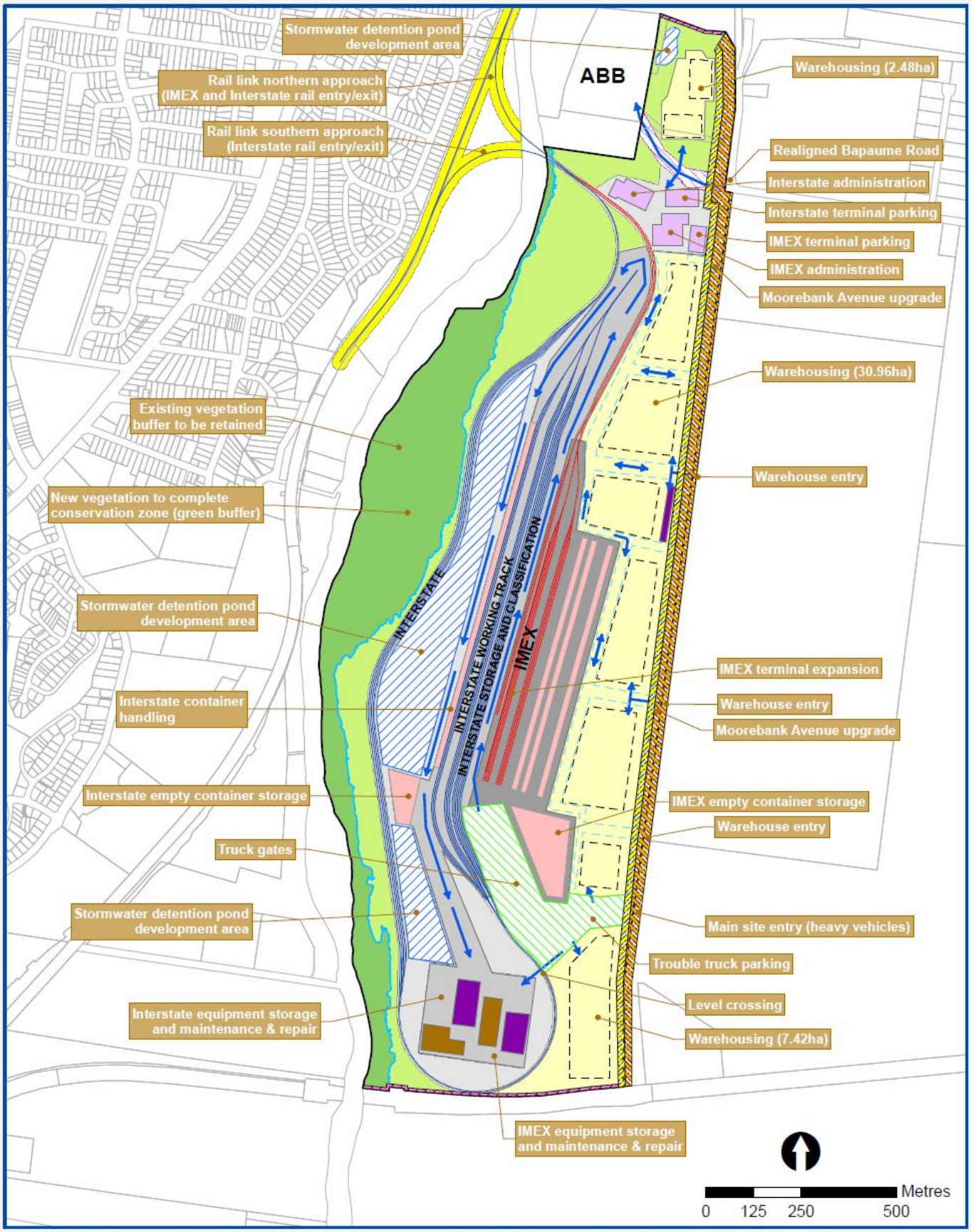


Figure 2.2: Indicative IMT layout associated with the northern rail access option at Full Build

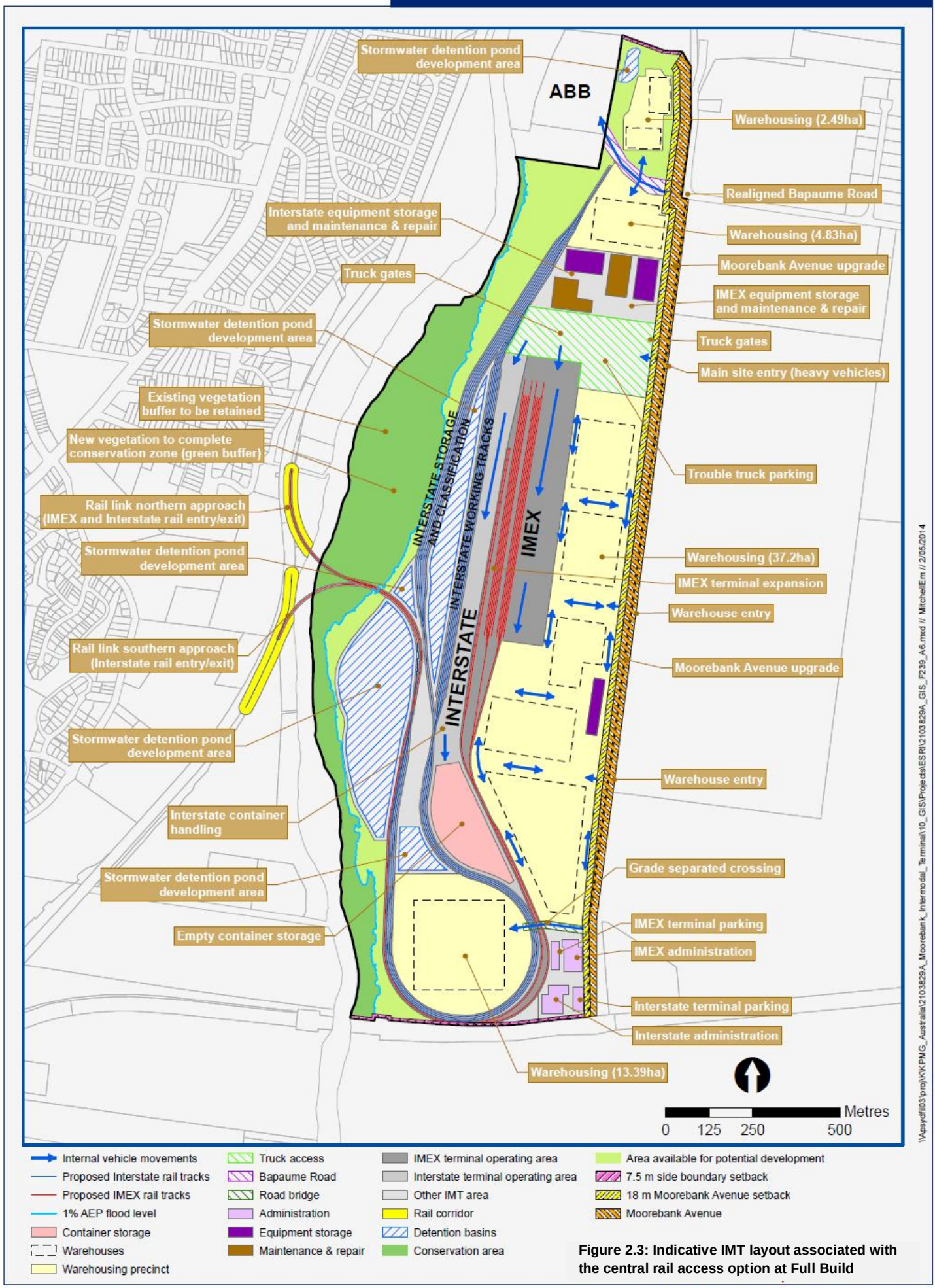


Figure 2.3: Indicative IMT layout associated with the central rail access option at Full Build

INDICATIVE SOUTHERN RAIL CONNECTION CONCEPT LAYOUT
MOOREBANK INTERMODAL TERMINAL

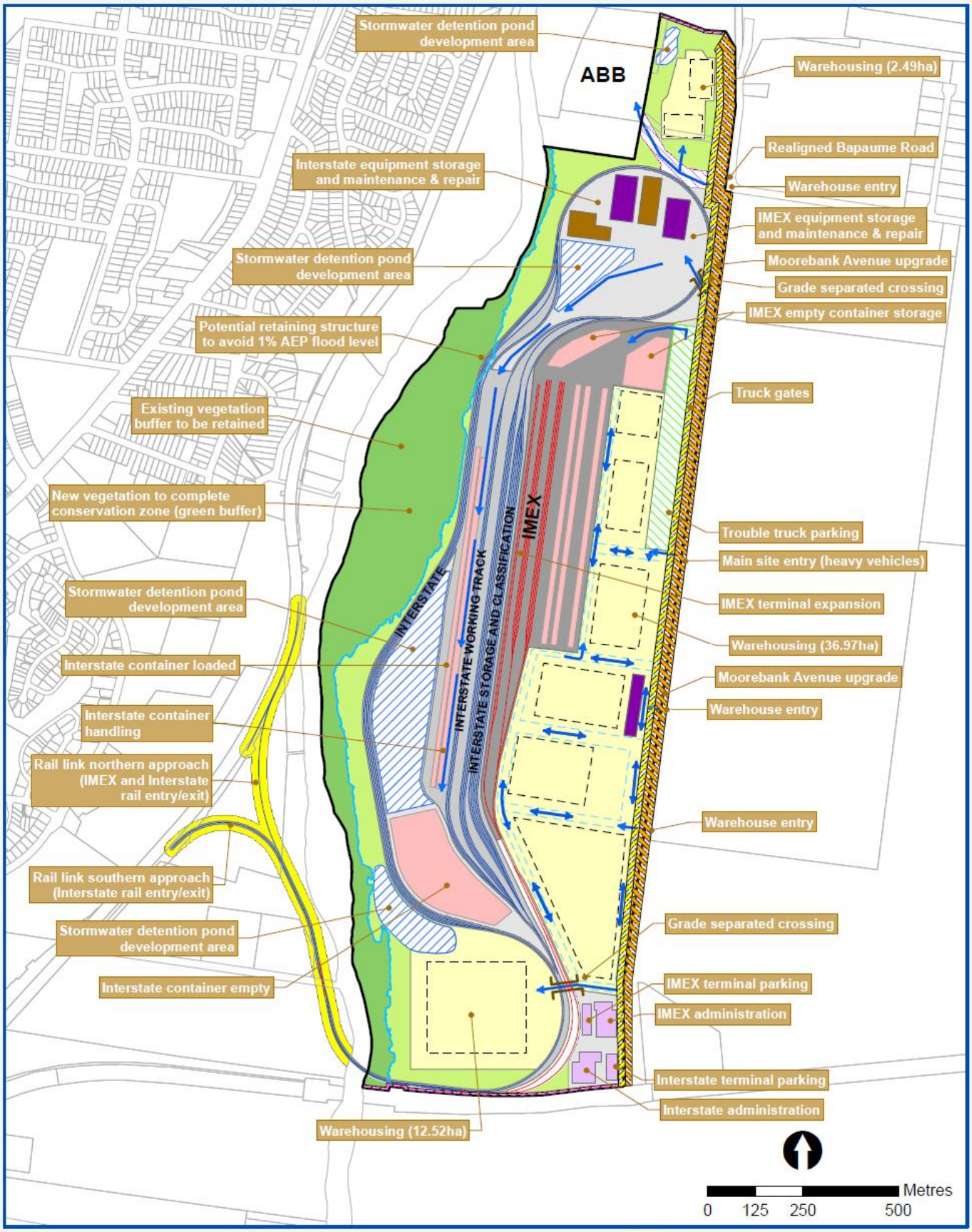


Figure 2.4: Indicative IMT layout associated with the southern rail access option at Full Build

Figure 2.5 Artists Impression of Proposed IMT

2.7 The Project and the SIMTA development

The Sydney Intermodal Terminal Alliance (SIMTA) is proposing to develop an IMT facility on the site currently occupied by the Defence National Storage Distribution Centre (DNSDC) on Moorebank Avenue, Moorebank. A short description of this other development is provided below. In light of this, the NSW SEARs require a cumulative assessment of the impacts that would occur in the event that both projects were developed.

The site for the SIMTA development is to the immediate east of the Moorebank IMT Project Site and the two projects would, if both approved, operate simultaneously. The line capacity of the SSFL is likely to constrain the development and operational capacity of the two IMTs. Even assuming future upgrades are made to the line, including additional passing loops and intermediate signalling, the SSFL is likely to be capacity-constrained above a throughput of 1.7 million TEUs. At full operation the two proposed IMT developments provide would involve:

- Moorebank IMT Project - 1.05 million TEUs (IMEX facility) and 0.5 million TEUs (interstate facility) throughput capacity; and
- SIMTA IMT – 1 million TEUs throughput capacity.

In response to this constraint, potentially more realistic scenarios have been developed. The development of these scenarios has considered the SSFL capacity constraints, the need for an IMT in the area, the existing zoning of the SIMTA site (IN1 – General Industrial which permits warehouse or distribution centres) as well as the existing concept approval for an IMT on the SIMTA site.

It is noted that these scenarios have been developed by DoFD and its Moorebank Advisor Project Team purely for the purposes of an indicative cumulative impact assessment should these types of developments operate adjacent to each other in this location. No consultation with SIMTA has occurred in relation to these scenarios.

The cumulative scenarios considered are as follows:

- Cumulative Scenario 1: Development of the Moorebank IMT site as described in the EIS with additional development of 300,000m^2 warehousing on the SIMTA site (configured as per **Figure 2.6**).
- Cumulative Scenario 2: Development of both sites to include IMEX, each handing 500,000 TEU throughput, with the Interstate freight terminal on the Moorebank IMT site and 300,000m^2 warehousing on each site.
- Cumulative Scenario 3: Development of an Interstate freight terminal and 300,000m^2 warehousing on the Moorebank IMT site, and development of the SIMTA development as proposed (Hyder 2013).

For these cumulative scenarios it is assumed that:

- the Moorebank IMT Project operates in accordance with how it is defined in the Moorebank IMT Project EIS (and as described in this Technical Paper) – with operations considered on the basis of the northern rail access option in scenario 1 and the southern rail access option for scenarios 2 and 3;
- both sites are assumed to be operational 24 hours a day, seven days a week; and

- the assessment would consider cumulative operations of the two developments at year 2030 – when both are at full build operational levels. This allows for an assessment of potential 'worst case' impacts resulting from the two developments.

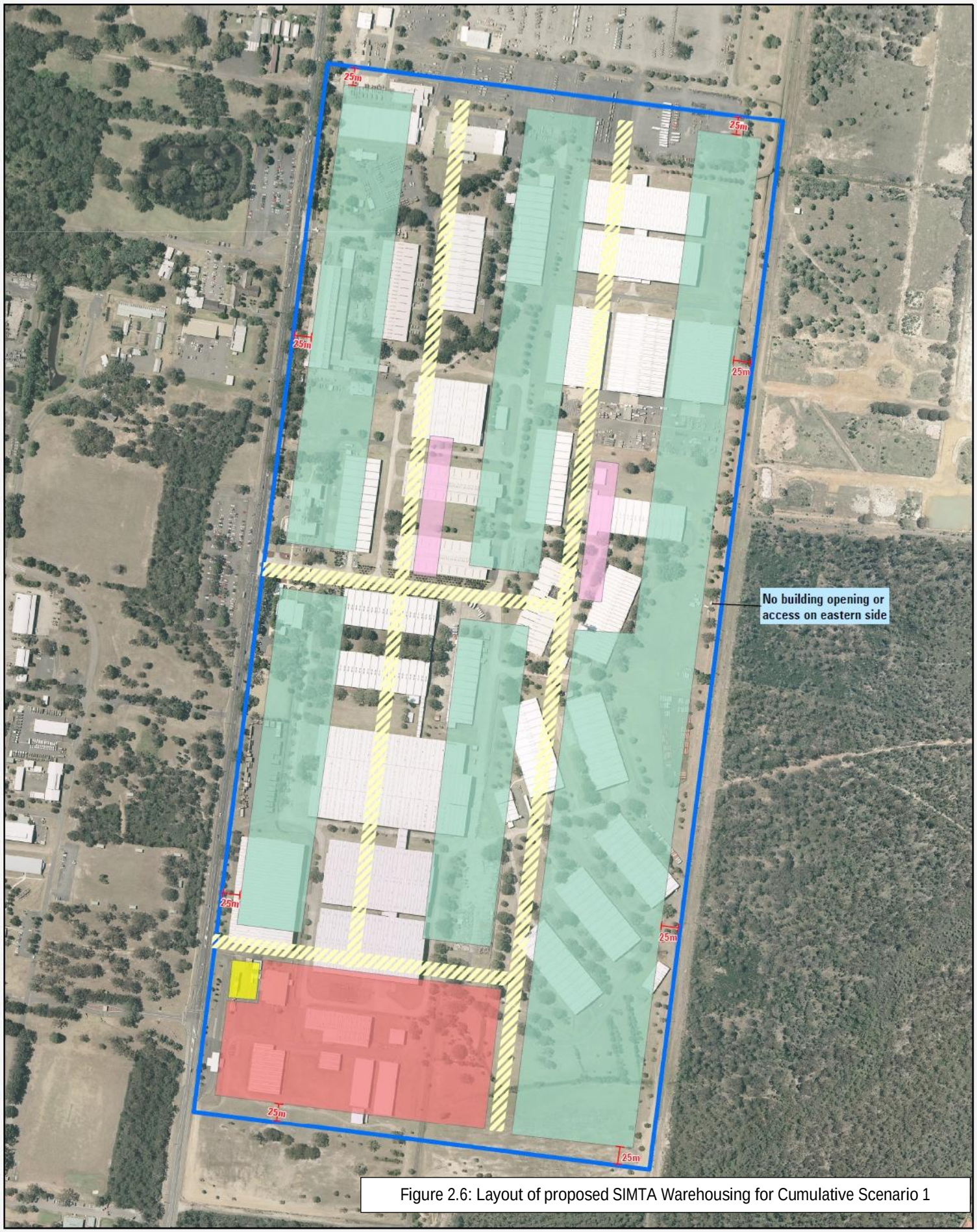


Figure 2.6: Layout of proposed SIMTA Warehousing for Cumulative Scenario 1

Section 3. Community Profile

3.1 Overview

This section aims to provide an overview of the community potentially impacted by the proposed Project. It is noted that the key focus of the assessment presented is the local community surrounding the Moorebank IMT site, however some aspects of the assessment relate to regional impacts within the greater Sydney area. Hence, where relevant, information related to both the local community and other areas within Sydney (and NSW) have been presented.

3.2 Geographical Area

3.2.1 Local Area of Interest

The proposed Moorebank IMT is located within the Liverpool City Council local government area (LGA). Within the Liverpool LGA, the suburbs of Moorebank, Wattle Grove, Casula, Glenfield, Liverpool and Lurnea are adjacent to the proposed site and contain residential populations which may be affected by the construction and/or operation of the Moorebank IMT (and where impacts have been evaluated in most of the specialist/technical studies). The suburb of Holsworthy is also adjacent, but there are no residential areas near the site. There is a distance of approximately 200 metres between the site boundary and any residential areas, although the SSFL is considerably closer to residences along much of its length.

The Liverpool City Council maintains over 250 parks with varying facilities ranging for BBQs to sporting fields, and in many cases these are connected by a network of walkways and cycleways. The Georges River runs along the western boundary of the Project site and includes a corridor of parks/recreation land along much of its length. Leacock Regional Park is west of the site with walking tracks along the banks of the Georges River. There are some large recreation areas including Kelso Park and Chauvel Park in and around the suburb or Moorebank while there are also corridors of open space parks following the paths of smaller waterways such as Brickmakers Creek through Casula and Liverpool. The Whitlam Leisure Centre in Liverpool services the surrounding community with a gym, aquatic facilities as well as a sports stadium.

The Casula Powerhouse Arts Centre is located adjacent Georges River in Casula and is approximately 100 metres from the Project site boundary. The building was originally a power station that was built in the 1950s during post-WWII. It was purchased by Liverpool City Council in 1978. After refurbishment it was opened as an arts centre in 1994 and has seven exhibition spaces, a 326-seat theatre space, retail outlet, café, weaving garden, production studios, artist's residency studios and new office spaces[1].

