ACOUSTICS AND AIR

MPW STAGE 2

NOISE AND VIBRATION IMPACT ASSESSMENT

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OCTOBER 2016

PREPARED FOR

ARCADIS
LEVEL 5, 141 WALKER STREET
NORTH SYDNEY NSW 2060

WILKINSON MURRAY

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Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. 2010 saw the introduction of our Queensland office and 2011 the introduction of our Orange office to service a growing client base in these regions. From these offices, Wilkinson Murray services the entire Asia-Pacific region.

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

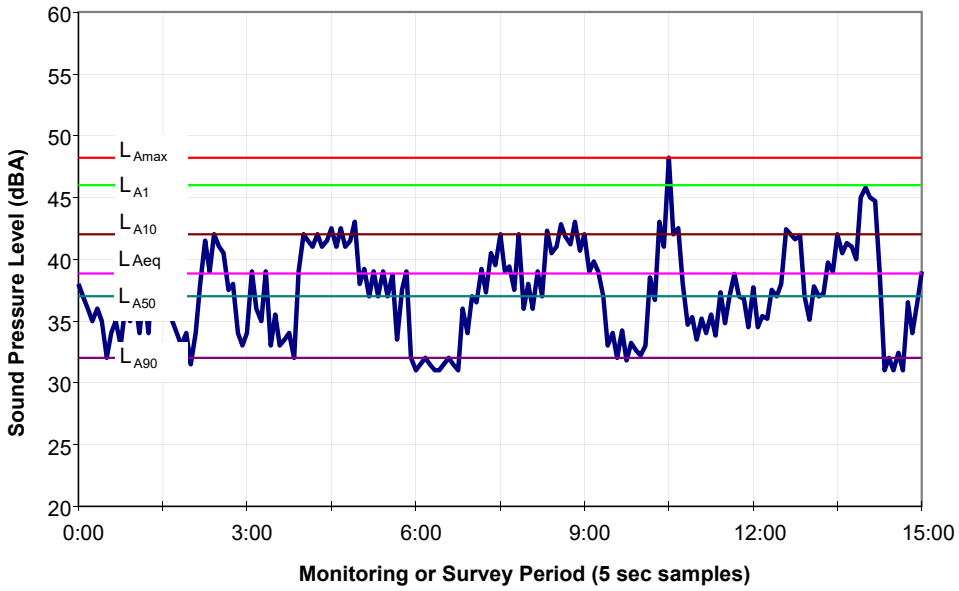
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



EXECUTIVE SUMMARY

Wilkinson Murray Pty Limited (WM) has conducted a Noise and Vibration Impact Assessment for Stage 2 (the Proposal) of the Moorebank Precinct West Project (MPW Project). This report forms part of the Environmental Impact Statement (EIS) for approval of the Proposal.

The nearest potentially affected noise sensitive receivers have been identified. These receivers comprise residential, industrial, educational and recreational land uses. Potential noise and vibration impacts at sensitive receivers, associated with the construction and operation of the Proposal, have been considered, along with potential cumulative noise impacts from other significant developments in the surrounding area.

Potential noise and vibration impacts have been assessed in general accordance with the following NSW Government guidelines and policies:

- *NSW Industrial Noise Policy* (INP) (EPA, 2000);
- *Noise Guide for Local Government* (NGLG) (EPA, 2013);
- *NSW Road Noise Policy* (RNP) (DECCW, 2011);
- *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013);
- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009); and,
- *Assessing Vibration: a technical guide* (Assessing Vibration) (DEC, 2006).

Noise and vibration limits for the construction and operation of the Proposal were presented in the MPW Concept Plan EIS, and were established in general accordance with the above guidelines.

Noise levels at sensitive receivers have been predicted using a computer noise model created with the CadnaA software package. Noise source and receiver locations, and details of warehouse buildings and surrounding topography have been incorporated into the noise model.

The study has found that operational levels from the Proposal can comply with the relevant criteria, including relevant sleep disturbance goals. Additionally, cumulative noise levels due to the concurrent operation of the Proposal and the Moorebank Precinct East (MPE) Stage 1 Proposal are predicted to comply with the established criteria.

The Proposal has the potential to increase road noise levels at sensitive receivers along the M5 Motorway, Moorebank Avenue and Anzac Road. Any increases in road noise levels at sensitive receivers along these roads are predicted to be well below 2 dB, and in accordance with the *NSW Road Noise Policy,* no mitigation is necessary.

Project specific L_{Aeq} and L_{Amax} rail noise criteria have been developed in accordance with *RING* and previous submissions from the EPA. These criteria are considered particularly stringent to the extent that the existing L_{Aeq} and L_{Amax} noise levels are already above the project specific criteria. L_{Aeq} and L_{Amax} rail noise levels at the most sensitive residential receivers near the Rail link are predicted to exceed the project specific rail noise criteria. However, due to the proximity of these receivers to the Southern Sydney Freight Line, rail movements associated with the Proposal are not expected to result in a noticeable change to the existing L_{Aeq} and L_{Amax} rail noise levels.