The specialist/technical studies have evaluated the potential for off-site impacts. Most of the impacts evaluated are relevant to suburbs adjacent to the Moorebank IMT (i.e. local area), hence the scope of the impacts evaluated in the HIA are limited to the areas evaluated in the specialist/technical

[1] Refer to the Casula Powerhouse Arts Centre website for further information; www.casulapowerhouse.com

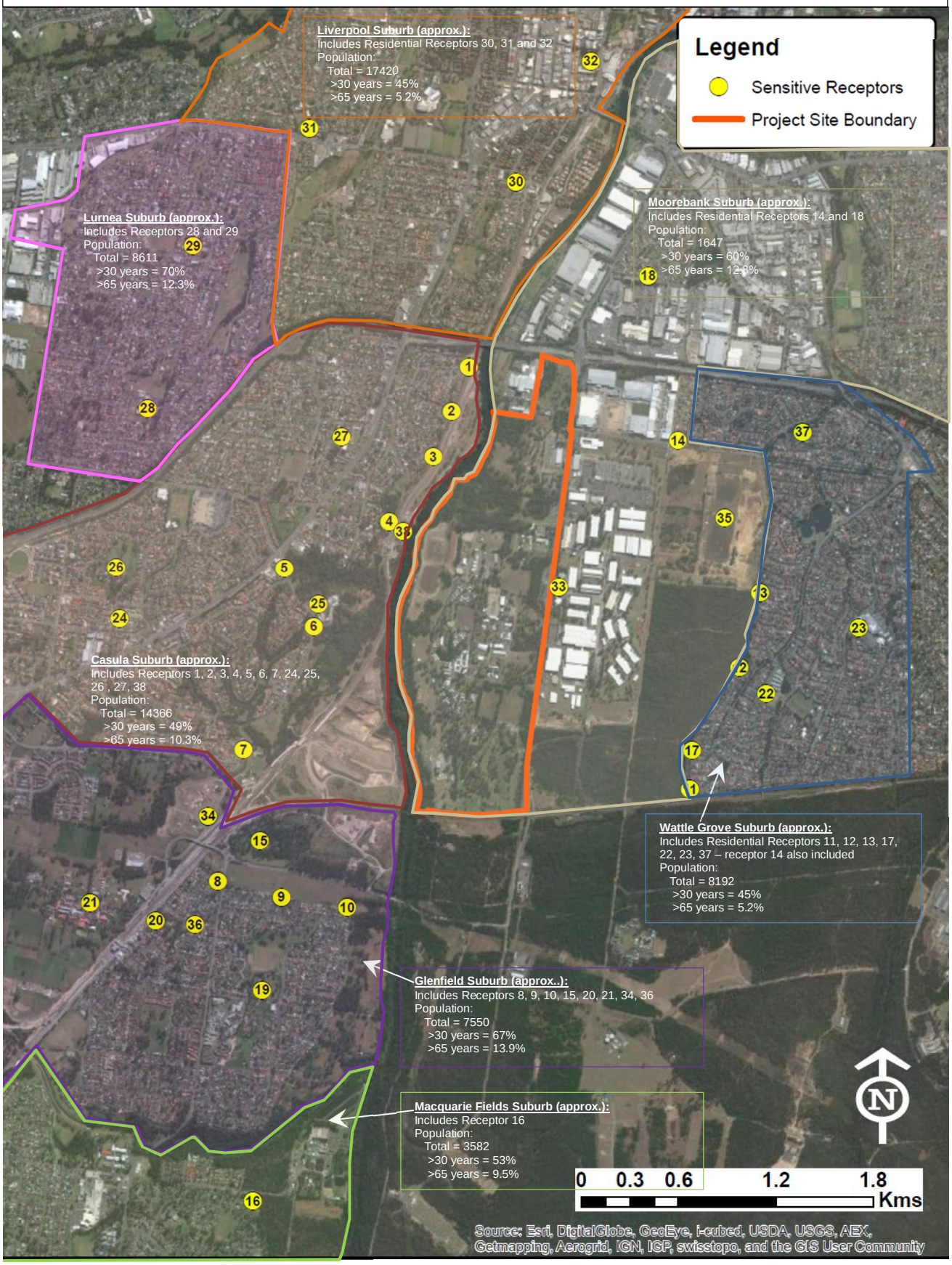
studies. The community profile presented in this report reflects these local suburbs which are illustrated in **Figure 3.1**.

3.2.2 Location of Sensitive Populations

The distribution of identified sensitive receiver sites (also considered within the specialist/technical studies) is also shown in **Figure 3.1**. These receivers were selected to include residential properties located closest to the Project and within adjacent suburbs, schools (primary and secondary) and aged care facilities. In addition a number of receivers were chosen as representative of workplaces close to the Project site.

The majority of the receivers identified are located in areas of Liverpool, Lurnea and Casula with moderate to low socio-economic indices for areas (SEIFA) disadvantage scores (refer to **Section 3.3**). Of the 39 receivers identified, 13 are located within 1km of the site boundary and four are located on the site boundary. Twelve of these represent residential areas, with two schools located between 500m and 1km away. A further 18 sites, predominantly schools and residential areas, are located between one kilometre and two kilometres from the site boundary with the remaining four sites – a mixture of schools, health and community facilities – located between two kilometres and three kilometres from the site boundary.

Figure 3.1: Location of sensitive receptors within suburbs of interest (approximate suburb boundaries)



3.3 Population Profile

The location of the proposed Moorebank IMT in the Local Government Area (LGA) of Liverpool within the greater Sydney area, NSW, positions it within a socio-economic and demographic context which reflects both state wide trends and strong local influence. The relevant demographic indicators are summarised in **Table 3.1**.

The east coast of New South Wales is generally densely populated, with the greater Sydney area accounting for almost 4.4 million of the state's nearly 7 million residents in 2011. Sydney's popularity as a destination for both long- and short-term migration is reflected in the relatively high percentage of persons born overseas, a significant proportion of whom do not speak English at home. The percentage of the population born overseas are even higher in the Liverpool LGA (46.2% for Liverpool LGA compared to 40.1% for Sydney and 31.4% for all of NSW), where the number of single parent families (18.2% for Liverpool LGA compared to 15.7% for Sydney) and the level of mortgage stress (16.8% for Liverpool LGA compared to 12% for Sydney) are also increased. The proportion of young children (aged 0 – 4 years) in the study area population is also notably higher than the average for Sydney (7.8% compared to 6.8%), and this figure is even higher for some of the individual suburbs (refer to **Table 3.2**).

Table 3.2 summarises the selected socio-demographic variables within and between the key local suburbs and the Liverpool LGA, showing that Liverpool (suburb) and Lurnea have more indicators of disadvantage which are reflected in their lower (more disadvantaged) SEIFA Index of Relative Socio-Economic Disadvantage (IRSD) scores[2], while Wattle Grove, in particular, has a significantly higher median income and is comparatively less disadvantaged. There is, however, more variation within Lurnea, indicating that this is not necessarily a homogenous population. The same is true of the other suburbs of interest.

[2] The five yearly Australian Census of Population and Housing ('the census') conducted by the Australian Bureau of Statistics (ABS) collects a variety of social and demographic information for individuals and households in Australia. As well as the data generated by discrete census questions, the ABS also compiles a series of indices which attempt to quantify the socio-economic status of small areas relative to each other. These are known as the Socio-Economic Indexes for Areas (SEIFA). In particular, the Index of Relative Socio-Economic Disadvantage (IRSD) incorporates attributes such as low income, low educational status, high unemployment and other variables which reflect disadvantage – lower scores indicate relatively greater disadvantage Australian Bureau of Statistics 2003, Socio-Economic Indexes for Areas: Australia 2001.

Table 3.1 Selected Demographic Characteristics: Wider Study Area

INDICATOR	STATE New South Wales	CITY Sydney	LGA Liverpool
Total Population	6 917 658	4 391 674	180 143
Population 0 – 4 years	*6.6%*	*6.8%*	*7.8%*
Indigenous	2.5%	1.2%	1.5%
Median Age	38	36	33
Born overseas	31.4%	40.1%	46.2%
Speak other language at home	27.5%	37.8%	55.6%
Median weekly household income	$1,237	$1,447	$1,299
Married	50.0%	48.0%	53.2%
Single parent families	16.3%	15.7%	18.2%
Unemployment	5.9%	5.7%	7.0%
Home owned outright	33.2%	30.4%	24.1%
Home being purchased	33.4%	34.8%	41.9%
Home rented	30.1%	31.6%	30.4%
Unoccupied private dwellings	9.7%	7.2%	4.2%
Median rent	$300	$351	$295
Median monthly mortgage repayments	$1,993	$2,167	$2,167
Mortgage stress	10.5%	12.0%	16.7%

Source: ABS Census 2011

Table 3.2 Selected Demographic Characteristics: Local Area

INDICATOR	LGA	SUBURB					
	Liverpool	Moorebank	Wattle Grove	Casula	Glenfield	Liverpool	Lurnea
SEIFA IRSD 2011	951	1 020	1 091	985	1 004	848	848
SEIFA Ranking NSW *Out of 2563 State Suburbs*	*51 out of 153 LGAs*	1 479	2 312	999	1 250	118	117
Total Population	180 143	7 595	8 192	14 696	7558	24095	8610
Population 0 – 4 years	*7.8%*	*8.4%*	*8.7%*	*8.0%*	*6.6%*	*8.6%*	*8.7%*
Indigenous	1.5%	0.8%	1.6%	1.0%	1.5%	1.1%	3.0%
Median Age	33	35	31	34	36	33	32
Born overseas	39.8%	29.4%	28.8%	39.9%	40.5%	56.6%	38.3%
Speak other language at home	49.8%	34.3%	27.8%	49.7%	41.0%	66.0%	52.0%
Median weekly household income	$1,299	$1,434	$1,938	$1,366	$1,394	$922	$883
Married	53.2%	55.9%	60.2%	54.4%	53.2%	50.2%	47.5%
Single parent families	18.2%	15.9%	11.2%	16.6%	17.3%	22.0%	25.4%
Unemployed	7.0%	4.7%	3.9%	7.0%	6.8%	10.5%	11.4%
Home owned outright	24.1%	34.0%	21.0%	26.5%	27.2%	19.7%	26.9%
Home being purchased	41.8%	44.2%	47.1%	42.3%	44.9%	25.5%	32.5%
Home rented	30.4%	19.4%	30.5%	26.0%	24.1%	50.3%	36.6%
Median rent	$295	$350	$280	$340	$290	$280	$263
Median monthly mortgage repayments	$2,169	$2,300	$2,200	$2,167	$1,965	$1,600	$1,733
Mortgage stress	16.7%	18.5%	13.1%	17.7%	14.5%	10.0%	15.6%

Source: ABS Census 2006 and 2011

The average SEIFA scores for the Liverpool LGA and the suburbs surrounding the Project site are presented in **Table 3.2**, which indicates that Wattle Grove is the least disadvantaged while Lurnea, Liverpool and Casula are the most disadvantaged suburbs.

Table 3.3 presents a summary of more selected statistics for the local suburbs, including statistics for Liverpool based on Statistical Area – Level 1 (SA1) (the smallest geographical unit for the 2011 census data, based on populations greater than 20 people). These statistics do not, therefore, reflect the whole population of Liverpool (which is a large suburb area), rather it reflects the SA1s within the local area of interest.

Table 3.3 Detailed demographic statistics by suburb

INDICATOR	SUBURB					
	Moore-bank	Wattle Grove	Casula	Glenfield	Liverpool*	Lurnea
Population 0 - 4 years	*8.4%*	*8.7%*	*8.0%*	*6.6%*	*8.6%*	*8.7%*
Population 5 - 19 years	23.3%	19.5%	25.1%	22.1%	19.7%	18.7%
Population 20 - 64 years	59.8%	59.3%	61.0%	59.6%	59.8%	61.6%
Population 65 years and over	9.2%	12.8%	5.2%	10.3%	13.9%	11.1%
Couple families with children <15	33.8%	47.7%	36.9%	32.3%	34.7%	44.8%
One parent families with children <15	6.9%	6.0%	7.5%	8.6%	11.3%	13.2%
Unemployment	4.7%	4.0%	7.0%	6.8%	10.5%	11.3%
Separate houses	83.4%	93.8%	70.4%	60.5%	33.9%	74.7%
Semi-detached houses	8.5%	2.5%	21.6%	30.6%	12.0%	19.0%
Flats/Units/Apartments	3.1%	0.0%	4.8%	1.9%	48.3%	2.5%
Other dwellings	0.1%	0.0%	0.1%	0.0%	0.2%	0.0%
Unoccupied private dwellings	4.8%	3.6%	3.1%	7.0%	5.3%	3.8%
Median house prices (2014)**	$502,500	$578,500	$480,000	$456,500	$338,000	$415,000

*SA1s within study area only as identified in the Social Impact Assessment (PB 2012)
**Data from PriceFinder (www.pricefinder.com.au)

Overall, the social profile of the local area of interest/study area is one where families with young children predominate and the majority of the sensitive receivers are subsequently schools. However these families live within an area which exhibits a variety of socio-economic conditions and associated housing types, ranging from the high income, two-parent families and more expensive houses of Wattle Grove to the variation in incomes, family types and dwelling choices seen in areas of the Liverpool LGA.

The estimated population growth from 2008 to 2028 in the LGAs associated with these suburbs ranges from 40.9% (Campbelltown LGA) to 53.4% (Liverpool LGA)[3].

3.4 Economic indicators

Economic data from the 2011 census indicate that, in the Liverpool LGA, the percentage of unemployed people (7.0%) was significantly higher than the national average of 5.6% (**Table 3.2**). Within the study area, unemployment is higher Liverpool and Lurnea but is generally below the national average in Moorebank and Wattle Grove (**Table 3.3**).

The most common occupation groups reported in the Liverpool LGA are Clerical and Administrative Workers (17.5%), Technicians and Trades Workers (15.7%), Professionals (15.4%) and Labourers (10.5%). The percentage of people in these occupations is slightly higher than the national average for all categories except Professionals, which is significantly lower than the national figure of 21.3%. Moorebank and Wattle Grove have a higher proportion of Professionals while Labourers and Machinery Operators and Drivers make up a high proportion of occupations reported in Liverpool and Lurnea.

[3] Data provided on the NSW population growth by LGA from Health Statistics NSW, http://www.healthstats.nsw.gov.au/Indicator/dem_pop_lgamap

The top industries of employment in the Liverpool LGA are School Education (3.8%) and Cafes, Restaurants and Takeaway Food Services (3.6%), both slightly below the national average, followed by Road Freight Transport (3.2%) at almost double the national average.

As outlined in the Social Impact Assessment, the availability and distribution of potential housing stock for an incoming workforce can be gauged by the number of unoccupied dwellings in the region. The proportion of unoccupied private dwellings in the study area varies from a low of 3.1% in Casula to a high of 7.0% in Glenfield (**Table 3.3**), however, in terms of absolute numbers Liverpool has the most with 358 while Glenfield is the next highest with a total of 189 unoccupied dwellings. The remaining suburbs have less than 150 each.

3.5 Existing Health of Population

The health of the community is influenced by a complex range of interactive factors including age, socio-economic status, social capital, behaviours, beliefs and lifestyle, life experiences, country of origin, genetic predisposition and access to health and social care. While the health indicators available and reviewed in this report are focused on health outcomes considered in the range of specialist/technical reports, they generally reflect a wide range of these factors.

It is noted that most of the health indicators presented in this report are not available for each of the smaller suburbs/statistical areas surrounding the site, as outlined in **Sections 3.1 to 3.4**. Health indicators are only available from a mix of larger areas (that incorporate the study area) that comprise the Liverpool LGA, Liverpool District (that includes the Liverpool LGA, Campbelltown LGA as well as part of the Camden and Fairfield LGAs) and the larger Sydney South West Area. The health statistics for these larger areas are assumed to be representative of the smaller population located closer to the proposed Moorebank IMT site.

For the purpose of comparison, the available local data has been compared with data from other LGAs and the whole of Sydney and/or NSW (depending on the availability of the data).

Review of the general health for residents in Sydney South West (SWSLHN 2012) indicated that although high level health indicator measures such as life expectancy at birth and deaths from all causes for these residents are the same as the NSW average, on a range of other health indicators local residents have poorer outcomes than the average for NSW. Residents from Sydney South West, on average, have elevated rates of behaviours which have been linked to poorer health status and chronic disease including cardiovascular and respiratory diseases, cancer, and other conditions that account for much of the burden of morbidity and mortality in later life (SWSLHN 2012). These include:

- Current daily and occasional smoking at 17.0% (higher than the NSW average, dominated by the rate of smoking in males);
- Adequate physical activity at 49.2% (11% worse than the NSW average);
- Very high psychological distress at 11.4% (4% higher than the NSW average); and
- Consuming vegetables in recommended quantities at 7.9% (17% worse than the NSW average). A similar trend is observed for the consumption of fruit in recommended quantities.

The incidence of these health-related behaviours in Sydney South West, compared with other health areas in NSW, and the state of NSW (based on data from 2009) is illustrated in **Figure 3.2**.

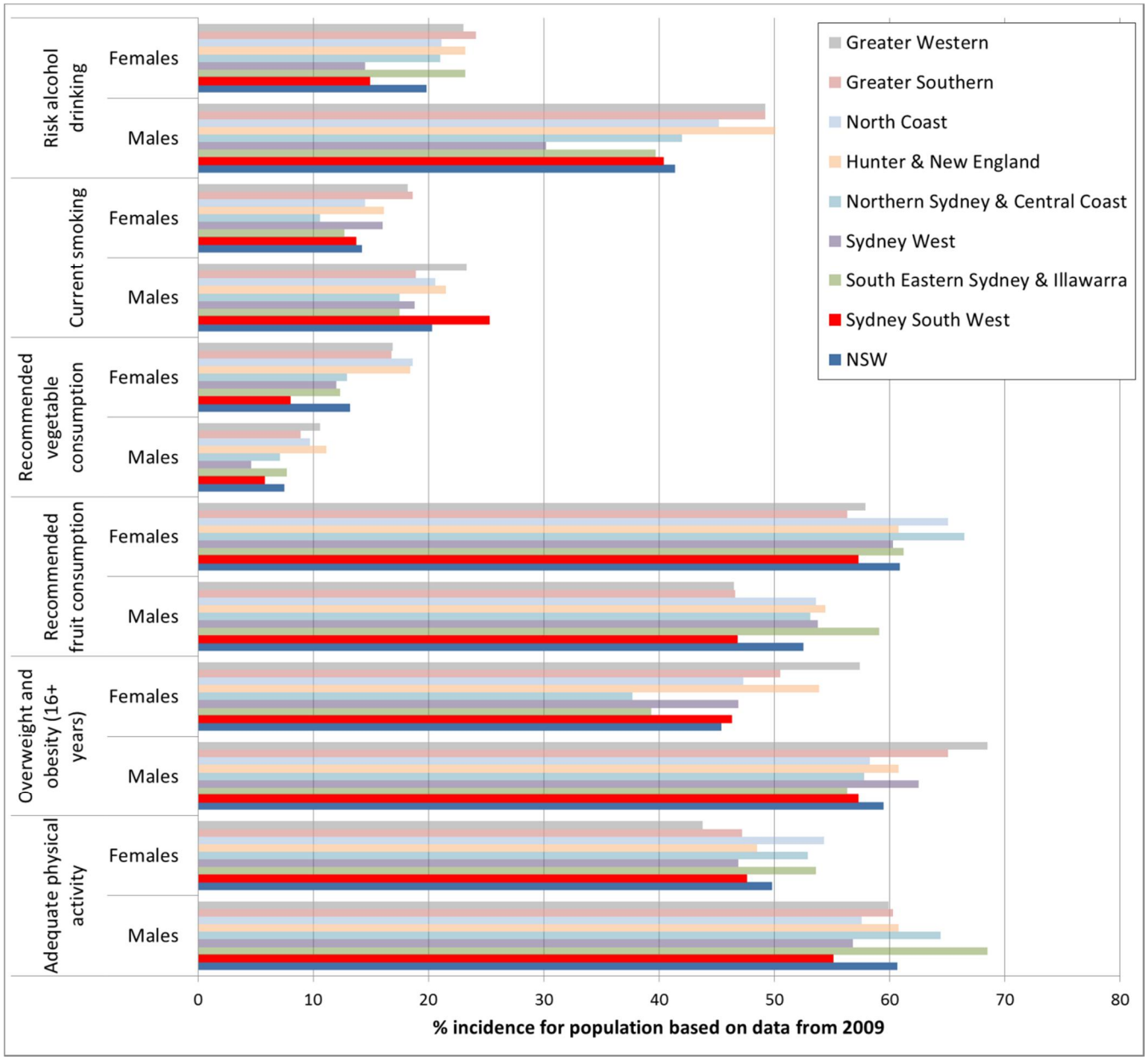


Figure 3.2: Summary of Incidence of Health-Related Behaviours 2009 (source: NSW Health 2010)

Figures 3.3 and 3.4 present a comparison of the rates of the key mortality indicators (all causes, potentially avoidable, cardiovascular disease, lung cancer and chronic obstructive pulmonary disease [COPD in the elderly 65+ years]) and hospitalisations (diabetes, cardiovascular disease, asthma [5-34 years] and COPD [65+ years]) reported in the Sydney South West Area Health Service, with comparison to other NSW area health services (in urban and regional areas) as well as NSW as a whole. **Figure 3.5** presents more refined data on hospitalisations (respiratory disease [including asthma], cardiovascular disease and coronary heart disease) in the local health areas of Liverpool (separated into east and west areas) and Campbelltown (separated into north and south) with comparison against data for Sydney South West and NSW.

Review of this data, with consideration of the observations reported by SWSLHN (2012), indicates the following:

- Mortality[4] rates (all causes and potentially avoidable[5]) reported in Sydney South West, also observed in Campbelltown and Liverpool LGAs, were higher than for NSW;
- In NSW between 1998 and 2007 the incidence rate for all cancers rose by 11% in males, but was stable in females. Higher rates of new cases of lung cancer were reported in Sydney South West (16% higher than the NSW average). It is projected that the number of new cancers in South Western Sydney will increase by 63% in comparison to 42% in NSW.
- Cardiovascular disease accounts for 34% of all deaths in Australia. Mortality rates in Sydney South West for cardiovascular disease are 5% higher than the NSW average and are significantly higher in Liverpool LGA. Cardiovascular disease is higher in Liverpool east, compared with Liverpool west, with the highest rates in the area reported in Campbelltown south.
- Hospitalisation rates for COPD (in the elderly, 65+ years) in Sydney South West are higher than the NSW average, while hospitalisation rates for cardiovascular disease are lower than the NSW average.
- Respiratory disease is higher than the NSW average in Sydney South West with higher rates reported in Liverpool East and Campbelltown (north and south).
- Hospitalisation rates for asthma (5-34 years) are similar in Sydney South West when compared with the NSW average.

[4] Mortality rate is a death rate from all causes that is adjusted to take account differences in age composition within the population considered.

[5] Potentially avoidable deaths are those occurring before the age 75 years, which could be avoided by prevention or clinical interventions

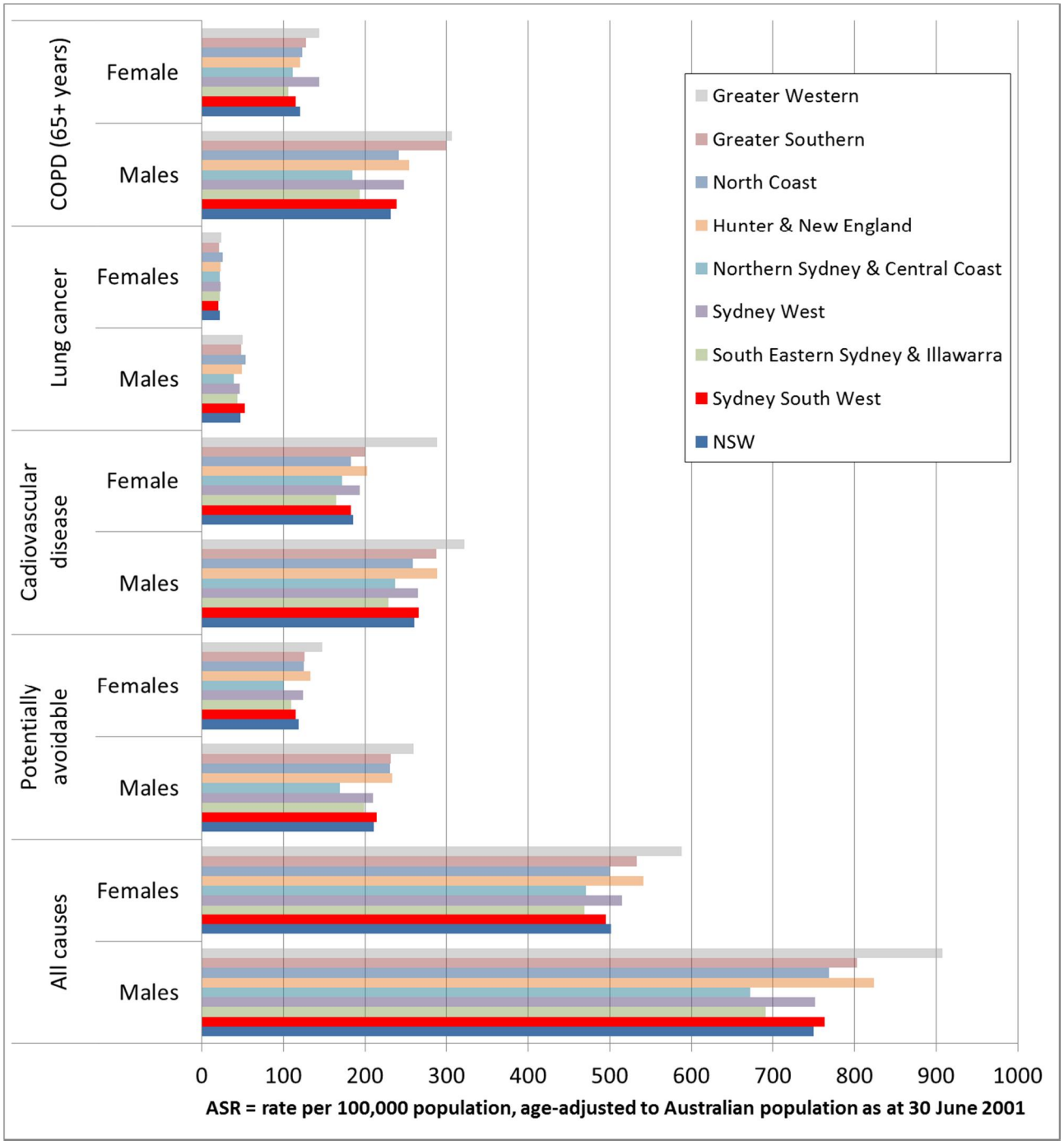


Figure 3.3: Summary of Mortality Data 2003-2007 (source: NSW Health 2010)

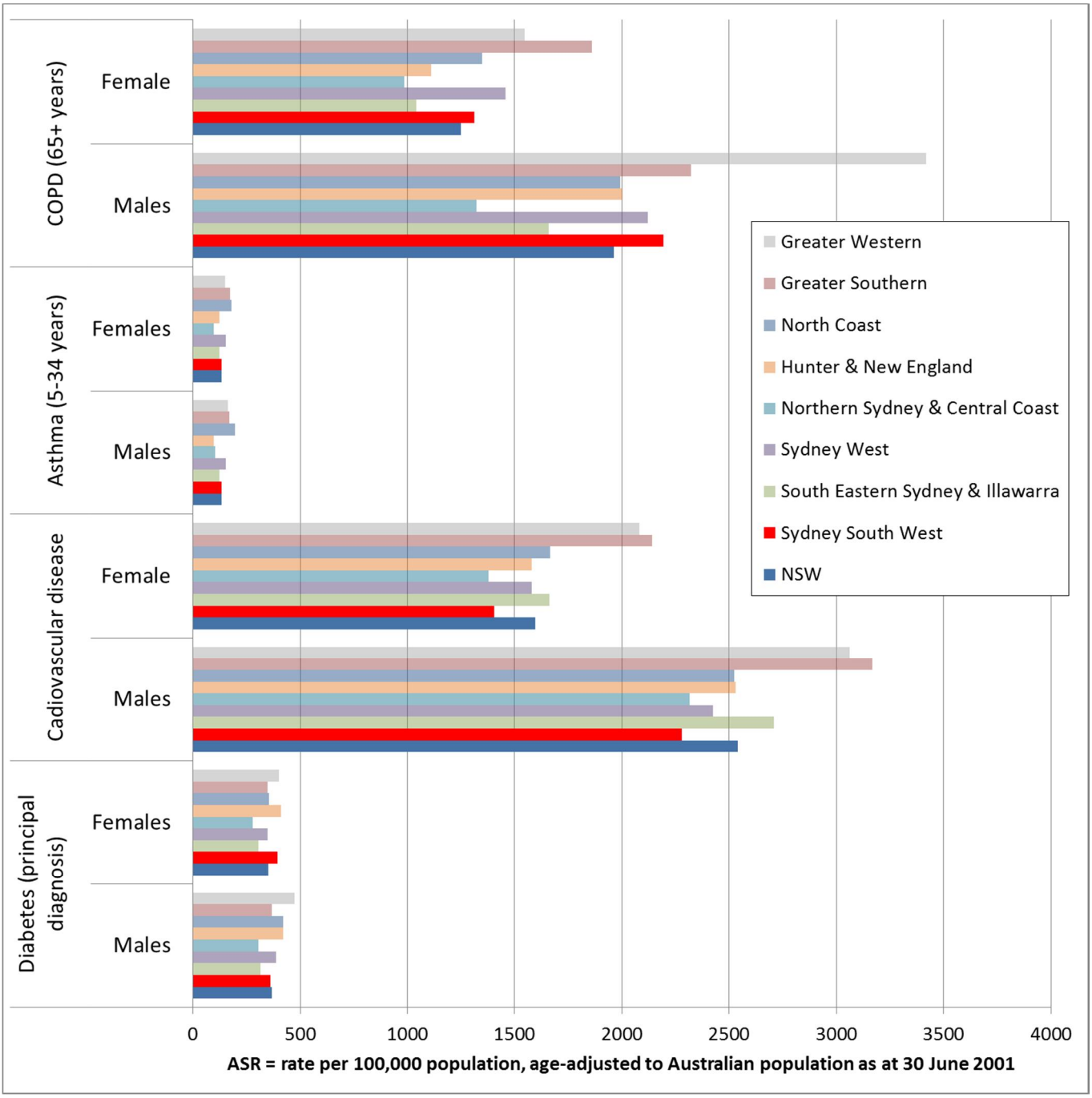


Figure 3.4: Summary of Hospitalisation Data 2008-2009 (source: NSW Health 2010)

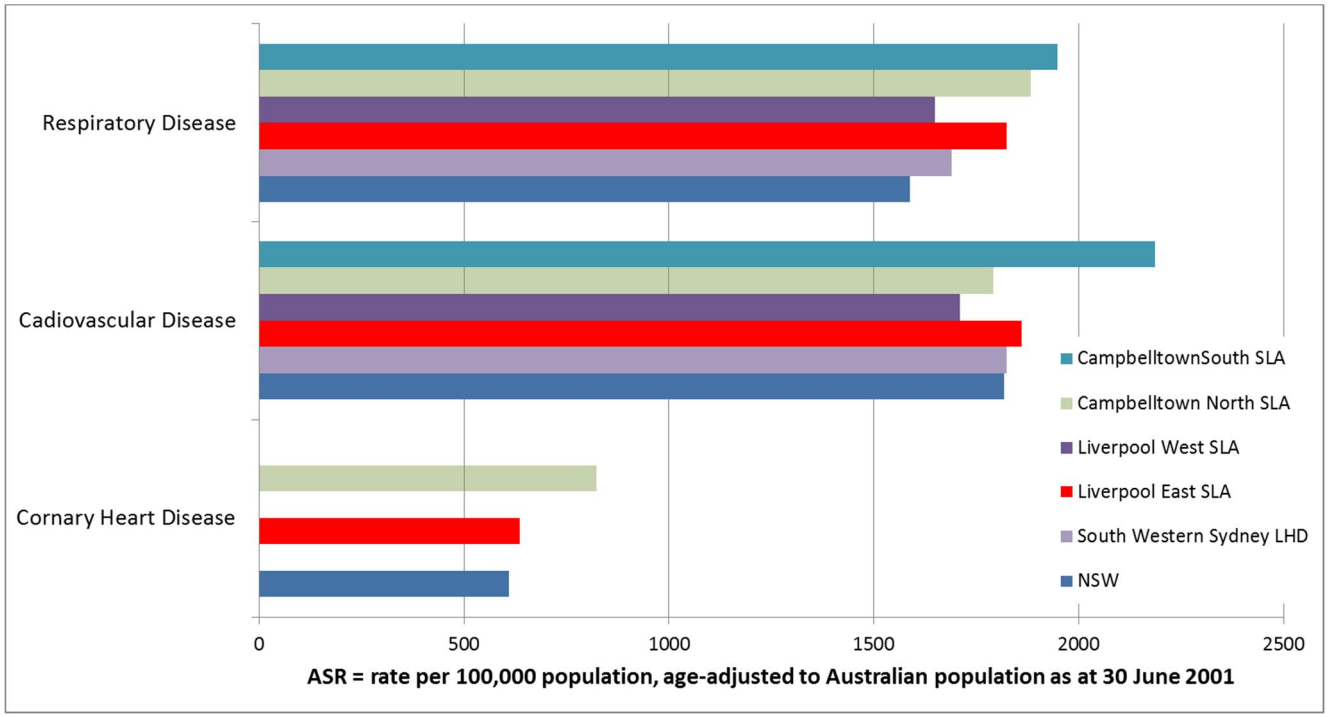


Figure 3.5: Summary of Local Hospitalisation Data 2011 (source: Sydney South West Local Health Area)

In relation to asthma in children, **Figure 3.6** summarises available data in relation to the prevalence and management of asthma in children in the Liverpool and Campbelltown LGAs and the Sydney South West Area with comparison against NSW. These data sets show that children in Sydney South West and Liverpool LGA have lower rates of asthma prevalence than the NSW average, however, they also have a higher rate of reliever medication use and lower rate of preventer medication use suggesting the management of asthma in these areas is poorer when compared with NSW.

It is noted that while the available data in relation to moderate to extreme interference with daily activities suggests that for children aged 2-15 years with asthma in Sydney South West the rate is consistent with that reported in NSW, when more narrow age groups are considered, the following is observed:

- children aged 2-8 years report a higher rate of moderate to extreme interference, with children in Sydney South West reporting the highest rate of interference of all the area health services in NSW;
- children aged 9-15 years report a lower rate of moderate to extreme interference, with children in Sydney South West reporting the lowest rate of interference of all the area health services in NSW.

These data sets suggest that asthma is less well managed in the younger children in this area.

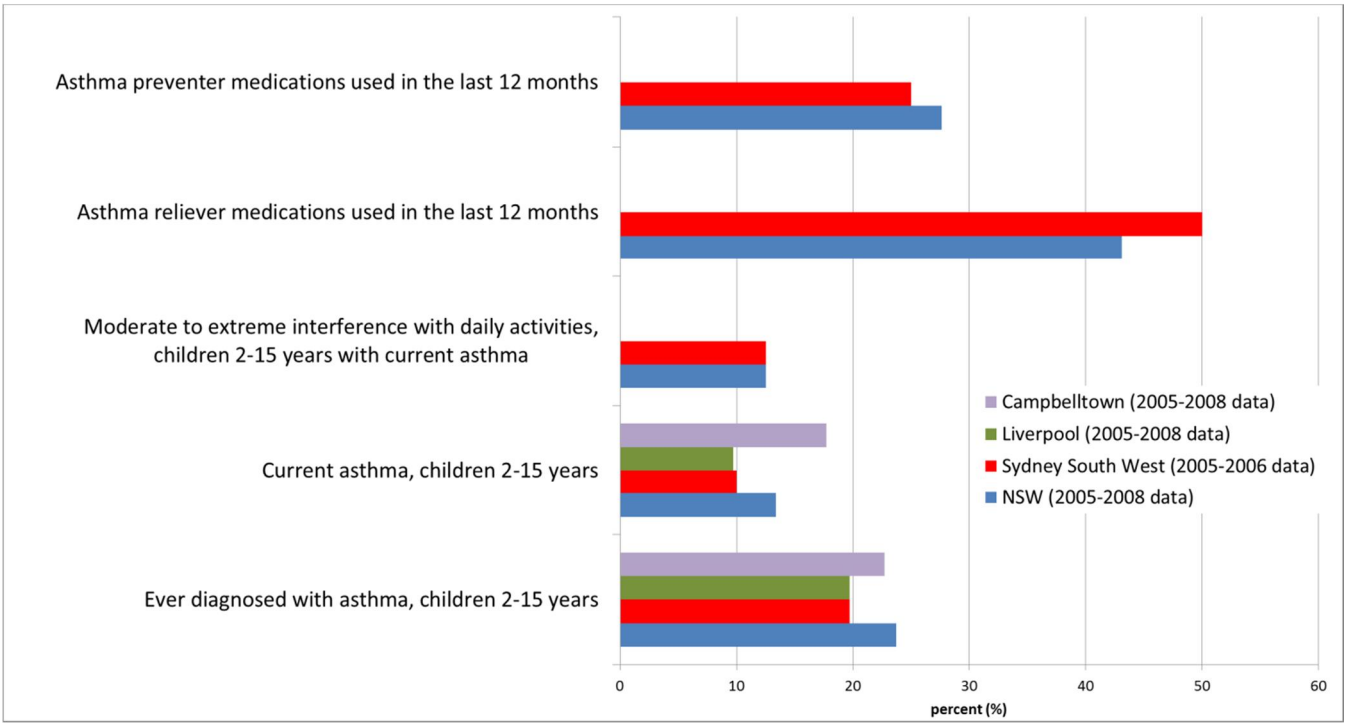


Figure 3.6: Summary of Asthma Prevalence in Children Aged 2-15 years (source: Sydney South West Area Health Service and NSW Health 2008b)

3.6 Consultation Process and Community Concerns

Issues relevant to the local community have been monitored and tracked as part of the Project consultation/communication program as outlined in Chapter 5 of the EIS.

The consultation process has been ongoing and has included the following stakeholders:

- Commonwealth government (Defence, DoE, Infrastructure Australia, Australian Rail Track Corporation [ARTC], DoIRD);
- NSW State Government (NSW Planning and Infrastructure [P&I], TfNSW, EPA, Infrastructure NSW, SPC, DPI, OEH, NSW Rural Fire Service, NSW Health, NSW Treasury, DPC and Ministerial officers);
- Local government (LCC, CCC and Western Sydney Regional Organisation of Councils [WSROC]);
- Utility and service providers (Endeavour Energy, Telstra, Optus, AAPT, Jemena, AGL and Sydney Water Corporation [SWC]);
- Business, infrastructure/utility and other peak organisations (Sydney Business Chamber, NSW Business Chamber and the Australian Trucking Association).

In relation to community consultation a range of activities have been undertaken since 2010 that include:

- A Project website <http://www.micl.com.au/>, is continually being updated to provide information as the Project progresses. The website includes details on the results of the water, air and noise monitoring that been conducted on or adjacent to the site. Outcomes of community consultation sessions (as discussed below) are also presented on the website.

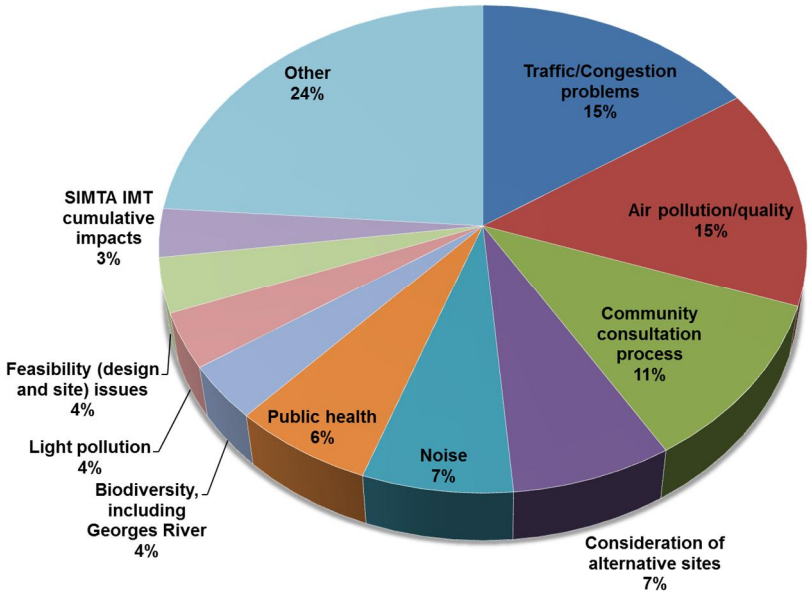
- Communication with community members (who have contacted MIC through the Project website) has occurred through a series of personal briefings for residents, held in January 2011, August 2012 and January 2014. MIC has also responded to enquiries made through the website.
- Community update newsletters have been mailed to all households in communities surrounding the Project site (e.g. Casula, Wattle Grove, Holsworthy and Glenfield) to keep the community up to date on Project milestones. To date five community updates have been mailed to 10,000 residents in August 2011, October 2011, November 2011 and June 2012, and to 12,000 residents in October 2013, and May 2014. The letters also invited the community to the information sessions.
- Five community information sessions held on 28 October 2011, 29 October 2011, 30 October 2013, 2 November 2013 and 7 November 2013. These sessions provided the community with the opportunity to:
    - view information boards about the various aspects of the Project;
    - hear presentations by MIC and the Project team;
    - ask questions about the Project during an open question and answer session;
    - discuss the Project with members of the technical team and ask questions about any potential impacts; and
    - take away fact sheets on some of the technical studies.
- Stakeholder meetings with local community members to address their particular concerns about the Project. This included meetings held on:
    - 17 March 2014 at the Hunts Comfort Inn — seven community members were invited to attend, and two members attended; and
    - 30 January 2014 at the Hunts Comfort Inn — three community members attended.

Information on issues relevant to the proposed Moorebank IMT have been logged from community information sessions, newspaper and community articles, emails, blogs and phone calls.

The key concerns raised by the community and other stakeholders have been reviewed at various stages throughout the preparation of the EIS. **Figure 3.7** presents a summary of the overall issues of concern raised by the community, with the graphical distribution based on information received up to January 2013.

Figure 3.7: Summary of Issues Raised by C**ommunity**

Key Issues
Traffic, transport and congestion problems
Public health
Air pollution/quality
Noise
Biodiversity and the environment, including Georges River
Economic issues such as reduction in property values
Community consultation process
Consideration of alternative sites
Light pollution and vibration
Feasibility (design and site) issues
SIMTA IMT project and cumulative impacts
Other (general objections etc.)



The focus of issues raised by the community (via all methods) related to negative impacts of the Project. A number of the issues related generally to key issues such as lifestyle and wellbeing and negative impacts associated with air pollution, noise pollution and light pollution, however some more specific health issues that have been raised during this process include:

- Health impacts from diesel emissions that include respiratory effects, cancer and mortality;
- Asthma concerns; and
- Impacts on young children.

In addition, issues of inequality have also been raised by the community. These particularly relate to impacts from the Project in an area where it is perceived that there are already high levels of air pollution.

It is noted that further community consultation is planned as part of the EIS process including the conduct of further community information sessions. If the project is approved a Community Engagement Plan will be prepared and implemented by the contractor selected for the construction and operation of the Project. The plan will ensure:

- The community and stakeholders have a high level of awareness of all processes and activities associated with the Project.
- Accurate and accessible information is made available.
- A timely response is given to issues and concerns raised by stakeholders and the community.

Section 4. Screening Level Assessment

4.1 Approach

A screening level HIA has been undertaken to provide an initial evaluation of key health issues addressed in the specialist/technical reports to identify potentially significant positive and negative impacts that may require further evaluation in the detailed HIA. The (screening level) HIA has focused on a number of key health issues that have the potential to be impacted by the Project, that include:

- Economic environment;
- Transport;
- Natural environment; and
- Social environment.

The screening level HIA has been undertaken on the following basis:

- The specialist/technical reports available have been reviewed as follows:
  - The scope and overall assessment has been reviewed and summarised;
  - The potential for impacts in the surrounding community has been identified based on outcomes presented;
  - The nature of the impacts presented, either positive or negative, has been determined; and
  - Where there is the potential for impacts within the surrounding community, these have been further evaluated in the detailed HIA.
- Issues raised by the community and stakeholders have also been considered in the screening level assessment to determine if these have been addressed within the available specialist/technical reports. Where there are data gaps in the expectations of the community and the scope of the specialist studies, or there are impacts that require more detailed assessment, these have been further discussed in the detailed HIA.

The screening level HIA assessment presented is qualitative and has been conducted for the purpose of identifying aspects of the Project that have the potential for impacts within the surrounding community that may require a more detailed assessment (as presented in **Section 5**). Where impacts/outcomes identified can be enhanced (for positive outcomes) or mitigated (for negative outcomes) these measures have been identified (within either the screening level HIA or detailed HIA).

In some cases an impact may be identified in the screening level HIA; however no further information may be available to undertake a further, more detailed assessment. Where this occurs, this has been noted in the assessment presented.

4.2 Economic Environment

Summary of available information

The Moorebank IMT is expected to generate a number of economic, social and environmental benefits for the community and economy, as outlined below and discussed in greater detail in section 3 of the EIS:

- *Economic benefits* – close to $9 billion in economic benefits (before costs and in net present value terms), over a 30-year operational period of the Project, including $120 million a year for the south-western Sydney economy through improved productivity; reduced operating costs; reduced costs associated with road damage, congestion and accidents; and better environmental outcomes;
- *Job creation* – up to 2,600 jobs during construction (1,350 jobs during the IMEX terminal construction and 1,250 during the interstate terminal construction), and approximately 1,700 long-term jobs when the Project is fully operational. Jobs created by the Project and its construction would be located at the IMT itself, as well as within the broad range of industries that would service the IMT construction and operations and its staff, including construction suppliers to retail, financial services, food outlets and health services;
- *Better environment through reduced road congestion* – up to 1,500 fewer truck journeys to and from Port Botany each day, with associated reductions in greenhouse gas emissions and other air pollutants;
- *Social benefits of reducing road traffic and associated noise* along key road freight routes between Moorebank and Port Botany and interstate;
- *Easing the Port Botany bottleneck* to enable the Port to cope with future growth and provide large-scale freight capacity; and
- *Enabling the movement of freight around Australia* – interstate freight is expected to grow by 3.6% a year over the next 20 years.

The development of the Project is intended to increase intermodal capacity in Sydney, and will have a number of flow-on benefits across the freight sector and NSW economy. By providing increased intermodal capacity in Sydney, it is envisaged that the unit costs of transporting containers by rail for IMEX and interstate markets would be reduced, which would lead to an increase in the share of freight movements by rail.

Potential Health Outcomes in Community

The potential health outcomes associated with this aspect of the Project (as outlined for the Moorebank IMT) are positive.

No further assessment of the potential economic impacts is provided in the detailed HIA given an in depth economic assessment was not a requirement for the concept EIS.

The following provides a summary of potential health outcomes associated with the economic impacts outlined above.

The most significant health outcomes in the community are expected to be associated with job creation. While there is evidence to support that finding employment has health benefits, most studies are related to the negative impacts of unemployment. It would seem reasonable that if

unemployment has a range of negative effects then finding employment would have positive effects. Health outcomes from unemployment include increases in the risk of illness and premature death and there are impacts on a range of mental health issues (anxiety, stress etc.) and social aspects of life (lower self-esteem, feelings of insecurity etc.). Finding employment is expected to be associated with improvements in these aspects of health and wellbeing.

Can outcomes be enhanced/mitigated

It is noted that it is likely that the skill sets sought for the construction/operation of the Project are available in the local community. Hence if people in the local community are encouraged to seek employment in any of the construction/operation phases of the Project, this may assist in enhancing the positive health outcomes in the local community.

4.3 Transport

Potential impacts of the Project in relation to traffic in the local community have been evaluated in the Moorebank Intermodal Terminal Traffic, Transport and Accessibility Impact Assessment Report (PB 2014).

The issue of traffic movement/congestion in the local area, and within the supporting road network, has been evaluated, identifying both positive and negative impacts. The potential for local traffic congestion has also been identified by the local community and stakeholders as of potential concern and hence these impacts have been further evaluated in the detailed HIA (refer to **Section 5.2**).

4.4 Natural Environment

Potential impacts of the Project on the natural environment have been evaluated in a range of specialist/technical reports. These reports cover a wide range of aspects of the natural environment that may be impacts by the Project, as outlined below.

4.4.1 Noise and Vibration

Potential impacts of the Project in relation to noise and vibration in the local community have been evaluated in the report: Moorebank Intermodal Terminal Project EIS – Noise and Vibration Impact Assessment Report (SLR 2014).

Vibration

Summary of Specialist Study

The vibration assessment considered potential impacts during both construction and operational phases of the Project. Vibration from the Moorebank IMT development has been assessed in accordance with guidance from the NSW EPA – Assessing Vibration: a technical guidance. This guidance was developed based on British Standard 6472 which has been the international benchmark and is in line with ISO standards and Australian Standards. The criteria developed in accordance with this guidance should protect people from vibration that causes annoyance or discomfort. Effects on amenity occur at lower levels of vibration than those that cause effects on building structure or other damage so criteria based on minimising annoyance and discomfort would also be protective for structural damage caused by vibration.

Based on typical ground vibration levels from plant and equipment to be used at the site and the distance between residents and the Project site, the assessment of potential levels of vibration from both the construction and operation of the IMT (during all phases evaluated, and for all rail access options) has shown that all the works comply with goals for vibration that are required to minimise disturbance and/or damage. It is not likely that potential ground vibration arising from the works would be able to be felt by residents within places of residence.

It is noted that vibration issues associated with the SSFL are outlined and addressed in the *SSFL Operational Noise and Vibration Management Plan* prepared by ARTC in 2011. In addition a Construction Noise and Vibration Management Plan (CNVMP) would be included in the Construction Environment Management Plan. This will include measures to minimise and manage vibration during construction works, including procedures to address community concerns or complaints.

Potential for off-site impacts

There is a negligible potential for off-site impacts from vibration due to the Project. On this basis no further detailed assessment is required.

Noise

Increased noise is one of the key potential impacts associated with this Project. A detailed assessment of construction and operational noise for the conceptual design of the IMT has been undertaken in the specialist/technical report. It identified the potential for impacts (negative) in the surrounding community and identified that a range of mitigation measures are required to minimise the potential operational noise impacts for the closest residential areas (refer to **Section 5.3** for further discussion in relation to these mitigation measures).

As impacts have been identified in this study, and noise has been identified as a key area of concern by the local community and stakeholders, the potential impacts have been further evaluated in the detailed HIA (refer to **Section 5.3**).

4.4.2 Light Spill

Summary of the Specialist Study

Potential impacts of the Project in relation to light spill in the local community have been evaluated in the report: Light Spill Impact Assessment (AECOM 2014).

During construction it is currently proposed that works would only occur during standard construction hours (daytime) unless absolutely necessary (required by Police or RMS or to maintain safety) hence no lighting impacts at sensitive receivers would be expected for construction activities.

In relation to the assessment of the various Phases of the Project, the Moorebank IMT would introduce a new source of light into the area at night. Currently the Moorebank site is mostly unlit at night. The change in use of the site requires installation of lighting to allow operations at night to be undertaken safely.

The impact of this additional light has been assessed (AECOM 2014). The existing light levels were assessed at a number of suburban receivers locations around the site similar to the noise and air

quality assessments (as presented in **Figure 7**). The additional light due to the new development was then modelled and compared to existing levels.

At most locations surrounding the site the increase in light above existing levels was very small. A full moon causes an increase of light of about 0.3 lux while the increased light from this development would be of the order of 0.03 lux at most residential locations. This is due to the proposed lighting design and the use of lighting equipment that minimises light spill.

The situation which might cause impacts to residential areas is the movement of trains at night (where the train headlight may be directed towards some residences) across the rail access spur over the Georges River, particularly where the northern and central rail access options are considered. Minimum impacts are predicted for the southern rail access option due to the greater distance between the train and existing residences.

Potential for Off-site Impacts

During the operational phases of this Project, there is expected to be negligible effects off-site from this development with regard to light spill. The only impact identified is a transitory effect in Casula of headlights from trains crossing the rail spur.

Health Outcomes

Excessive light at night can cause sleep, gastrointestinal, mood and cardiovascular disorders so it is important to ensure light spill is controlled well from new developments (EU 2012 - SCENIHR [Scientific Committee on Emerging and Newly Identified Health Risks], Health effects of artificial light, 19 March 2012).

Can outcomes be enhanced/mitigated

Light spill predictions are sensitive to the installation and aiming of each luminaire and hence the impact of light spill will depend on the final design and implementation. The lighting requirements and specifications should be checked throughout the Project to ensure that it is selected and installed appropriately to minimise light spill.

The specialist study has identified a range of design measures that could be incorporated into the final Project design to minimise light spill in areas surrounding the Project site. These should be considered in the final design of the Project to further minimise impacts from the Project.

Consideration should be given to introducing similar controls on reducing the effect of train headlights as those that have been developed for the residential areas around Port Botany. It is noted that the trains operating as a shuttle between Port Botany and the Moorebank IMT would be required to meet the lighting requirements in residential areas near Port Botany, and hence they are expected to meet lighting requirements in the Casula area.

4.4.3 Air Quality and Human Health Impacts

Increased emissions to air, particularly from diesel powered vehicles, is one of the key potential impacts associated with this Project. Detailed assessments of air quality (local and regional) have been undertaken in the specialist/technical reports, where impacts have been identified and assessed. In addition, impacts on local air quality have been further evaluated in relation to risks/impacts to human health.

Potential impacts of the Project in relation to air quality have been evaluated in the reports: Proposed Moorebank Intermodal Terminal – Local Air Quality Impact Assessment (Environ 2014); Moorebank Intermodal Terminal – Human Health Risk Assessment (enRiskS 2014); Regional Air Quality Impact Assessment (Todoroski 2014).

As potential air quality impacts, and associated impacts on the health of the surrounding population have been identified as a key area of concern by the local community and stakeholders, the potential impacts have been further evaluated in the detailed HIA (refer to **Section 5.4**).

4.4.4 Odour

Summary of Specialist Study

The potential for odours from the site has been considered and is presented within the report Proposed Moorebank Intermodal Terminal – Local Air Quality Impact Assessment (Environ 2014).

Based on the evaluation undertaken, the Project is unlikely to generate odours that could leave the site. Normal operations of the facility as a freight distribution hub are not likely to have the potential to generate odours. In the event of a prolonged power outage, where perishable good are stored at the site, there is the potential for odours to be generated from spoilt perishables. During construction activities such as excavating contaminated soil or using an asphalt plant to construct hardstand, have the potential to generate odours. These scenarios/activities would only occur for short periods of time.

During remediation of the site, prior to construction, the primary types of contamination that need to be removed are soils contaminated with metals and/or asbestos. Neither of these types of contamination would generate odours.

The operation of a small scale sewage treatment plant on the site may be associated with intermittent/short-term localised impacts. Odours from the plant are to be controlled through implementation of Best Management Practice (BMP).

The potential for unacceptable odours from the construction and operation of the Project (over all phases and rail access options) is considered to be very low.

Potential for off-site impacts

There is a negligible potential for off-site impacts from odours for the Project. On this basis no further detailed assessment is required.

4.4.5 Contaminated Land

Summary of Specialist Study

Previous activities at the site have resulted in some soil and groundwater contamination. Underground and above ground storage tanks for petroleum products, filling of vehicles, use of vehicles and other heavy machinery, fire fighting training, waste disposal and munitions training has resulted in a variety of contaminants being present in soil and groundwater at the site.

The change of use at the site provides an opportunity to address the existing contamination and remove relevant sources.

An extensive site investigation has been undertaken. Firstly work was undertaken in 2006, then in 2011 further investigations were undertaken to confirm findings and fill in gaps. It has been found that petroleum related contaminants, metals, asbestos, unexploded ordinance (UXO), exploded ordinance waste (EOW), blank munitions and the components of fire fighting foams are present due to activities at the site while chlorinated solvents are present potentially due to activities at neighbouring properties.

A preliminary remedial action plan (RAP) has been prepared for the site to address the presence of contamination at the site (as Appendix F to the Phase 2 Environmental Site Assessment, PB 2014). The Preliminary RAP includes the following goals:

- to remove and manage identified UXO/EOW in accordance with an UXO management plan (to be developed and implemented in conjunction with the RAP
- to identify, remove and validate underground storage tanks (USTs) and associated fuel supply infrastructure as per the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008* (UPSS Regulation)
- to remove known asbestos mounds that have been identified during previous investigations, to mitigate the potential for mixing of these materials into graded soils and to mitigate the occupational risks associated with handling asbestos impacted materials
- contamination 'hotspot' removal, comprising excavation of soil/fill materials that were identified to be impacted by contamination, to render these areas suitable for commercial industrial land use
- to appropriately manage/remediate contaminated materials that are found unexpectedly during Project works that were not identified during previous site investigations in accordance with the contingency measures outlined within the RAP
- to consider and apply sustainability principles with a view to minimising off-site disposal of materials and maximising reuse of material on-site
- to validate/assess materials on-site in order to evaluate suitability for beneficial reuse without off-site disposal
- to undertake additional investigations to augment the existing data relating to potential acid sulphate soil, surface water quality, residual sediments and groundwater to inform if any additional control, management or remediation measures to be implemented during future development.

The final extent and methods adopted for the remediation of the site will depend on the final construction design. It is expected that the new IMT facilities would require much of the site to be

covered with hardstand (roads, rail tracks and parking areas) which will further control access to and remaining contaminated soil or groundwater and limit potential contamination in the future.

Potential for off-site impacts

The development would provide the opportunity to address contamination at the site so the overall health outcome is positive. No off-site impacts are associated with existing contamination at the site. In addition, the measures outlined in the RAP mitigate the potential for off-site migration of contamination during any remedial or construction works. Hence provided the RAP is implemented on the site, no off-site impacts relevant to contamination are identified at the site.

On this basis, no further detailed assessment is required.

4.4.6 Green Space and Ecology

Summary of Specialist Study

The Project site is located with the Sydney Basin Bioregion, within the Cumberland Plain. It is located within the residential suburbs of Casula, Wattle Grove and North Glenfield and includes land that is used for agriculture, commercial and industrial purposes as well as areas used by the Department of Defence. Prior to 1788, the Liverpool district was home to the Cabrogal clan and Darug tribe. The first land grants in the Liverpool area were between 1798 and 1805. Since the middle of the nineteenth Century, the Cumberland Plain has undergone extensive clearing, grazing and disturbance for agricultural, urban and industrial development.

Much of the vegetation at the site has been cleared already and replaced with roads, buildings, playing fields and grassed areas. Substantial areas do remain along the riparian zone next to the Georges River. There are some other areas which provide some connections to wider areas for the ecological community.

Some recognisable ecological communities were found to be present at the site, particularly Castlereagh Scribbly Gum Woodland and Riparian Forest. Some threatened flora and fauna species were found or are expected to be found in these areas.

A range of noxious weeds were also found at the site which would be expected for such a site.

The Project would enable the maintenance and rehabilitation of the riparian zone that is integral to the site as a conservation zone along the Georges River. This area of the site would also be involved in providing flood mitigation which will also ensure it is left uncleared. Only the rail spur crossing the river will be constructed in this area. The rest of the conservation zone will be left as is or rehabilitated. Extensive replanting would be required.

Currently, the community has no access to the site including the green space given that it is a Department of Defence site. There are no current plans for access to these areas, however, access may be further considered in future designs. The riparian zone will be retained to protect ecological communities and for flood management. The rehabilitation of this area will add positively to the visual impact of the site.

The construction environmental management plan would include measures to minimise harm to the flora and fauna at the site. An ecologist will be involved in supervising vegetation clearing to ensure

no additional areas are cleared and that fauna in the area are removed prior to clearing. Relevant trees with hollows will be identified across the site prior to clearing to minimise the potential for impacts on organisms during removal. Animals would be relocated by specialists.

In addition, to manage the construction of the IMT carefully to minimise impact on the flora and fauna, a series of offset areas where ecological communities would be maintained and improved will be set aside. The proposed offsets cover an area of approximately 150.6 ha and include:

- Restoration and management of the Georges River riparian zone (38.6 ha) including the eastern side of the River corridor from approximately 300 m south of the M5 Motorway for a length of approximately 2.5 km south to the East Hills Railway Line (within the Project site);
- Active management for biodiversity conservation of a parcel of land (84.3 ha) located immediately to the east of the Project Site (east of Moorebank Avenue) including the eastern portion of Lot 3001 DP 1125930; and
- Licence for the management for conservation of land (27.7 ha) within Lot 2 DP 1048198 on the north east side of Heathcote Road opposite Holsworthy Barracks (off site).

A riparian restoration plan would be developed during the detailed design of the site and implemented.

Potential for off-site impacts

The potential for off-site impacts primarily relates to changes to visual amenity, and perceptions in the local community to these changes. Changes in the amenity of an area may be associated with positive and negative health impacts, particularly in relation to community wellbeing, anxiety and stress.

The Project involves a change from an open/vegetated landscape to one that is a mix of built environment and vegetated landscape. A number of vegetated areas located on and adjacent to the site (on the banks of Georges River) are proposed to be improved, which is likely to improve the visual character of these landscaped areas. The nature of visual landscape (i.e. the proposed changes to the vegetated areas along the Georges River, the visibility of the development from more areas surrounding the site) can be perceived in different ways by different people, and hence the changed landscape may be considered a positive or negative impact. On this basis, no further detailed assessment is required.

4.4.7 Landscape Character and Visual Impact

Summary of Specialist Study

Potential impacts of the Project in relation to visual impact in the local community have been evaluated in the report: Moorebank Intermodal Terminal Landscape Character and Visual Impact Assessment (Clouston 2014).

Currently the site is largely cleared with Defence buildings of various sizes and a maximum height of 15m. The buildings are surrounded by gardens and lawns. Some areas of the site where training occurs are fairly scarred and dusty. There is a golf course at the southern end of the site and a light industrial area at the northern end. The eastern boundary of the site is Moorebank Ave which has mature street trees and well maintained gardens and lawns. The western boundary of the site is the Georges River where the riparian vegetation is well established.

The new development requires the clearing of 42 ha within the main part of the site to construct the roads, rail tracks and buildings. This will reduce some areas of remnant vegetation. In addition the Project would lead to an increase in the scale, height and bulk of structures within the site. The locations identified as those with the greatest potential to be visually impacted by some aspect of the Project are:

1. Southern section of Leacock Regional Park
2. Leacock Regional Park and associated residential properties within the parklands
3. Carroll Park and associated residential properties backing onto the park
4. Central section of Georges River Casula Parklands (northern rail alignment option only)
5. St Andrews Park and associated residential properties near the park and along the eastern edge of roads parallel to the Southern Sydney Freight Line.
6. Junction of M5 South Western Motorway and Moorebank Avenue.

Visual impacts for the Casula Powerhouse Arts Centre are also expected to occur.

Assessment suggests that there is a moderate/high potential visual impact to a limited number of Casula based residential properties who overlook the site due to distance, existing visual barriers and topography. The greatest visual impact would be on the public parks and associated residential properties that are situated on the elevated land west of the Georges River. Direct views over the development will be available from properties directly adjacent to Leacock Park and Carroll Park. The most prominent views of the Project would be at localised site boundaries and public parks overlooking the site.

Potential for Off-site Impacts

There would be some changes in the visual characteristics of the area, as noted above as well as in **Section 4.7**. The site is already light industrial in nature, however, the nature of the landscape would change and the development will be visible from more areas surrounding the site than is currently the case. This can be perceived as a negative outcome for some members of the community.

Can outcomes be enhanced/mitigated

Mitigation measures that may be considered in the Project design (on the site) include maintaining vegetation, landscaping zones, setbacks along Moorebank Avenue, use of screening on the site, consideration of the use of lower, more frequent light poles to mitigate light spill and ambient light, consideration of localised earth mounding, choice of finished and materials (to limit contrast with the surrounding landscape) and encourage higher buildings fronting Moorebank Avenue and Anzac Road to provide a visual buffer from terminal operations.

4.5 Water Quality and Hydrology

Summary of Specialist Study

The Project has the potential to affect water quality and the hydrology of the area as it is in the floodplain of the Georges River.

The Project design requires an increase in the area of hardstand at the site compared to the current scenario and the installation of an additional bridge across the Georges River. The potential for water related impacts mostly involves the potential changes to areas that may be affected by flooding in extreme events. There is also the potential for water quality impacts on stormwater.

Flooding:

Flooding has been carefully considered in the design of the Project. Consequently, the design of the site has been arranged to ensure compliance with regulations for managing flood potential which require the provision of space to accommodate flooding to ensure no change in flood levels from the current situation. In particular the establishment of a dedicated conservation area between the Georges River and the 1% AEP (or 1% annual exceedance probability[6]) design flood level (where no development will occur with the exception of the rail access) will minimise the potential for the Project to impact on flooding, and minimise the impact of regional flooding on the Project.

Addition of a rail spur across the river, either at the northern, central or southern end of the Project site, is the main structure proposed for the site that could impact on flooding in the region due to the potential constriction on flows during high flow events. The specialist study undertaken identified that for the southern and northern rail access options impacts on regional flooding within the Georges River are considered acceptable. However, further assessment, design considerations and mitigation would be required for the central option.

The design of the bridge therefore, proposes that the bridge be set at an oblique angle across the river. The deck of the bridge will also be set at least 0.5m above the 1% AEP flood level in accordance with the relevant design standards. In addition to these, the study recommends that further refinement of the bridge and associated infrastructure is undertaken in the later stages of design to minimise flood risks upstream of the bridge.

[6] A 1% AEP flood has a chance of occurrence in any year of 0.01. This is the same as a 100 year average recurrence interval (ARI) or a 100:1 flood event.

Stormwater Management and Water Quality:

For the construction phase (primarily Phase A) of the Project it is proposed that temporary sedimentation basins are built in the locations of the permanent basins, then converted to permanent structures for the operational phase.

Once developed, much of the site (excluding the conservation zone) would be covered by hardstand (roads, rail tracks, parking areas) or buildings. This has the potential to result in an increase in the potential runoff during storm events compared to the current situation. However, the plan for the site includes a detailed stormwater management system including sedimentation and bio-retention basins so there would be no net increase in runoff from the site. This system is designed to prevent water quality impacts on the currently "stressed" condition of the Georges River.

Stormwater from the current Defence site discharges directly into either Anzac Creek or Georges River. With the development of the proposed Project, stormwater from the site will not be discharged directly to the environment. Stormwater at the site would be collected and treated through sedimentation ponds and bio-filtration basins. There will also be swale drains and gardens across the site to encourage infiltration of some of the water into those areas of the site that are not covered by hardstand. The use of wetlands to further polish the stormwater quality and the collection of roof rainwater for reuse are other possible measures that could be implemented at the site. Additional treatment of stormwater may be needed in specific areas of the site depending on the uses and this will be considered during further detailed design stages. The proposed stormwater management system enables control of the water quality of any stormwater that is discharged to the local environment of Georges River.

The proposed stormwater management system would also allow water reuse opportunities to be maximised at the site reducing the site's demand for non-potable water.

Potential for off-site impacts

There is potential for off-site impacts from water management at the site if the proposed design, including proposed mitigation measures, is not implemented.

Health Outcomes

The location of the site within the floodplain of the Georges River means it is possible the Project may increase the potential for flooding, resulting in negative health outcomes in the area unless it is designed appropriately. While the Project has considered these issues and the design has already incorporated measures to manage and mitigate flooding, in the event that these were not fully implemented, possible health outcomes associated with flooding include the potential for increased property damage, stress and anxiety, loss of income due to business shutdowns, loss of jobs and increased potential for injury and death are possible.

Appropriate design of the site and incorporation of flooding considerations in the design of structures that have to span the river would reduce these potential negative health outcomes so that there is no change in health outcomes in this area. The maintenance of the conservation zone along the river, development of an extensive stormwater management system at the site (including the re-

use of stormwater, reducing demand on water resources in the local area) and the careful design of the rail spur would all ensure the health outcome of this Project would be neutral to positive.

Can outcomes be enhanced/mitigated

Mitigation measures identified in the specialist study to minimise adverse flooding impacts in the Georges River system as well as minimise stormwater runoff and impacts during construction works should be implemented within the CEMP. A range of mitigation measures have also been identified for the operation of the Project. These mitigation measures should be considered in the Project design and operation.

Ensuring the detailed design of the bridge and stormwater management system for the Project site meet flooding and water quality requirements would add to the potential for positive health and environmental outcomes for this Project. Also maintenance of the conservation zone, as proposed, would provide numerous health benefits – those related to appropriate flood management and those related to a pleasant living environment.

4.6 Hazardous Materials Management

Summary of Specialist Study

It has been decided that dangerous goods freight would not utilise the IMT development. As a result, hazardous materials that are likely to be present at the site relate mostly to fuels for the various methods of transport at the site. They include various fuels at the proposed service station. Also, within the site, diesel and LNG storage would be required for rail and truck refuelling. There is also a natural gas pipeline in Moorebank Ave, access to which will be part of this development. There is also likely to be a requirement for carbon dioxide to be stored on site for fire fighting purposes.

The assessment of risk around the gas pipeline indicates that significant effects are only likely within 25m of the pipeline should it fail and no residences are within that zone.

The other hazardous material that required more detailed assessment under the Planning guidelines was the LNG storage. It would be placed in the equipment maintenance and storage area which is a significant distance from the various places that might be impacted – about 100m from the East Hills railway line, 400m from Moorebank Avenue and 1km from the nearest residence. The distance from the storage tank, given its size and construction, where effects might be seen should it fail is 25-50m. These distances meet the requirements outlined in the Planning guidelines.

On the Project site a range of management and mitigation measures have been identified to ensure hazards and risks for workers on the site are minimised.

Potential for off-site impacts

There is negligible risk for off-site impacts from the hazardous materials likely to be stored at the site as part of this development. On this basis, no further detailed assessment is required.

4.7 Waste Management

Summary of Specialist Study

The assessment of waste management associated with the Proposed Project is outlined in the Waste and Resource Management chapter of the EIS (Chapter 26).

In common with most large developments, this Project would generate waste during construction and operation. Appropriate consideration of the various types of waste and methods of management will ensure that impacts of such waste will be negligible.

During construction, waste streams would include demolition waste, green waste, sewage, litter, paper, recyclables and a range of contaminated materials and military materials. During operations waste streams would include green waste, waste associated with maintenance of plant and equipment, waste from refuelling, warehousing and distribution facilities like packaging waste. Other waste like paper and food waste and sewage will also be generated.

Discussion of the management of the contaminated materials and military waste is covered above under contaminated land.

The waste management hierarchy would be applied to all aspects of waste management at the site. The waste hierarchy involves consideration of the opportunities to reduce, reuse, recycle or recover materials before just disposing of materials that are not needed any further to landfill.

During construction a waste management plan would be prepared to facilitate the reduction, reuse or recycling of demolition waste.

During operation a waste management system will be implemented to govern the overall usage of materials at the site and maximise reuse and recycling of materials. Waste storage areas will be included in the design and they will be big enough to enable appropriate storage of waste materials for reuse and recycling. Water sensitive urban design principles will help ensure a site design that keeps stormwater as clean as possible and reduces the use of potable water. As part of the development a sewerage management system will also be constructed to ensure sewage is managed in compliance with all relevant regulations.

Potential for off-site impacts

With appropriate waste management as outlined, the potential for off-site impacts from waste resulting from the Project should be negligible. On this basis, no further detailed assessment is required.

4.8 Sustainability, Lifestyle and Social Environment

4.8.1 Summary of Specialist Study

Housing and accommodation:

A potential increase in population in the area could result in an increase in demand for housing. Currently, most of the local area has low to moderate housing density while some areas of Liverpool have higher housing densities with a higher proportion of flats and units. Almost 8% of the housing is public housing. In some suburbs up to 50% of the housing is rented accommodation. The level of unoccupied private dwellings is 4.2% for the Liverpool LGA.

It is expected that there will only be a small potential for an increase in demand for housing due to the Project due to the small expected increase in population and the current availability of rental accommodation.

Change in demographics:

Modelling estimates that the terminal, at full build in 2030, will would generate approximately 2173 direct jobs. Indicative workforce numbers (administrative, operational and maintenance) during full operations indicates approximately 374 positions for the IMEX, 290 positions for the interstate operations and 1509 positions for warehousing. Additional staff will be required during the construction phases of the project with the peak daily workforce estimated to be up to 1236 during the Project Phase B works.

Ninety per cent of the staff who will work at the site during operations are expected to be involved in warehousing and IMT operations – including supervisors, those involved in manual handling and loading/unloading as well as maintenance staff. The rest of the workforce will be those who work in the offices undertaking clerical duties. The breakdown of occupational skills in the Liverpool LGA correlate to the skills required. The most common occupation groups reported in the Liverpool LGA are Clerical and Administrative Workers (17.5%), Technicians and Trades Workers (15.7%), Professionals (15.4%) and Labourers (10.5%). Potentially the workforce can comprise both local and non-local employees. It is possible that a focus could be placed on employing local people as the local community is likely to have the skill set required.

During construction there will be a requirement for specialist staff – trades, engineers and Project managers. It is not expected that all construction workers will relocate to the area as there will be a portion of workers who come from the LGA as Technicians and Trades Workers (15.7%) is the second largest occupational group in the Liverpool LGA with Labourers (10.5%) as the fourth largest group.

It is possible that a small increase in population could occur in the local area as a result of this Project if non-local staff decide to move into the area rather than commute. However, as noted in **Section 3.3**, from 2008-2028 a significant increase in population is predicted for the Liverpool (54.4%) and Campbelltown (40.9%) LGAs, regardless of the presence of the Moorebank IMT. Hence any increase in population associated with the Project would be insignificant by comparison.

If the SIMTA development were also considered, this will result in additional jobs (with up to 4058 from both terminals in cumulative scenario 3) once fully operational. It is anticipated that impacts

relating to employment opportunities will have a positive effect on the local and regional community with the inflow of more employment opportunities.

The larger working population in the area as a result of both the Project and SIMTA may have an impact on local rents and housing affordability.

Demand on medical, health and emergency services and infrastructure:

It is not expected that the Project will change the level of demand for medical, health and emergency services in the area. A slight increase in population is possible if workers move into the area from other locations but the change will be too small to see a detectable change in demand for these services.

It is noted that the Western Sydney Regional Organisation of Councils has identified that Western Sydney has relatively less access to health services and GPs compared with the rest of the Sydney metropolitan area. This situation will not change (for the better or worse) due to the Project.

Demand on education services:

It is not expected that the Project will significantly increase the demand for education services in the area. The area is well serviced for schools with a total of 29. The slight increase in population if people employed at the site from out of the region move into the area will be able to be accommodated.

The closest TAFE with relevant courses is located in Macquarie Fields. The TAFE at Liverpool does not offer any building or construction courses (which would be relevant for skills required during construction works associated with the Project). There is the potential for the Project to facilitate opportunities to assist in delivering courses at these TAFEs relating to trades and services required during construction and operational phases of the Project and therefore create an increase in enrolments, and potentially increase employment of local workers.

Property values:

There is likely to be a slight increase in demand for rental accommodation during the construction of the Project as specialist staff are needed for particular parts of the Project requiring short to medium term accommodation.

While it is noted that there is concern in the local community as to the impact of the Project on house prices, there are many factors that influence housing prices in an area. Given the complexity of these factors, it is not possible to predict if the project will have any positive or negative impact on housing prices in the local area.

Regional and state infrastructure:

Long-term regional benefits (positive impacts) associated with the Project have been identified including:

- Savings in operating costs in freight transport;
- Improved freight service reliability and availability;
- Reduced costs derived from road congestion, damage and accidents; and

- Potential for increased employment opportunities in south-western Sydney.

Recreation and social infrastructure:

Currently, the site is not accessible to the public for recreation and this is not proposed to change. A number of groups access various areas around the site.

The Royal Engineers Golf Course (which is not currently publicly accessible) is a Department of Defence facility and it will be closed as a result of this Project.

Various parks exist along the western side of the river and in other locations around the area. The key areas of community concern include the Casula Power House Arts Centre and the Georges River and Casula Parklands. There are existing community perceptions that the Project could potentially impact on the enjoyment of the facility and the area through the construction period and also during operation from noise from the terminal, traffic increases, train increase.

Other infrastructure that could be potentially impacted includes the Royal Engineers Golf Course located on the Project site; the NSW Barefoot Water Ski Club, which operates on the Georges River upstream of the Liverpool Weir; as well as impacts on visual amenity from Leacock's Park in Casula which is a public space for the local community.

The views from these parks/areas may change somewhat once facilities are constructed at the site but from most of these parks/areas it is the more distant views that change. It is unlikely that the Project will affect the use of these spaces.

The Barefoot Water Ski club makes use of the Georges River adjacent to the development site. This group may be affected while the rail spur is being constructed over the river but otherwise their access to the river will not be changed by this Project.

Severance (i.e. a real or perceived barrier or physical separation between people and places) to the Casula Powerhouse Arts Centre is currently experienced due to the physical barrier of the rail line and park lands. This may be worsened by the central or northern rain access, however this can be mitigated in the detailed design of the rail access option selected. In addition during construction, works should be managed top minimise impacts on access to the Powerhouse and adjacent park lands.

Local traffic:

As noted in the traffic impact assessment, during the construction phase there is the potential for temporary (short-term) impacts on local traffic as a result of the Moorebank Avenue upgrade and Project related associated construction works. Additional enhancements at some intersections will be required if both the Project and SIMTA developments proceed. There could be local traffic congestion in Casula during Phase A when the rail bridge is constructed on the western side of the Georges River. These impacts can be managed.

The existing congestion on the M5 motorway is expected to get worse over time as general traffic volumes grow with or without the Project proceeding. The Moorebank IMT would facilitate the distribution of freight to western Sydney by transferring the origin from Port Botany to Moorebank. As a result, the change in freight related truck movements generated by the Moorebank IMT on the

M5 would be minimal. These movements would be present on the road network originating from Port Botany if the Moorebank IMT was not developed.

In the longer-term the operation of the Project has the potential to result in:

- Increased capacity of Moorebank Avenue to cater for the increased vehicle movements from the Project as well as expected increased local congestion. When fully operational vehicle movements associated with the Project will be spread over 24 hours, reducing impacts on the local area;
- A significant increase in the local workforce, forming a critical mass for increasing bus services to the local area. This may result in increased services for the local community; and
- The new pedestrian and cycleway facilities on Moorebank Avenue may increase use of alternate forms of transport due to increased access and safety.

Community stress and wellbeing:

Although it may not be representative of the entire community, there has been a significant level of community opposition to the project with emotions such as anxiety, fear and stress observed at public community forums.

It is anticipated that this level of stress will decrease as the project progresses once concerns can be alleviated through management of any adverse impacts. Ongoing dialogue and engagement with the community in decision making aspects of the development will build community understanding and acceptance if they have had the opportunity to influence the outcomes.

4.8.2 Potential for off-site impacts

Outside of impacts addressed separately within individual technical studies associated with key aspects of the Project, it is likely that there will be negligible to low impacts on the social supports in the local community due to this Project.

It is noted that a key aspect of social impacts relates to perceptions, trust and effective communications. It is therefore important that community consultation is continued and uses a range of techniques that are tailored to the various sub-populations that have particular areas of concern or particular characteristics that make normal methods of communication less effective.

4.8.3 Can outcomes be enhanced/mitigated

While impacts on the social structure of the local community are not predicted to be significant, the following aspects can be considered to enhance potential positive impacts identified:

- Advocacy for the improvement of bus services to the area to cater for the additional workforce prior to existing services being overloaded. Such advocacy could evaluate the potential bus routes to assist the local community in accessing existing and planned recreational areas.
- Evaluate the proposed upgraded pedestrian and cycleway facilities on Moorebank Avenue to ensure that they connect through to existing or proposed facilities. This will enhance the usability and access of these alternate forms of transport in the local area.
- Establish links with the local TAFEs to facilitate opportunities to assist in delivering courses directly relating to trades and services required during construction and operational phases

of the Project and therefore create an increase in enrolments, and potentially increase employment of local workers.

- Investigate the potential to include a requirement for the provision of employment opportunities for the local area in the constructors' tender specification and contracts.
- Measure and track the proportion of local jobs during construction and operation that are filled by local residents. This data would allow stakeholders to make informed decisions regarding strategies to enhance and stimulate local employment.

In relation to community consultation, this may be improved with consideration of the following:

- Develop a programme of 'community outreach', with planned visits to community groups, local area meetings and community events.
- Develop a 'Community Alerting System' so that that key shareholder groups and the local community are kept informed of developments.
- The local population has a high level of non-English speaking homes and hence it is important that information related to the Project is provided in a number of languages relevant to the population in the area.
- Develop a mix of universal (e.g. information available of project website) and targeted (e.g. providing information of languages other than English, visiting sensitive receivers etc.) approaches to communication so that all members of the community (that include a range of ages, education and ethnicity) have the opportunity to obtain information relevant to the Project. These methods may include providing information through local community centres and on the internet (including the use of social media).
- Monitoring data (on air quality and noise) is currently being collected for the purpose of monitoring and evaluating impacts in the local community and is made available on a website. The continuation of this monitoring program throughout the construction and operational phases of the Project is recommended.
- Monitoring data for air quality, noise and traffic should be regularly reviewed against the guidelines developed in the specialist studies supporting this Environmental Assessment as they are based on protecting the health of the community. Should exceedances be identified in these key indicators as a result of the Project, then it is recommended that a further and more targeted monitoring and management program be developed as required.
- Provide an accessible overview (e.g. written in plain English and other appropriate languages) of the relationship between the identified exposures and potential health impacts (noise, air quality, traffic).
- A complaints process to be set-up for the duration of the construction works, and for a few years of full operation. It is recommended that a dedicated worker (who has a good understanding of the Project and is effective at communicating and following up on concerns) is employed to monitor and handle complaints from the local community during this period. Complaints, responses and all follow-up should all be logged during this period and made publically available. This process will assist in providing a measure of community concern (and potential levels of anxiety) and a mechanism for consistent communication with concerned individuals.

Section 5. Detailed HIA

5.1 Approach

Where potential impacts (and/or issues of concern in the local community) have been identified in the screening level assessment that requires detailed evaluation, a more detailed review and evaluation of potential impacts and health outcomes has been undertaken. This has involved a more detailed evaluation of the specialist/technical study and potential health outcomes.

The screening level HIA (presented in **Section 4**) has identified the following aspects of the Project that require more detailed evaluation:

- Traffic;
- Noise; and
- Air quality and human health risk assessment.

These aspects are further evaluated in the following sections.

In addition the issue of cumulative impacts associated with both the IMT Project and the SIMTA project are of particular concern to the local community and hence these impacts have been further discussed in this section.

5.2 Traffic

5.2.1 Impact on Moorebank Avenue

Summary of Specialist Study

The Moorebank IMT would accept freight from Port Botany by rail and distribute freight within the site and western Sydney by truck. The focused transport and traffic activity associated with the Moorebank IMT would have an impact along Moorebank Avenue, but relatively minor impacts elsewhere on the surrounding transport network. How the logistics industry responds to the Moorebank IMT, through changes in surrounding land use such as the relocation of warehousing throughout Western Sydney etc., is currently unknown. Currently, these warehouses are likely to be widely spread and therefore the individual impacts associated with their transport and traffic activity at the local level would be relatively minor. It is noted that truck movements from the IMEX and Interstate operations are not new trips, without Moorebank IMT these movements would be associated with trips to and from Port Botany and so would already be on the highway network (as opposed to having originated from the Moorebank IMT).

The section of the M5 over the Georges River between Moorebank Avenue and the Hume Highway can be a bottleneck within the motorway network. This is due in part to the substandard distance available for the weaving movement of vehicles joining and leaving the motorway. This is expected to become worse with the planned widening of the M5 to the east and west of this location. The issues associated with the capacity of the M5 over the Georges River would occur regardless of any intermodal terminal developments along Moorebank Avenue.

The proposed development intends to use Moorebank Avenue as the main access route to the site. Currently Moorebank Avenue has just one lane each way so the increase in traffic on this road due to this development has been carefully considered. Currently Moorebank Avenue is congested and

some of the intersections are already at capacity. Without the development of the Moorebank IMT, no upgrade would occur so this unacceptable level of congestion would continue.

To address the predicted increases in traffic volumes on Moorebank Avenue associated with the Project, improvements to Moorebank Avenue and its intersections are proposed. These improvements include:

- widening Moorebank Avenue to a dual carriageway, four-lane road with two lanes in each direction, between the M5 intersection and the southernmost site access road;
- substantial upgrades to the existing intersections especially the intersection of Moorebank Avenue and Anzac Road; and
- new access points to the Moorebank IMT to separate trucks from other light vehicles.

The first phase of the Project (Project Phase A) would involve construction activities associated with upgrades to Moorebank Avenue. The maximum delay in traffic during construction is expected to occur in 2016 during these upgrade works. These impacts can be mitigated through the implementation of a Traffic Management Plan.

Once the Moorebank Avenue upgrade is completed, this road and its intersections should be well sized to cope with all stages of the Moorebank IMT development and operations. In addition standard operating practices would be put in place for truck movements requiring the use of particular entry points depending on which part of the facility is being accessed. Exiting of the facility (which is from different locations for trucks and cars) would be limited to a left hand turn from at least some of the access points.

Once the Project is completed in 2030, the Moorebank IMT traffic is not predicted to have a significant impact on most of the intersections in the vicinity of Moorebank.

The development plans for the IMT include provision of parking for workers on the site at all stages. Residential areas are far enough from the site that it is unlikely that site workers or road workers (during the Moorebank Avenue upgrade) would be likely to park in these areas as it would be too far to walk to the site. If there is a need for offsite parking it is likely to occur around the light industrial developments near the site.

The Moorebank IMT facility will not have any heavy vehicles travelling to or from Cambridge Avenue. All heavy vehicle movement will be to and from the north along Moorebank Avenue. There will be some Moorebank IMT light vehicle movement to and from Cambridge Avenue however the predicted increase in light vehicle volumes is minimal and will not impact on Cambridge Avenue road capacity into the future.

Strategic modelling undertaken in 2012 indicated that in 2031 the following approximate daily network-wide benefits of transferring containers to Moorebank by rail would be:

- a saving of 56,125 truck vehicle kilometres travelled (VKT) per day
- a saving of 1,265 truck vehicle hours travelled (VHT) per day.

This is accompanied by a daily saving of approximately 2,530 VHT for other traffic across the Sydney road network. The vehicle kilometres for non-truck traffic increased by approximately 10,670 VKT. This is probably caused by traffic migrating from adjacent routes to take advantage of the

reduction in the number of trucks and congestion along the M5 and the other routes benefitting from the reduced truck numbers.

While there will be an increase due to traffic generated by the warehouse developments on the Moorebank IMT site, this increase would have little impact on the performance of the road network beyond Moorebank Avenue due to the proposed upgrades to Moorebank Avenue.

Assessment of the combined traffic associated with the operation of both the Moorebank IMT and the SIMTA IMT (based on the three operational scenarios considered) indicates that the traffic volumes generated could be accommodated within the proposed upgrades to Moorebank Avenue for Cumulative Scenarios 1 and 2. In relation to Cumulative Scenario 3 (where an interstate freight terminal and 3000,000 m^2 warehousing is on the Moorebank IMT site and the SIMTA development operates as proposed) this option has the greatest potential to impact on the performance of Moorebank Avenue. If this scenario were considered mitigation measures in the form of intersection upgrades for the Moorebank Avenue, Anzac Road and Bapaume Road intersection will be required.

Potential for Off-Site Impacts

There is a potential for off-site impacts particularly during the first few years of development of the Project, while the modification of Moorebank Avenue is underway.

Health Outcomes

The health outcomes of this Project overall with regard to traffic on Moorebank Avenue are positive in the medium to long term as development of this Project would ensure the upgrade of Moorebank Avenue. This upgrade would mean the increase in traffic along this road which would have occurred even without the development would be accommodated as will the increased traffic due to this development. The health benefits of good management of traffic on this route include stress relief/anxiety reduction and improved perception of safety on this road and in the area.

It is noted that these positive outcomes may be limited due to the increased use of Moorebank Avenue by heavy vehicles, potentially increasing stress levels in drivers of smaller passenger vehicles who share the road.

In the short term, however, some of these health outcomes would not be realised as the duplication of Moorebank Avenue and the initial construction phases of the IMT would initially cause a likely increase in congestion along this route. These negative outcomes are of short duration only during the first 2-3 years of the Project.

Can outcomes be enhanced/mitigated

Impacts during the early years of the Project can be mitigated. Construction Traffic Management Plans (CTMP) would be developed for each development phase to provide additional information for the construction planning of the Moorebank IMT and the upgrade of Moorebank Avenue. Numerous CTMPs are potentially required to address the traffic impacts of individual components of the different stages.

The following mitigation measures to provide additional information during the construction stages should be considered in developing the CTMPs:

- Modify access locations in response to the development of the Moorebank Avenue upgrade. During this stage numerous access locations may be required for the transportation of spoil and material.
- Maximise use of the Moorebank IMT site for the construction of the Georges River rail bridge to minimise heavy vehicle movements through Casula residential roads.
- Reducing the volumes of construction vehicles during peak periods, especially if the increase in traffic generated by construction activities impedes on the operation of Moorebank Avenue.
- Maintain access to neighbouring properties. This is particularly important that the ABB site has access throughout the construction stages as the proposed works have potential to affect their operation.
- Provision of alternate suitable pedestrian, cycle and public transport facilities during the construction of Moorebank Avenue upgrades retaining well defined and well signed routes, paths and bus stop locations.
- Develop a communication plan to provide information to the relevant authorities, bus operators and local community. This is particularly important as there is potential for multiple contractors to be present on site at any one time. The communication plan will need to incorporate a contact list with the chain of command.
- The implementation of Traffic Control Plans (TCP) to inform drivers of the construction activities and locations of heavy vehicle access locations. Variable Message Signs (VMS) and advertisements in local papers may be required to provide advanced warning of the proposed works.
- Obtain Road occupancy licences (ROL) for the upgrade of Moorebank Avenue. A TCP and potentially a Speed Zone Authorisation (SZA) application will need to be prepared for the ROL applications.
- Develop an emergency response plan for the upgrade of Moorebank Avenue during Project Phase A. During this stage, emergency vehicles using Moorebank Avenue as a transport route will need to be considered, as well as emergency access to adjoining properties

5.2.2 Congestion

Summary of Specialist Study

Currently, containerised freight arrives at Port Botany by ship and is transferred to trucks with some rail movements. Much of the truck traffic ends up on the M5 to move freight through Sydney and NSW. The Project would reduce the traffic around Port Botany by providing rail capacity and moving all containers from Port Botany to the Moorebank IMT by train. Truck traffic would then commence from Moorebank rather than Port Botany.

The modelling of potential benefits across the Sydney road network of transferring containers from Port Botany to Moorebank by rail shows that there would be a saving in truck vehicle kilometres travelled per day and in truck vehicle hours per day. Other savings in the number of hours trucks are on the road is possible across the Sydney road network in other regions. It is also possible that there will be additional light traffic in some areas taking advantage of decreased congestion.

Congestion along Moorebank Avenue is discussed above and is the major traffic impact thought to result from this Project. Congestion in other areas is considered to be increased negligibly. It is estimated that the increase in traffic on the M5 during AM and PM peak periods for full operations

(i.e. from 2030) would be less than approximately 3%, probably less, which is not considered substantial. Most trucks accessing the M5 would have been on the M5 anyway from Port Botany without this development.

The initial stages of construction include some site access to construct the rail spur on the western side of the Georges River (with the level of access required varying from 10% [of construction] for the southern rail access to 40% for the northern rail access option). This would involve some access through local roads in Casula between the site and the Hume Highway. This would need to be carefully managed to ensure that any impacts are minimal. It is proposed that access will be from within the site (i.e. from the eastern side of the river) as much as possible. Controls required to ensure access through Casula will be developed in the Construction Environment Management Plan.

The Project has sufficient parking provision on-site to cater for the expected staff numbers during each shift. The issue of truck parking on Moorebank Avenue has been mitigated by the design of the internal road system which includes service roads designed to accommodate trucks which arrive at the site but for some reason, are unable to proceed directly to the entry gates.

Potential for off-site impacts

There is the potential for off-site impacts from traffic congestion.

Health Outcomes

Congested traffic has the potential to impact on health in a number of ways. Increased anxiety, reduced air quality, increased noise, and poor perceptions of an area due to safety issues are all possible.

This Project involves an increase in rail transport of containers from Port Botany to Moorebank which results in a significant reduction in truck vehicle kilometres (65,000 truck vehicle kilometres per day) and hours (1,850 truck vehicle hours per day) in the Port Botany area and across the wider Sydney road network. These benefits will have a positive impact on the area of Port Botany and regional roadways. However, the Project does have the potential to increase traffic in the local Moorebank area.

Planning of this Project has developed an approach to enable the network wide benefits to be achieved without unreasonable impacts in the local area. Assessment of impacts on the M5 predicted less than 3% increase in traffic generated from the Moorebank IMT during the morning and afternoon peak hours. This impact is considered to negligible in relation to the operation of the M5. Overall, congestion on the wider road network is predicted to be unaffected or improved by the Project due to the increased use of rail transport.

The potential for increased congestion along Moorebank Avenue has been addressed by the proposed upgrade.

It is noted that within the local area Cambridge Avenue is a 2 way (single lane each way) local road, owned by LCC and Campbelltown City Council, which crosses the Georges River to the south of the site via a low lying bridge that is prone to flooding. Existing traffic volumes on this road, that provides a link from Glenfield to Moorebank Avenue, are already at their maximum. Congestion on this local road will not be impacted by the Project as the design of the IMT does not allow for

southbound heavy vehicle movements, however, it is noted that it will also not improve (as there are no plans to improve capacity of the road).

Overall the health outcomes of the Project related to traffic congestion should be positive as long as all the proposed mitigation measures are implemented.

Can outcomes be enhanced/mitigated

Particular attention would need to be placed on mitigation measures during the first couple of years of the Project as the upgrade to Moorebank Avenue is constructed at the same time as initial construction at the site is underway. Such measures are expected to be detailed in the relevant CTMP and should include consideration of scheduling vehicle movements for the Project outside of peak hours and other similar measures.

The Project is predicted to have a small impact on the traffic volumes on the M5 (as many of the trucks from the IMT would already have been present on the road network as it would have been generated from Port Botany). The M5 is currently a bottleneck in the motorway network and while widening activities are proposed, the full benefits of these works on traffic congestion may not occur. Should congestion on the adjacent M5 motorway network continue to be an issue then the operator of the Moorebank IMT could consider scheduling more vehicle movements to occur outside of peak periods when congestion is less likely to occur on the M5.

It may be possible to investigate opportunities with relevant stakeholders to alleviate current local congestion issues associated with Cambridge Avenue (access to Moorebank Avenue from Glenfield).

Advocate for the improvement of bus services to the area to cater for the additional workforce prior to existing services being overloaded. Such advocacy could evaluate the potential for bus routes to assist the local community in accessing existing and planned recreational areas.

Evaluate the proposed upgraded pedestrian and cycleway facilities on Moorebank Avenue to ensure that they connect through to existing or proposed facilities. This will enhance the usability and access of these alternate forms of transport in the local area.

Community consultation on traffic issues should include building linkages with businesses along Moorebank Ave so that they are fully aware of potential issues during construction.

5.2.3 Road and Rail Accidents

Summary of Specialist Study

The reduction in travel distance and time for heavy vehicles has the potential to reduce the impact of the contributing factors associated with accidents (fatigue and speeding). It would also assist in reducing the number of potential conflicts along existing travel routes between light and heavy vehicles.

The duplication of Moorebank Avenue and controls on how trucks access the IMT site would also reduce the potential for accidents locally. Proposed treatments along Moorebank Avenue include controlling right hand turns with traffic lights, providing right hand turn lanes, upgrading signal displays, separated left turn deceleration lane, installing appropriate street lighting, limiting access to

roadside developments from the road, new signage, non-skid road surfacing and installation of reflective raised pavement markers to indicate the centre and edge of lanes. Not only would these controls be installed as part of the upgrade of the road but controls on how truck drivers access the site would also be implemented. Different parts of the site would only be able to be accessed from particular intersections and trucks would only be allowed to leave the site to the north (i.e. left hand turn).

Potential for off-site impacts

The potential for road accidents is expected to be reduced.

Health Outcomes

A reduction in road accidents would have a positive health outcome.

Can outcomes be enhanced/mitigated

None required.

5.3 Noise

5.3.1 Summary of Specialist Study

The following presents a summary of the evaluation presented in the Moorebank Intermodal Terminal EIS, Noise and Vibration Impact Assessment Report (SLR 2014).

Existing Noise Environment

Initially the assessment evaluated the existing noise environment by measuring ambient noise at six locations relevant for residential areas (i.e. sensitive receivers) adjacent to the site. Both attended and unattended noise monitoring was undertaken. Attended monitoring allows for the identification of existing sources of noise, such as cars or powered equipment very close to the noise meter etc. in order to well characterise the existing noise environment at the monitoring locations. Consistent with regulatory guidance, unattended noise monitoring is used to quantify the existing noise environment across the whole day. Since July 2012 continuous (long-term) unattended monitoring has been occurring at three of these locations to provide further input to the consideration of noise for this Project. A total of 20 months of ambient noise monitoring data has been obtained to determine the existing noise environment surrounding the Project site.

The existing noise environment is characterised by local and distant road traffic noise, train pass-by events, noise from within the residential communities with no existing industrial noise observed. The night-time noise environment is the most sensitive period when the background noise levels within the residential communities are low.

The measured day time, evening and night time noise levels, reported as Rating Background Levels (RBL) and ambient noise levels are then used when establishing representative noise assessment goals for the Project. The RBL and ambient noise levels reported during this monitoring are listed in **Table 5.1**.

Table 5.1 RBL and Ambient Noise Levels in Residential Areas Surrounding Proposed Moorebank IMT Site

Monitoring Location	RBL, dB(A) $L_{A90,\ 15\text{-minute}}$			Ambient Noise Level, dB(A) $L_{Aeq,\ 15\text{-minute}}$		
	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am
L1 Aitape Place Wattle Grove	39	33	30[1]	54	50	50
L2 Goodenough Street Glenfield	41	41	35	59	55	54
L3 Todd Court Wattle Grove	57	54	46	62	61	58
L4 Corryton Court Wattle Grove	38	39	37	56	46	47
L5 Buckland Road Casula	41	39	32	57	53	52
L7 Corryton Court Wattle Grove[2]	35	36	32	55	49	46
L8 Goodenough Street Glenfield[2]	35	37	33	48	47	44
L9 Buckland Road Casula[2]	39	39	33	55	54	53

Notes

Values expressed as A weighted dB and rounded to nearest 1 dB(A)

L_{A90} = A-weighted sound pressure level exceeded for 90% of the time (background)

L_{Aeq} = equivalent continuous (energy average) A-weighted sound pressure level

Note 1: The lowest RBL recommended by the NSW INP is 30 dBA.

Note 2: Monitoring location from the continuous noise monitoring survey

Location 3 (L3) represents locations currently affected by noise from the M5 while Location 4 (L4) measured noise from existing rail operations on the East Hills Railway Line and Location 5 (L5) represents areas with audible rail noise from the Main South Railway Line.

It is understood that the Australian Rail Track Corporation (ARTC) is completing a post commissioning monitoring survey to determine the current rail noise levels from the SSFL. The outcomes of this survey were not available to MIC at the time the technical paper was prepared for this Project.

Noise Assessment Criteria

Noise issues in NSW are managed by the NSW EPA. They have prepared a number of guidance documents with regard to the types of noise being generated at the Moorebank IMT site. The NSW Industrial Noise Policy, the NSW Road Noise Policy, and the Interim Construction Noise Guideline are all relevant to the assessment of noise generated by this Project. Recently, the NSW EPA released the Rail Infrastructure Noise Guideline which has now also been considered for the Project. In all these policies there is discussion of the need to balance the economic and social benefits of activities that may generate noise with the protection of the community from the adverse effects of noise. These guidelines were developed using the WHO Guidelines on Community Noise (2000) and the Environmental Health Council of Australia's guidance – The health effects of environmental noise – other than hearing loss.

The NSW Noise Policy sets out two noise criteria:

- To assess the potential for disturbance (referred to as an intrusive criterion). This criteria is based on existing noise levels measured as RBL ($L_{A90,\ 15\text{-minute}}$, dB(A)) at sensitive receivers (adjusted to account for potentially annoying noise characteristics). This criterion applies to the assessment of residential areas only; and
- To manage noise amenity relevant to specific land uses (referred to as an amenity criterion). This criterion is designed to preserve noise amenity of the land use and protect against noise impacts such as community annoyance and speech interference. The criterion is

based on existing ambient and background noise levels ($L_{Aeq,\ 15\text{-}minute}$) at receivers not affected by industrial noise. This criterion applies to all land uses considered in the assessment.

The assessment of sleep disturbance has been undertaken on the basis of the "Application Notes – NSW Industrial Noise Policy". The criterion adopted is intended to be used as a guide to identify the likelihood of sleep disturbance. Where the criteria are exceeded further work is required to determine the number of times this may occur during the night time period.

For the Industrial Noise Policy, the criteria developed using the guidance are based on protecting at least 90% of the population from the adverse effects of noise for at least 90% of the time around an industrial source of noise.

For the Road Noise Policy, the criteria have been developed to provide protection inside and immediately around permanent residences and at schools, hospitals and other sensitive land uses. The criteria are based on a level where 90% of residents should not be highly annoyed by the noise from traffic.

The Interim Construction Noise Guideline provides a range of work practices suited to reducing the usually temporary noise impacts from construction. The temporary nature of such noise does mean that it is not as amenable to some noise control measures as other more permanent facilities. The criteria that are provided are designed to protect most people close to construction from unacceptable noise most of the time.

The Rail Infrastructure Noise Guideline includes criteria based on more recent WHO guidance – Night Noise Guidelines for Europe (2009)[7] which provides recommendations for upper levels during the day (for existing residents, classrooms, places of worship, childcare facilities and aged care facilities) and includes a recommended a target of 55 dB(A) for airborne noise at night.

Noise Impacts during Construction

The noise assessment predicted the potential levels of noise during construction using an understanding of the types of equipment likely to be present and how they would be used along with known noise levels put out by these different types of equipment. The cumulative levels of noise from all the different types of equipment were then determined to assess potential impacts at receivers.

During the proposed Early Works activities, for all proposed construction works with each of the rail access connection layouts, the predicted noise levels at nearest residential receptors, and non-residential receptors, in Casula, Wattle Grove and Glenfield comply with the daytime noise management levels. Hence no specific noise mitigation measures are required for the Early Works activities.

[7] available at http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf

During other phases of Project construction (Phases A to C) the following impacts have been identified:

- Phase A: noise impacts above the noise management levels were identified at Casula (during piling and construction of the IMEX rail tracks for all rail access options) and Glenfield (during piling).
- Phase B: noise impacts above the noise management levels were identified at Casula (during piling) and Glenfield (during piling).
- Phase C: noise impacts above the noise management levels were identified at Casula (during piling and construction of the interstate rail tracks) and Glenfield (during piling).

Reasonable and feasible noise management measures will need to be developed to reduce the noise to acceptable levels during construction activities.

Additional noise mitigation might be required if:

- Rail construction works are undertaken within 500 m of residences in Wattle Grove or North Glenfield or within 475 m of residences in Casula;
- Noise generating construction works are undertaken outside standard day time construction hours;
- Measured construction noise levels trigger the residential or non-residential noise management levels to be applied at the site; or
- Measured construction noise levels from the Project at the nearest residences are greater than 75 dB(A) $L_{Aeq\ 15\ min.}$

Such additional controls can be fully detailed in the Construction Environment Management Plan.

The Project proposal has included a series of mitigation measures that if fully implemented are likely to result in compliance with the Noise Policy (for intrusive noise and sleep disturbance). These are outlined in **Section 5.3.4**.

Noise Impacts during Operations

Operational activities have been assessed on the site during Phase B, Phase C, Phase D (full build) and the cumulative SIMTA scenarios. The Noise and Vibration Impact Assessment Report has considered impacts during both neutral and noise enhancing (adverse) temperature inversion meteorological conditions. Impacts predicted during neutral meteorological conditions are more likely to occur. However during the early morning and night-time of the winter months, potential temperature inversion conditions may enhance the propagation of noise, where noise impacts may be enhanced and are considered adverse meteorological conditions. While the Noise and Vibration Impact Assessment Report has considered both conditions, the key concern to the local community is during adverse conditions (especially as these conditions are more likely during evening and night-time) and hence the following summary relates to impacts predicted during adverse meteorological conditions. Impacts predicted during neutral meteorological conditions are noted to be 1 to 3 dBA lower than during adverse conditions.

The operating capacity (and times of operations) of the Project differs in each of these scenarios and hence operational noise impacts associated with each of the scenarios has been evaluated:

- Phase B: the assessment identified noise impacts in excess of the adopted noise level criteria at Casula (associated with all rail access options and all meteorological conditions), Wattle Grove (all rail access options under adverse meteorological conditions only) and Glenfield (associated with the southern rail access option and under all meteorological conditions). The Project should consider feasible and reasonable noise mitigation measures to reduce noise levels during adverse meteorological conditions by up to 13 dBA L_{Aeq} at Casula, 4 dBA L_{Aeq} at Wattle Grove and 2 dBA L_{Aeq} at Glenfield (Southern Rail Access design only).
- Phase C: the assessment identified noise impacts in excess of the adopted noise level criteria at Casula (associated with all rail access options and all meteorological conditions) and Wattle Grove (all rail access options under adverse meteorological conditions only). The Project should consider feasible and reasonable noise mitigation measures to reduce noise levels during adverse meteorological conditions by up to 15 dBA L_{Aeq} at Casula and 4 dBA L_{Aeq} at Wattle Grove.
- Phase D: the assessment identified noise impacts in excess of the adopted noise level criteria at Casula (associated with all rail access options and all meteorological conditions), Wattle Grove (associated with all rail access options and all meteorological conditions) and Glenfield (associated with the northern and southern rail access option and under adverse meteorological conditions only). The Project should consider feasible and reasonable noise mitigation measures to reduce noise levels during adverse meteorological conditions by up to 16 dBA L_{Aeq} at Casula, 6 dBA L_{Aeq} at Wattle Grove and 3 dBA L_{Aeq} at Glenfield (Southern Rail Access design only).
- Cumulative SIMTA scenarios:
    - Scenario 1: the assessment identified noise impacts in excess of the adopted noise level criteria at Casula and Wattle Grove. The Project should consider feasible and reasonable noise mitigation measures (at both the Moorebank IMT and SIMTA IMT) to reduce noise levels by up to 9 dBA L_{Aeq} at Casula and 5 dBA L_{Aeq} at Wattle Grove.
    - Scenario 2: the assessment identified noise impacts in excess of the adopted noise level criteria at Casula. The Project should consider feasible and reasonable noise mitigation measures (at both the Moorebank IMT and SIMTA IMT) to reduce noise levels by up to 7 dBA L_{Aeq} at Casula.
    - Scenario 3: the assessment identified noise impacts in excess of the adopted noise level criteria at Casula and Wattle Grove. The Project should consider feasible and reasonable noise mitigation measures (at both the Moorebank IMT and SIMTA IMT) to reduce noise levels by up to 10 dBA L_{Aeq} at Casula and 1 dBA L_{Aeq} at Wattle Grove.

An assessment of sleep disturbance associated with operations at the Project site determined that the maximum predicted noise impacts comply with the sleep disturbance criteria in all offsite community locations.

The Project proposal has included a series of mitigation measures that if fully implemented are likely to result in compliance with relevant noise criteria. These are outlined in **Section 5.3.4**.

Noise along Rail Spur

As part of the Project a rail access spur is to be constructed to connect the Project site to the SSFL. The rail access to the project site has been evaluated for three options, northern, central and southern rail access.

Assessment of noise levels associated with the operation of the rail access connection to the SSFL identified the following:

- Phase B: all predicted noise levels at receptors in Casula, Wattle Grove and Glenfield comply with the daytime, evening and night-time amenity noise criteria for the central and southern rail access options. For the northern rail access option all receptors comply with the noise criteria except for the receptor at Lakewood Crescent where evening and night-time noise levels exceed the adopted criteria by up to 9 dBA. Mitigation measures will be required to address these impacts.
- Phase C: all predicted noise levels at receptors in Casula, Wattle Grove and Glenfield comply with the daytime, evening and night-time amenity noise criteria for the central and southern rail access options. For the northern rail access option all receptors comply with the noise criteria except for the receptor at Lakewood Crescent where evening and night-time noise levels exceed the adopted criteria by up to 16 dBA. Mitigation measures will be required to address these impacts.
- Phase D: all predicted noise levels at receptors in Casula, Wattle Grove and Glenfield comply with the daytime, evening and night-time amenity noise criteria for the central and southern rail access options. For the northern rail access option all receptors comply with the noise criteria except for the receptors at Lakewood Crescent, St Andrews Boulevard and Buckland Road where evening and night-time noise levels exceed the adopted criteria by up to 17 dBA. Mitigation measures will be required to address these impacts.

In relation to the impact of rail noise form the rail access connections on sleep disturbance, the assessment undertaken identified the potential for sleep disturbance impacts to occur at the nearest receptors (Lakewood Crescent and Buckland Road in Casula) to the northern rail access option. Sleep disturbance criteria were met at all other community receptor locations and rail access options. It is recommended that a detailed assessment of sleep disturbance impacts is undertaken during the further noise impact assessments for the future approvals and detailed design for the northern rail access connection. If this option is selected mitigation measures may be required to reduce and control maximum noise levels in these areas.

The Project proposal has included a series of mitigation measures that if fully implemented are likely to result in compliance with the relevant noise criteria. These are outlined in **Section 5.3.4**.

Noise along SSFL

Rail movement of containers from Port Botany to Moorebank will occur along the SSFL, which officially opened in January 2013. Potential rail noise from the SSFL was considered during the approval of the SSFL project, as detailed in the *SSFL Operational Noise and Vibration Management*

Plan prepared by ARTC in 2011[8]. The assessed rail noise levels in the noise and vibration management plan are representative of SSFL operations including the capacity for IMEX and interstate rail freight. The assessment of noise levels associated with the operation of the SSFL (and presented in the noise and vibration management plan) identified the following:

- Predicted noise levels in the locality of Buckland Road, Marsh Parade, Ashcroft Avenue, Dunmore Crescent, Leacocks Lane and Slessor Road in Casula, at the Casula Arts Centre and at 122 Railway Parade in North Glenfield triggered the investigation of measures to mitigate potential rail noise levels.
- To mitigate rail noise levels at these receptors an acoustic barrier 4 m in height was proposed from the southern extent of Carroll Park to Casula Station. Architectural treatment of the Casula Powerhouse Museum and 122 Railway Parade was recommended.

Road Noise

The assessment of road noise has considered the impact construction and operational activities associated with the Project utilising the existing road network (using light and heavy vehicles). Some receptors have been identified to be impacted by existing road traffic levels from the M5 Motorway. Based on the separation distances to nearest receptors and measured existing ambient noise levels, potential road traffic noise levels from Moorebank Avenue (between south of the M5 Motorway and Cambridge Avenue) and Anzac Road are expected to comply with the Road Noise Policy.

Where the SIMTA project is also considered (in addition to the IMT) potential future road traffic noise levels from Moorebank Avenue are estimated to increase by 2 dBA and the cumulative noise impacts will still comply with the Road Noise Policy.

5.3.2 Potential for off-site impacts

Off-site noise impacts (negative impacts) associated with this Project have been predicted in the local community and additional noise mitigation measures are required to be implemented to mitigate these.

5.3.3 Health Outcomes

Environmental noise has been identified (I-INCE 2011; WHO 2011) as a growing concern in the growth of urban areas because it has negative effects on quality of life and well-being and it has the potential for causing harmful physiological health effects. With increasingly urbanised societies impacts of noise have the potential to increase within the community.

Deciding on the most effective noise management option in a specific situation is not just a matter of defining noise control actions to achieve the lowest noise levels or meeting arbitrarily chosen criteria for exposure to noise. The goal should be to achieve the best available compromise between the benefits to society of reduced exposure to community noise versus the costs and technical feasibility of achieving the desired exposure levels. On the one hand there are the rights of the

[8] Available from http://www.ssfl.artc.com.au/_docs/docs/Tech%20Paper%202%20Noise%20&%20vibration.pdf

community to enjoy an acceptably quiet and healthy environment. On the other are the needs of the society for a new or upgraded facilities, industries, roads, recreation opportunities, etc., all of which typically produce more community noise (I-INCE 2011; WHO 2011).

Sound is a natural phenomenon that only becomes noise when it has some undesirable effect on people or animals. Unlike chemical pollution, noise energy does not accumulate either in the body or in the environment but it can have both short-term and long-term adverse effects on people. These health effects include (WHO 1999, 2011):

- Sleep disturbance.
- Annoyance.
- Hearing impairment.
- Interference with speech and other daily activities.
- Children's school performance (through effects on memory and concentration).
- Cardiovascular health.

Other effects for which evidence of health impacts exists, but for which the evidence is weaker, include:

- Effects on mental health (usually in the form of exacerbation of existing issues for vulnerable populations rather than direct effects).
- Effects on the performance of cognitive tasks.
- Some evidence of indirect effects such as impacts on the immune system.

Often, annoyance is the major consideration because it reflects the community's dislike of noise and their concerns about the full range of potential negative effects.

There are many possible reasons for noise annoyance in different situations. Noise can interfere with speech communication or other desired activities. Noise can contribute to sleep disturbance, which can obviously be very annoying and has the potential to lead to long-term health effects. Sometimes noise is just perceived as being inappropriate in a particular setting without there being any objectively measurable effect at all. In this respect, the context in which sound becomes noise can be more important than the sound level itself.

Different individuals have different sensitivities to different types of noise and this reflects differences in expectations and attitudes more than it reflects any differences in underlying auditory physiology. A noise level that is perceived as reasonable by one person in one context (for example in their kitchen when preparing a meal) may be considered completely unacceptable by that same person in another context (for example in their bedroom when they are trying to sleep). In this case the annoyance relates, in part, to the intrusion from the noise. Similarly a noise level, which is considered to be completely unacceptable by one person, may be of little consequence to another even if they are in essentially the same room. In this case the annoyance depends almost entirely on the personal preferences, lifestyles and attitudes of the listeners concerned.

It is against this background that regulators in various communities have established sound level criteria above which noise is deemed to be unacceptable and below which it is deemed to be acceptable. Any assessment of noise impacts needs to consider the relevant criteria established for

a new or existing (or upgraded) facility or activity. Where there are impacts in excess of these guidelines an assessment of noise mitigation is required to be undertaken.

In relation to the IMT Project, potential noise impacts have been assessed against Australian (more specifically New South Wales) criteria that have been established on the basis of the relationship between noise and health impacts. The criteria developed for use in the assessment for control of noise come from policy documents developed by the NSW Government including the NSW Industrial Noise Policy, the NSW Interim Construction Noise Policy, the NSW Rail Infrastructure Noise Guideline and the NSW Road Noise Policy. All of these policies are based on the health effects of noise, and are based on guidance and reviews published in the following:

- World Health Organisation- Guidelines on Community Noise – Health effects of noise (WHO 1999).
- World Health Organisation – Night Noise Guidelines for Europe (WHO 2009).
- Environmental Health Council of Australia - The health effects of environmental noise – other than hearing loss (enHealth 2004).

Various attempts have been made to assess the effect (measured by average reported annoyance, sleep disturbance or a similar type of effect) from community noise (measured by long term average sound levels) to develop exposure-response relationships. As individual reactions to noise are so varied, these studies need large sample sizes to obtain reasonable correlation between the noise exposure and the response. Any dose-response relationship determined from large studies over a range of communities and cultures will not necessarily represent the reaction of individuals or small communities. These exposure-response relationships are of value for macro-scale (i.e. whole urban environment scale) strategic assessment purposes where individual differences are not important, however they are not useful when considering potential impacts to a small population located close to a specific project/activity. Hence these macro-scale relationships cannot be applied (in any meaningful way) in this assessment.

As guidelines/criteria are available for construction and operational noise impacts associated with this project, that are based on the protection of health (including annoyance), the assessment of potential health impacts has focused on whether the guidelines/criteria established can be met. Noise levels that do not comply with these guidelines/criteria would have the potential to have negative health outcomes for the community surrounding the IMT Project.

Currently, the worst case assessment predicts that noise criteria would be exceeded at some locations without additional noise mitigation measures. Such measures have been included in the plans for the Project. It will be essential to adopt proposed noise mitigation measures to ensure the health outcomes related to noise are neutral for the Project.

5.3.4 Can outcomes be enhanced/mitigated

Noise levels will need to be mitigated to ensure the Project (all phases including the cumulative impacts that are predicted for the operation of both the Moorebank and SIMTA IMTs) complies with relevant guidance, and has acceptable health outcomes.

During construction, a Construction Noise and Vibration Management Plan (CNVMP) would be included in the CEMP to document management and mitigation measures required to demonstrate

compliance with the project approvals and commitments made in the Project EIS. Recommended measures to mitigate noise impacts during construction include:

- Works should only occur during standard construction hours (daytime) unless absolutely necessary (required by Police or RMS or to maintain safety) or where works are not audible at receivers.
- Residents particularly close to specific works are to be given adequate notice of works commencing.
- Site establishment and work method statements are to be designed to minimise noise. For example: quieter and less vibration emitting construction methods should be applied where feasible and reasonable; setup to ensure fixed equipment, temporary stockpiles, load and unloading areas should be located well away from the nearest residents; equipment to be shut down when not in use; engine covers to be closed at all times equipment is operating; reversing of equipment should be minimised so as to prevent nuisance caused by reversing alarms; use of broadband reversing alarms are to be used instead of tonal reversing alarms; where possible, trucks associated with the work are not to be left standing with their engine operating in a street adjacent to a residential area; prohibit unnecessary dropping of materials from height.
- Additional measures that may be implemented where necessary include the use of localised acoustic screens; fitting dominant noise generating machinery with noise mitigation like mufflers or shrouds; ensuring the most noisy equipment is not operated simultaneously and providing respite hours on days when particularly noisy operations are underway.
- A community liaison phone number and a process for keeping the community informed regularly throughout the Project are to be provided.

During operation noise levels at a number of receptor locations are required to be mitigated to ensure compliance with the relevant criteria. Levels of noise reduction required to meet the noise criteria range are up to 17 dBA. Mitigation measures that can be implemented to control noise are based on a hierarchy of noise control where the greatest noise reduction can be achieved through control of source emissions and then attenuation of noise propagation between the source and receptor.

Specific noise mitigation measures that may be considered include:

Control of Source Noise Emissions

- Requiring equipment purchased for use at the site to comply with source noise levels that reduce overall noise. Where possible utilise electric motors and vehicles instead of diesel powered equipment.
- Enclosing noise sources on fixed and mobile plant and equipment (appropriately designed sound enclosures can reduce noise by 10 dB(A) or greater)
- Where feasible, motors and mechanical noise generating components of the RMGs should be located near to ground level rather than the top of the gantry.
- The following measures are to be incorporated into the design and operation of the freight trains on the Northern rail access connection and the rail track on the main IMT site:
    - Where required, the track form design should include feasible and reasonable measures to mitigate noise including investigation of rail dampers, rail pad stiffness

and the rail fastening systems. Increasing the rail support stiffness can reduce direct noise but may result in an increase in structure-radiated noise; the design will have to address these two sources to provide effective noise control.
    - The track would require an incline/ descent to access the site and the SSFL rail corridor. The track is to be designed to minimise acute changes in vertical alignment which can reduce the requirement for locomotives to operate at high throttle notch on the ascent or under heavy braking on the descent.
    - It is recommended the rail lines are continuously welded track to remove joints.
    - The rail access bridge should be designed as a concrete or composite/ concrete structure to minimise potential reradiated noise from vibrating sections of the elevated track. Detailed noise analysis should be undertaken to identify both airborne and reradiated noise contributions to effectively mitigate total noise emissions.
- In addition to the mitigation measures above, to further control potential rail noise from wheel squeal the following measures are recommended:
    - The turn radius of curved track sections should be greater than 500 m to reduce tight turns in the alignment.
    - Track greasing systems should be investigated on curved sections of track to lubricate at the wheel rail interface to reduce friction.
    - The track system maintenance should include measures such as grinding to remove rail roughness, treatment of roughness on the wheels of locomotives and wagons, adjustment of bogie-suspension tracking and brake system set up.

Controlling the Propagation of Noise from the Main IMT site

- Where feasible all rail tracks should be designed to maximise the separation distance between rail lines and the nearest residences.
- Noise walls or noise barriers should be installed within the main IMT site to impede the line of sight between noise sources and nearest receptors. Where a noise wall or barrier fully impedes line of sight to all dominant noise sources a reduction in received noise level of 10 dB(A) or more can be achieved. A range of wall and barrier options are available for consideration.
    - For the Northern rail access connection option, noise walls/barriers should be investigated for the rail tracks on the rail access connection between the SSFL and the main IMT site boundary. Due to the elevated location of residences in Casula the noise wall/ barriers on the viaducts of the rail access connection may require a cantilevered design to increase the mitigation of noise from locomotives.
    - It is recommended that on-site noise walls/ barriers are constructed at the earliest opportunity in the Project development to provide noise attenuation during all construction and operation phases.
- Earth mounding can be used similar to noise walls/ barriers to attenuate the propagation of noise between the site and nearest affected receptors. Where earth mounding can fully impede line of sight to dominant noise sources, reductions to ground level noise sources of 10 dBA L_{Aeq} or greater may be achievable.
    - The earth mounding can be used in conjunction with noise walls/ barriers to increase the height of on-site noise treatments.

- For each rail access option it is recommended earth mounding be considered on the main IMT site to the western extent of the IMEX and interstate rail lines.

- An operational protocol should be implemented to store all TEUs (empty and full) to maximise the screening of noise from on-site plant and equipment. The protocol would be specific to the timing for the distribution of TEUs to maintain capacity adjacent to the IMEX and interstate container handling areas.
- Where feasible all on-site buildings and structures would be designed and constructed to impede noise from ground level operation of heavy vehicles, side picks and ITVs.

Prior to the commencement of operations of each stage of development the Proponent should develop and implement an Operational Noise and Vibration Management Plan (ONVMP). The ONVMP would detail the staged operation of the Project, the potential off-site operational noise levels as determined during the detailed design process and all measures to manage and mitigation operational noise and vibration.

The ambient noise monitoring surveys within Casula, Wattle Grove and Glenfield will be continued throughout the construction and operation of the Project. The noise surveys will quantify any potential noise from the Project and identify any trends/changes in the ambient noise environment during the progressive development.

The measured noise levels will be continually applied to the detailed design of the Project to ensure the design includes appropriate mitigation to reduce and control noise during construction and operation. The monitoring data will also include any changes to the ambient noise environment from new developments such as the SIMTA project.

In the event of any noise or vibration related complaint or adverse comment from the community, where feasible to do so, noise and ground vibration levels will be measured at the potentially affected premises. In accordance with procedures in the CNVMP and ONVMP, the measured noise and/or vibration levels would then be assessed to ascertain if remedial action is required.

5.4 Air Quality

5.4.1 Local Air Quality and Health Impacts

Summary of Specialist Study

A local air quality impact assessment (LAQIA, Environ 2014) and a human health risk assessment (HHRA, enRiskS 2014) have been undertaken to look at the potential effects of air pollution from the Moorebank IMT development. The LAQIA has estimated (with consideration of the local meteorology and terrain) the potential concentrations of each type of pollutant that might be expected at the various phases of the development, for all rail access options, relevant to construction and operation..

The HHRA has then assessed potential health impacts associated with emissions to air from the Project on the local community.

Both the LAQIA and HHRA considered incremental impacts (from the Project only) as well as cumulative impacts (from the Project as well as existing air quality and other local sources of air emissions). As such existing air quality in the local area has been considered in the assessments undertaken. It is noted that review of the available long term data has shown that air quality in

Sydney (including south-western Sydney) has improved significantly since the 1980's and 1990's (when studies were conducted that identified the potential for ongoing and potentially worsening photochemical smog issues in the area) (Hyde 1990). Improvements in air quality have occurred as a result of banning backyard burning, improvements in vehicle emissions, improvements in fuel standards and improvements in industrial emission controls (refer to the HHRA for further detail). These improvements in air quality are reflected in the existing air quality data considered in the LAQIA and HHRA reports.

The pollutants that have been assessed are those related to diesel combustion sources (i.e. trucks and trains) and the earthworks involved in construction. The pollutants that have been assessed include particulates, carbon monoxide, oxides of nitrogen, sulfur dioxide, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). The LAQIA was conducted by modelling emissions to air from the Project during Early Works, Phases A to D and the cumulative scenario that incorporates the SIMTA project. These impacts were considered alone and in conjunction with monitoring data from local and regional air quality monitoring stations (at Liverpool, Prospect and Chullora) that record existing levels of pollutants in the community (from a wide range of sources) and modelling of more localised sources including the Glenfield Waste Disposals landfill and the SSFL.

The levels of oxides of nitrogen, sulfur dioxide, carbon monoxide, volatile organic compounds and polycyclic aromatic hydrocarbons during construction and operation are all estimated to be acceptable. That is, the estimated concentrations (incremental and cumulative) in air within the surrounding community (assessed at the sensitive receivers locations presented in **Figure 3.1**) were smaller than National and International guidelines that are based on the protection of all adverse health effects for all members of the population including sensitive subpopulations.

Particulates were the main pollutant of interest in the assessments undertaken. Particulates come both from the initial earthworks which is required as the site is constructed and from the combustion of diesel in the trucks, trains and other equipment that will be used at the site once operations commence. The larger particles (including coarse particles and PM_{10}) that get blown off earthworks are expected to dominate during construction activities while the smaller particles resulting from the operation of diesel powered trucks, locomotives and other equipment ($PM_{2.5}$) will increase through the Project as more diesel powered trucks and locomotives are brought onto the site.

Not all particulates are associated with adverse health effects. Large particles (coarse particulates larger than PM_{10}) are too big to penetrate the respiratory system and reach the lungs, where adverse effects may occur. These particulates, while not associated with health effects, easily fall out of the atmosphere and deposit onto surfaces. This dust deposition (which is higher closer to the source) can result in nuisance impacts that can increase levels of anxiety in the local community. Dust deposition has been evaluated in the LAQIA and at all sensitive receivers the impacts comply with regulatory guidance that are based on the protection of nuisance effects. While the predicted dust deposition impacts comply with the guidelines, it is important that the community is informed that some dust deposition may occur which may be noticeable, particularly during construction works and that they are reassured that the dust is not associated with adverse health effects given this is a community where potential dust impacts have been raised and discussed.

Exposure to smaller particulates (i.e. PM_{10} and smaller that can enter the respiratory system, with the smaller fractions reaching the lungs) within large populations has been linked to adverse health effects. This includes adverse health effects after both short-term exposure (days to weeks) and long-term exposure (months to years). The health effects associated with exposure to particulate matter vary widely (with the respiratory and cardiovascular systems most affected) and include mortality and morbidity effects.

In relation to mortality: for short-term exposures in a population this relates to the increase in the number of deaths due to existing (underlying) respiratory or cardiovascular disease; for long-term exposures in a population this relates to mortality rates over a lifetime, where long-term exposure is considered to accelerate the progression of disease or even initiate disease.

In relation to morbidity effects, this refers to a wide range of health indicators used to define illness that have been associated with (or caused by) exposure to particulate matter. In relation to exposure to particulate matter, effects are primarily related to the respiratory and cardiovascular system and include (Morawska, Moore & Ristovski 2004; USEPA 2009):

- Aggravation of existing respiratory and cardiovascular disease (as indicated by increased hospital admissions and emergency room visits).
- Changes in cardiovascular risk factors such as blood pressure.
- Changes in lung function and increased respiratory symptoms (including asthma).
- Changes to lung tissues and structure.
- Altered respiratory defence mechanisms.

These effects are commonly used as measures of population exposure to particulate matter. They are often grouped into the general categories of cardiovascular morbidity/effects and respiratory morbidity/effects. The available studies provide evidence for increased susceptibility for various populations, particularly older populations, children and those with underlying health conditions (USEPA 2009).

The initial step in the HHRA was to compare predicted concentrations (from the LAQIA) associated with cumulative impacts with national guidelines for PM_{10} and $PM_{2.5}$ that are based on the protection of adverse health effects (as outlined above) in the population.

In addition to the assessment of potential cumulative impacts of the Project, a more detailed assessment of incremental (increases from the Project only, above existing background levels and other local sources) risks/impacts associated with exposures in the local community to particulate matter was also undertaken. The assessment focused on health effects known to be associated with exposures to particulate matter, that included premature mortality (of various causes relevant to exposure to particulates including cardiovascular disease, respiratory disease and lung cancer) and a range of morbidity endpoints (including impacts on hospitalisation rates for individuals with various existing conditions [primarily associated with cardiovascular disease and respiratory disease] and impacts on asthma [medication use] in children).

Potential for off-site impacts

The assessment of cumulative and incremental impacts (as presented in the LAQIA and HHRA) associated with the Project showed the following:

- Existing concentrations of PM_{10} and $PM_{2.5}$ in the local community are variable due to the influence of bushfire and hazard reduction activities. Where these events are considered the existing levels of PM_{10} and $PM_{2.5}$ meet the current National guidelines that is based on the protection of health.
- The addition of emissions to air from the Project does not result in significant increases in the total (cumulative) levels of PM_{10} and $PM_{2.5}$ in the community. The total (cumulative) concentration of PM_{10} and $PM_{2.5}$ still meets the National guidelines. On this basis cumulative impacts from the Project (including consideration of cumulative impacts with the SIMTA project) are not considered to be of concern.
- More specific evaluation of the increase in PM_{10} and $PM_{2.5}$ concentrations in the local community from the Project only has shown that potential increased risks and the increase in the number of cases that may attributable to the Project (for a range of health effects, including the use of asthma medication by children) at all sensitive receivers locations are within acceptable levels.

While the Project is perceived by the local community to be associated with impacts on the local air quality, and potentially on health, the specialist studies have not identified significant impacts to sensitive receivers in the local community. Regardless of this assessment, where possible the best available technology and mitigation measures (including those outlined below) should be implemented to minimise exposures to particulates in the community.

In relation to the assessment of cumulative impacts from the operation of both the Moorebank and SIMTA IMTs, the predicted health impacts are generally considered to be low (not significant); however there is the potential for risks in adjacent commercial/industrial areas to be at a level that is considered unacceptable. Mitigation measures need to be implemented to minimise exposure to particulates in the adjacent workplaces.

Can outcomes be enhanced/mitigated

The LAQIA has been conducted on the basis that a range of mitigation measures and emission controls are used during construction works and operations. This includes the use of typical dust control measures during construction activities and improvements in pollutant emission rates over time for diesel trucks and diesel locomotives. These practices and improvements are in line with international standards. It is important that these mitigation measures are implemented within all aspects of the Project.

Based on the evaluation undertaken there is no requirement to incorporate additional mitigation measures over and above the mitigation measures outlined in the LAQIA.

In addition, the following can be considered:

- Construction dust mitigation measures will be adopted in the Dust Management Plan to ensure that sensitive receptors are not adversely affected during this phase. Additional mitigation measures will be outlined in this plan to address dust emissions that may occur during high dust risk activities/events. These additional measures should be considered and implemented where appropriate.
- Support development and promote the use of lowest emission freight technology available. Investigate the potential to provide incentives for freight (road and rail) operators accessing

the site to incorporate up-to-date emissions controls (either using newer heavy vehicles/locomotives or fitting aftermarket emission control systems, where available and effective).

- It is recommended that ambient air quality monitoring is undertaken in the local community. This should include:
    - on-site monthly dust deposition monitoring to measure dust fallout from the Project's operation at boundary points and selected sensitive receiver locations and compared to the air quality criteria;
    - the existing on-site air quality monitoring station (that records continuous measurements of NO_x, PM_{10} and $PM_{2.5}$) continue to operate to ensure that the ambient air quality criteria are met. The existing station may need relocation based on site construction works and regulator recommendations;
    - Consideration be given to the placement of an air monitoring station (that records continuous measurements of NO_x, PM_{10} and $PM_{2.5}$) in a key sensitive receptor location in the off-site community; and
    - the existing on-site meteorological monitoring station location should be reviewed to ensure compliance with relevant Australian Standard documentation.

  If air pollution levels rise above what is considered to be of concern to human health and this is attributable to the Moorebank IMT, commit to addressing impacts to keep levels below health based guidelines established by NEPM, NSW EPA and/or the WHO.

- It is noted that there is concern in the local community in relation to the impact of the project on rates and severity of asthma in children within the local community. The available information on existing levels of asthma in the local community indicates that levels of asthma are lower than average levels in NSW. However the local area has a higher rate of reliever medication use and lower rate of preventer medication use suggesting that the management of asthma (particularly in young children) in the local area is less well managed when compared with NSW overall. Perceptions of increased asthma problems in children in the local area as a result of the Project may result in increased visits to local GPs from children with breathing problems and/or requesting further asthma medication. It is recommended that South Western Sydney Local Health District works with South Western Sydney Medicare Local to provide advice to local GPs about the potential for increased presentations with breathing problems and/or requests for asthma medication and to encourage local GPs to review patients' asthma management plans and communicate strategies. In addition a monitoring system for asthma (particularly in children) should be set up in the local area.
- Communicate nuisance issues associated with any noticeable dust deposition that may occur in the local area (particularly during construction works).

5.4.2 Regional Air Quality

A regional Air Quality Assessment (RAQA) has been conducted (Todoroski 2014) to evaluate the impact of the Project at full operation in 2031 on regional air quality within the Sydney basin. The assessment has considered existing pollution sources within the Sydney basin that are dominated by on-road vehicle emissions. In addition data from existing air quality monitoring stations in the basin have been considered.

The focus of the RAQA was on potential regional air quality changes associated with potential changes in heavy truck traffic and rail traffic as a result of the Project. Regionally there would be no change in container traffic leaving Sydney, however, the key change relates to the spatial position where trucks are dispatched and where containers are transported within Sydney. The assessment evaluated vehicle kilometres travelled (VKT) on a suburb and local government area basis with emissions to air calculated on this basis. The calculation of emissions from trucks (travelling the predicted VKT) and locomotives have been conservatively estimated, not taking into account lower emissions standards for trucks expected to be implemented over time.

Modelling of VKT by trucks and locomotives in the Sydney basin, along with the predicted changes associated with the Project indicates that the Project will have a small effect[9] on emissions. The impacts predicted are small (no tangible effect) due to the large number of other sources of pollutants (from other on-road vehicles and other sources) in the Sydney basin that dominate total emissions.

Other impacts identified in the RAQA include:

- The project will involve some redistribution of heavy vehicle traffic, with increased numbers on roadways feeding the Project (which are in areas where traffic is less congested for less time, resulting in lower emissions) and decreased numbers on roadways feeding Port Botany as well as the M5, M4 and M2 Motorways (which are in areas more likely to experience congested traffic conditions for prolonged periods, resulting in higher levels of emissions).
- With the Project there would be decreases in VKT (for heavy vehicles) in most LGA's. As expected there is an increase in VKT in the Liverpool and Fairfield LGAs near the Project in 2031.
- The total change in VKT per year in Sydney associated with container transport with the Project is a reduction of approximately 1.4% (or 24,455,000 VKT).
- Assessment of potential impacts of the Project on regional concentrations of nitrogen dioxide (NO_2), PM_{10} and carbon monoxide (CO) at NSW EPA (NEPM) air monitoring sites in Sydney has indicated that there would be no measurable impact. The Project is predicted to have a negligible effect on population exposures to pollutants in Sydney.

The project is predicted to slightly increase impacts along roads near Moorebank and the rail corridor from Port Botany to Moorebank, and to decrease traffic emissions along the M5, M4 and M2 motorways. However, the significant finding is that the maximum change in emissions due to the Project on a regional level is small and unlikely to be discernible in comparison to pollutant levels that would occur with or without the Project. Impacts on local air quality (where heavy vehicle movements will increase) are assessed further in the LAQIA.

[9] The impacts predicted include 0.43% decrease in PAH emissions, 0.03% decrease in NO_X emissions and a 0.05% increase in fine particulate matter.

Section 6. Summary of HIA Outcomes

Based on the evaluations presented in the screening level HIA (**Section 4**) and the detailed HIA (**Section 5**), a range of impacts and outcomes (both positive and negative) have been identified in relation to health impacts. These, along with measures that could be implemented to enhance or mitigate the identified health impacts, are summarised in **Table 6.1** and **Figure 6.1**. The table and figure provide outcomes that are relevant to all phases of the Project under each of the rail access options being considered. The phases of the Project that have been assessed include Early Works and Phases A to D. The cumulative impact of the Project (at Phase D– Full Build) with the SIMTA project has also been assessed.

Table 6.1 Summary of HIA Outcomes and Enhancement / Mitigation Measures

Health Aspect/Issue	Screening/Detailed HIA		Impact Identified (positive or negative)	Health Impacts	Types of measures that could be implemented to enhance positive impacts or mitigate negative impacts
	Potential for Impacts to Local Community	Issue of Community Concern			
Economic Environment	The potential health outcomes associated with this aspect of the Project are positive. Impacts primarily associated with the local economy, increased employment, improved freight reliability and availability. No further detailed HIA assessment of potential economic impacts is provided in the HIA given an in-depth economic assessment was not a requirement.	Yes	positive	Reduction in anxiety, stress and feelings of insecurity.	The identified positive outcomes in the local community can be enhanced by encouraging employment of people who live within the local community.
Transport					
Construction of Moorebank Avenue Upgrade					
Access – along Moorebank Avenue	Yes, addressed in detailed HIA	Yes	negative	Stress and anxiety and perceptions of safety in area	Impacts during the early years of the Project can be mitigated to some extent by maximising car and truck movements to and from the site outside of peak hours (by scheduling start and finish times appropriately). Also construction of the duplication of Moorebank Avenue would need to be carefully designed and timed to minimise impacts on local traffic.
Congestion	Yes, addressed in detailed HIA	Yes	negative	Stress and anxiety and perceptions of safety in area	
Following Completion of Moorebank Avenue Upgrade					
Access – along Moorebank Avenue	Yes, addressed in detailed HIA	Yes	positive	Reduced levels of stress and anxiety and perceptions of safety in area	The Moorebank Avenue upgrade means that increased traffic on the road which would have occurred even without the development would be accommodated as will the increased traffic due to the Project. In the event that both the Moorebank and SIMTA IMTs are constructed additional upgrade works on Moorebank Ave may be required. It is noted that these positive outcomes may be limited due to the increased use of Moorebank Avenue by heavy vehicles, potentially increasing stress levels in drivers of smaller passenger vehicles who share the
Congestion	Yes, addressed in detailed HIA	Yes	positive	Reduced levels of stress and anxiety and perceptions of safety in area	

Health Aspect/Issue	Screening/Detailed HIA Potential for Impacts to Local Community	Issue of Community Concern	Impact Identified (positive or negative)	Health Impacts	Types of measures that could be implemented to enhance positive impacts or mitigate negative impacts
					road.
Vehicle and rail accidents (including cyclists and pedestrian accidents)	Yes, addressed in detailed HIA	Yes	positive	Fewer accidents and injuries	None identified
Natural Environment					
Vibration	No	No	None	NA	NA
Noise	Yes, addressed in detailed HIA	Yes	negative	Sleep disturbance, annoyance, children's school performance and cardiovascular health.	A range of mitigation measures need to be implemented during construction and operation of the Project as outlined in **Section 5.3.4**. These need to be further evaluated to ensure that all relevant noise criteria (that are protective of health) can be achieved in all phases of the Project. Ongoing noise monitoring should be undertaken to monitor the impact of the project on noise levels in the community and provide a trigger for undertaking additional mitigation measures (if required).
Light spill	Overall limited impacts identified, only from transitory impacts from train headlights.	Yes	negative	Excessive light at night can cause sleep disturbances, gastrointestinal, mood and cardiovascular disorders so it's important to ensure light spill is controlled well from new developments.	Implementation of a range of design measures in the detailed design phase to minimise light spill from the Project. Consideration should be given to introducing similar controls on reducing the effect of train headlights as those that have been developed for the residential areas around Port Botany.
Local air quality	Yes, addressed in detailed HIA	Yes	Negligible	Health impacts associated with increase in exposure to particulate matter. Potential for increase in premature death, hospitalisations for pre-existing cardiovascular and respiratory disease, exacerbation of existing respiratory diseases including asthma.	Impacts are low and acceptable based on the emission controls currently proposed in the Project; however to minimise exposure to particulate emissions in the local community, where possible, the best available technology and mitigation measures will be implemented. In the event that both the Moorebank and SIMTA IMTs are constructed additional mitigation measures need to be implemented to minimise exposures to particulates in adjacent commercial/industrial areas.
Health impacts of emissions to air from Project	Yes, addressed in detailed HIA	Yes	Negligible		
Regional air quality	Negligible	Yes	Impacts negligible (either positive or negative) as changes in emissions from	None, however it is noted that where there are small positive benefits (decreased emissions and	NA

Health Aspect/Issue	Screening/Detailed HIA		Impact Identified (positive or negative)	Health Impacts	Types of measures that could be implemented to enhance positive impacts or mitigate negative impacts
	Potential for Impacts to Local Community	Issue of Community Concern			
			heavy vehicles and locomotives only comprise a small percentage of emission sources that exist within the wider Sydney basin.	vehicle movements) are in areas already congested, hence the Project may help alleviate existing elevated levels of stress and anxiety.	
Odour	No	No	None	NA	NA
Contaminated land and remediation	Yes	Yes	Positive as remediation planned to reduce existing levels of contamination on the site.	NA	NA
Green space and Ecology	No	Yes	Impacts assessed as neutral	NA	NA
Landscape character and visual impact	Yes	No	This can be perceived as a negative outcome for some members of the community	Stress and anxiety	The visual impact assessment identified the height of lighting poles as the major contributor to changes in the visual characteristics of the site. It recommends that consideration be given to changing the lighting design to limit the height of the poles. A range of other recommendations have also been provided to minimise the impact of the Project on the landscape character. It would be appropriate to consider these recommendations in the detailed design phase of the project.
Water quality and hydrology	No if the proposed design and mitigation measures are fully implemented.	No	Positive impact due to well-designed storm water management system including water re-use. Negative impacts from flooding only if proposed design and management system not implemented.	If the proposed design is not implemented, flooding may cause stress and anxiety, loss of income, loss of employment and potential for injury and death.	Further refinement of the design of the bridge (for either the northern, central or southern rail access) and the stormwater management system (including water re-use) would add to the potential for positive health and environmental outcomes for this Project. Also maintenance and rehabilitation of the riparian zone, as proposed, would provide numerous health benefits – those related to appropriate flood management and those related to a pleasant living environment.
Hazardous materials management	No	No	None	NA	NA
Waste management	No, when operating in accordance with proposed	No	None	NA	NA

Health Aspect/Issue	Screening/Detailed HIA		Impact Identified (positive or negative)	Health Impacts	Types of measures that could be implemented to enhance positive impacts or mitigate negative impacts
	Potential for Impacts to Local Community	Issue of Community Concern			
	waste management plan				
Sustainability, Lifestyle and Social Environment					
Increased use of non-car/vehicle modes of transport	Yes, the Project has the potential for an increased use of other forms of transport.	Yes	Additional cycleways and improved pedestrian areas may enable an increase in non-car transport. The increased workforce may create critical mass to improve bus services to area.	Improved daily exercise levels, improved general health.	Advocacy for the improvement of bus services to the area to cater for the additional workforce prior to existing services being overloaded. Such advocacy could evaluate the potential bus routes to assist the local community in accessing existing and planned recreational areas. Evaluate the proposed upgraded pedestrian and cycleway facilities on Moorebank Avenue to ensure that they connect through to existing or proposed facilities. This will enhance the usability and access of these alternate forms of transport in the local area.
Disturbance of natural environment	No	Yes	Impacts assessed as neutral	NA	NA
Impacts on future generations	Negligible	Yes	Positive impacts associated with job creation will have positive benefit to future generations in local area. Negative impacts identified can be effectively mitigated such that there is current or future impacts associated with construction or operation. Perceived risks are negative.	Perceived risks to future generations may increase levels of stress and anxiety in the local community.	Implement measures to enhance local job creation. Risk perceptions can be further addressed through implementation of an effective communication/ community consultation program (refer to details in the following point).
Feelings of control over life decisions	Yes	Yes	Negative based on perceptions of negative impacts in local area and potential lack of effective communications.	Increased levels of anxiety and stress.	These health impacts relate to a range of specific impacts evaluated in the HIA as well as local community perceptions and trust. It is therefore important that the positive impacts associated with the project are enhanced within the local community and community consultation is continued and uses a range of techniques that are tailored to the various sub-populations that have particular areas of concern or particular characteristics that make normal methods of communication less effective. It is important that an effective communication/ community consultation

Health Aspect/Issue	Screening/Detailed HIA		Impact Identified (positive or negative)	Health Impacts	Types of measures that could be implemented to enhance positive impacts or mitigate negative impacts
	Potential for Impacts to Local Community	Issue of Community Concern			
					program is maintained throughout the planning, construction and operational phase of the project. Measures that can be implemented are outlined further in **Section 4.8.3**.
Housing and Accommodation	Negligible	No	Negligible – potential for slight increase in demand but existing stock should be sufficient.	NA	NA
Change in Demographics	Negligible	No	Negligible, noting that the increased number of workers in the area is small compared with projected population growth in area.	NA	NA
Demand on medical, health and emergency services and infrastructure	Negligible	No	Negligible	NA	NA
Demand for Education Services	None	No	None	NA	While there are no impacts on education services likely for the Project, there is the potential for the Project to facilitate opportunities to assist in delivering courses at these TAFEs relating to trades and services required during construction and operational phases of the Project and therefore create an increase in enrolments, and potentially increase employment of local workers.
Property Values	Negligible	Yes	While it is noted that there is concern in the local community as to the impact of the Project on house prices, there are many factors that influence housing prices in an area. Given the complexity of these factors it is not possible to predict if the project will have any positive or negative impact on	NA	NA

Health Aspect/Issue	Screening/Detailed HIA		Impact Identified (positive or negative)	Health Impacts	Types of measures that could be implemented to enhance positive impacts or mitigate negative impacts
	Potential for Impacts to Local Community	Issue of Community Concern			
			housing prices in the local area.		
Recreation	Negligible	Yes	No change in current access to or use of green space/ recreation areas. The visual amenity of some areas may be changed, however this is unlikely to affect use of existing or planned facilities. Improved pedestrian and cycleway facilities will encourage other recreational uses.		

Notes:
NA = not assessed in detailed HIA (addressed in screening HIA)

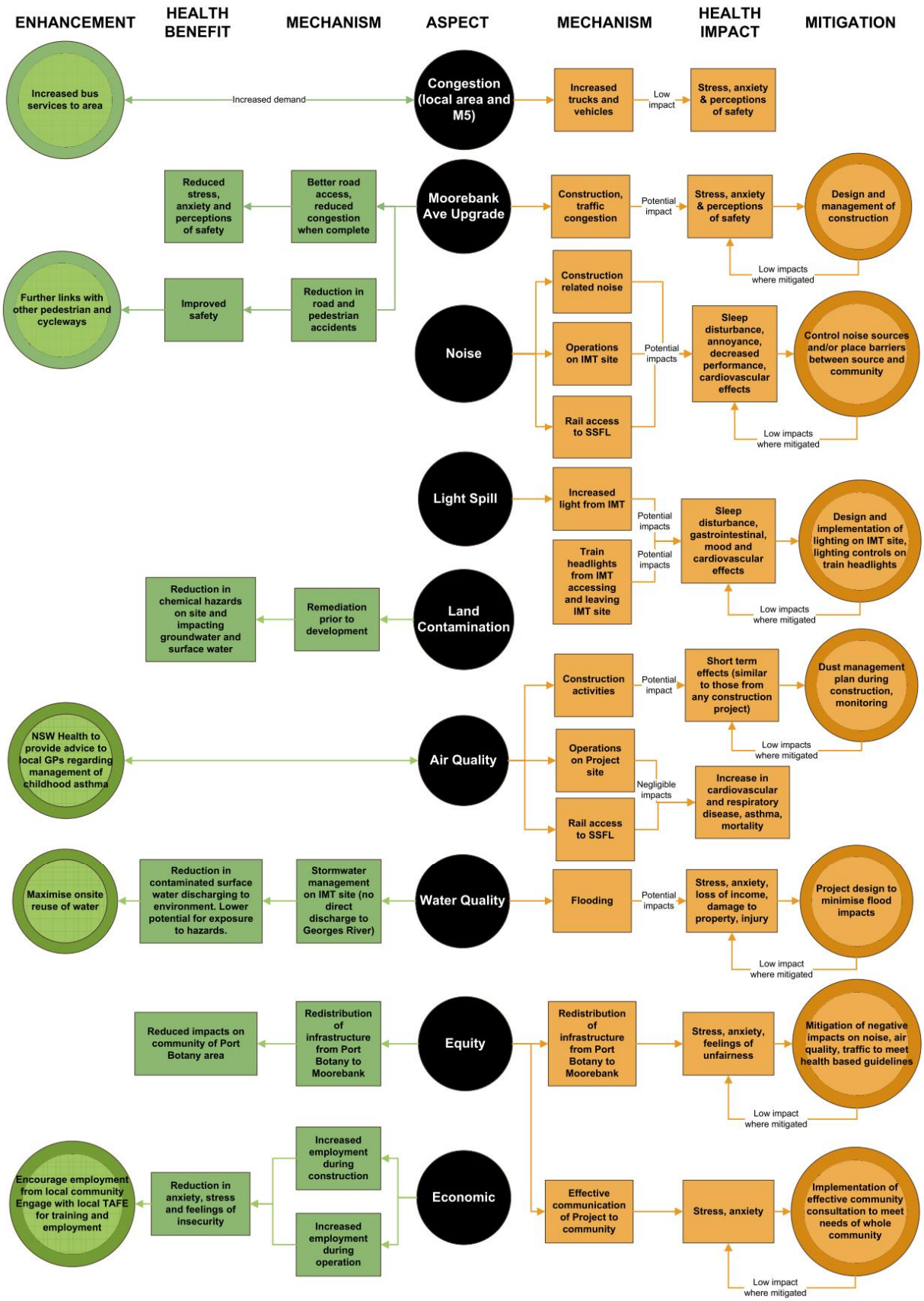


Figure 6.1 Overview of HIA Outcomes

Section 7. Equity Issues

As noted in Harris et al. 2007 when undertaking a Health Impact Assessment:

"equity is concerned with making clear if a proposal will differentially impact on different groups. Differential impacts refer to whether the benefits of the proposal may be experienced to a greater extent by one group and not others, and whether the negative impacts of a proposal may be experienced to a greater extent by one group and not others. For example, a freeway may make it easier for people to travel to and from work but may also have negative impacts on the air quality and noise for people who live near the freeway but make little use of it.

In an HIA, this involves an assessment of whether this difference is significant in health terms, whether it is likely to be considered unfair by affected people and whether the proposal can be modified to eliminate or reduce the potential impact. This is especially true if one group is seen to carry a higher burden of disadvantage or risk of being disadvantaged. For example, when major roads go through poor neighbourhoods and avoid more wealthy ones."

In considering issues of equity for this development there are two types of equity related impacts identified - spatial impacts and sensitive receivers.

Spatial impacts

Currently, most of the activities that will move to Moorebank IMT once it is developed are taking place in Botany. This means the people in the Botany area are currently affected by the transport of freight through their suburb – the noise, air quality and other issues highlighted in this report. This small area is affected by a service that provides benefit for the rest of Sydney but, particularly, western Sydney. Moving these activities to Moorebank IMT (where they can be expanded) will benefit the Botany residents. Moving the effects of freight handling to an area which also benefits from the provision of an efficient freight handling service will have a positive effect on the equitable spread of costs and benefits.

It is expected that the Moorebank IMT will provide some limited benefits at a regional level whereas the negative impacts will be experienced at a local level. Within the Moorebank area residential areas that are closer to the development are more likely to experience higher levels of noise, traffic and air quality impacts but, as discussed in this report, levels are within regulatory guidance. Due to the mixed nature of all the suburbs around the development it is unlikely that one particular population sub-group (e.g. low socioeconomic group or non-english speaking groups) will have a higher exposure to risk factors (e.g. noise, air pollution, traffic) than the general population in the area surrounding the development.

Sensitive receivers

The evidence gathered for the assessment identified population sub-groups that are particularly vulnerable to health impacts resulting from the IMT. These include:

- Children (air quality, noise)
- Elderly people (air quality, traffic)

Although these groups are not expected to experience a higher level of exposure they are likely to be more affected than other community members by the same exposure. Recommendations have been developed that take this into consideration. Such recommendations include the advice to GPs

regarding childhood asthma, targeted communication to various sub-groups, investigation of potential bus route options that target appropriate local facilities and the complaints handling system.

Finally our population profile and stakeholder evidence identified that there are population groups that may not benefit from some of the mitigation measures unless specifically targeted. This includes people with low levels of literacy or English language skills. Specific recommendations have been developed to address this. The Moorebank IMT also offers opportunities to reduce already existing inequalities. For example, through developing links to local education facilities to provide opportunities for the local community to gain skills and employment.

Section 8. References

Specialist/Technical Reports

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