Construction noise levels during all anticipated works periods for the Proposal are anticipated to comply with the established Noise Management Levels (NML) at most sensitive receivers. At the most affected receivers in Casula, construction noise levels during bulk earthworks may exceed the NML by 1 dBA, which is considered a negligible exceedance. Construction noise levels during all proposed out of hours works periods are predicted to comply with the NML at all times.

Cumulative construction noise levels due to concurrent activities associated with MPW Early Works, MPE Stage 1 and the Proposal are predicted to comply with the NML at all receivers, except for the most sensitive receivers in Casula. At these receiver locations, cumulative construction noise levels may exceed the NML by up to 2 dBA. This is considered a negligible exceedance.

Due to the large separation distances between the Proposal and nearby sensitive receivers, construction vibration impacts are considered unlikely.

A Construction Noise and Vibration Management Plan (CNVMP) would be developed for the Proposal, considering all reasonable and feasible measures to reduce noise levels at sensitive receivers.

On the basis of the assessments conducted by WM, it is concluded that noise and vibration impacts associated with the construction and operation of the Proposal are not expected to degrade the existing acoustic environment, or create significant annoyance to nearby sensitive receivers.

1 INTRODUCTION

On the 3 June 2016 Concept Plan Approval (SSD 5066) was granted, under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to develop the Moorebank Precinct West Project (MPW Project) on the western side of Moorebank Avenue, Moorebank, in south-western Sydney (the MPW site).

The MPW Project involves the development of intermodal freight terminal facilities (IMT), linked to Port Botany, the interstate and intrastate freight rail network. The MPW Project includes associated commercial infrastructure (i.e. warehousing), a rail link connecting the MPW site to the Southern Sydney Freight Line (SSFL), and a road entry and exit point from Moorebank Avenue.

Under the Concept Plan Approval, the MPW Project is to be developed in four phases, being:

- Early Works development phase, comprising:
  - The demolition of existing buildings and structures
  - Service utility terminations and diversion/relocation
  - Removal of existing hardstand/roads/pavements and infrastructure associated with existing buildings
  - Rehabilitation of the excavation/earthmoving training area (i.e. 'dust bowl')
  - Remediation of contaminated land and hotspots, including areas known to contain asbestos, and the removal of:
    - Underground storage tanks (USTs)
    - Unexploded ordnance (UXO) and explosive ordnance waste (EOW) if found
    - Asbestos contaminated buildings
  - Archaeological salvage of Aboriginal and European sites
  - Establishment of a conservation area along the Georges River
  - Establishment of construction facilities (which may include a construction laydown area, site offices, hygiene units, kitchen facilities, wheel wash and staff parking) and access, including site security
  - Vegetation removal, including the relocation of hollow-bearing trees, as required for remediation and demolition purposes
- Development of the intermodal terminal (IMT) facility and initial warehousing facilities
- 'Ramp up' of the IMT capacity and warehousing
- Development of further warehousing.

Approval for the Early Works phase (MPW Concept Plan Approval) was granted as the first stage of the MPW Project within the Concept Plan Approval. Works, approved as part of this stage are anticipated to commence in the third quarter of 2016.

Commonwealth Approval (No. 2011/6086), under the *Environmental Protection Biodiversity Conservation Act 1999* (EPBC Act), was also granted in mid 2016 (soon after the Concept Plan Approval) for the MPW Project. In addition to this, the Planning Proposal (PP_2012_LPOOL_004_00) which provided a rezoning of part of the MPW site, and surrounds, was gazetted on 24 June 2016 into the *Liverpool Local Environmental Plan 2008* (Amendment No. 62).

On 5 December 2014, Moorebank Intermodal Terminal Company (MIC) and SIMTA announced their in-principle agreement to develop the Moorebank IMT Precinct on a whole of precinct basis. This agreement is subject to satisfying several conditions which both parties are currently working towards. SIMTA is therefore seeking approval to build and operate the IMT facility and warehousing under the MPW Project Concept Approval, known as the MPW Stage 2 Proposal (the Proposal).

1.1 Report Purpose

This report has been prepared to support the Environmental Impact Statement (EIS) for approval of the Proposal. A summary of the works included in the Proposal is provided below.

This report has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the EP&A Act. This report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (ref: SSD 16-7709 and dated 14 July 2016) and revised environmental mitigation measures (REMMs) identified in the MPW Concept Plan Approval (SSD_5066). Table 1-1 provides a summary of the SEARs from the MPW Concept Plan Approval, which are relevant to this report and the section where they have been addressed in this report.

Table 1-1 Assessment Requirements

Section / number	Requirement	Where addressed in this report
6	**Noise and Vibration**	
	An updated assessment of noise and vibration impacts. The assessment shall:	
	a) assess construction noise and vibration impacts associated with construction of the proposal, including impacts from construction traffic and ancillary facilities. The assessment shall identify sensitive receivers and assess construction noise/vibration generated by representative construction scenarios focusing on high noise generating works. Where work hours outside of standard construction hours are proposed, clear justification and detailed assessment of these work hours must be provided, including alternatives considered, mitigation measures proposed and details of construction practices, work methods, compound design, etc;	Section 10
	b) assess operational noise and vibration impacts and identify feasible and reasonable measures proposed to be implemented to minimise operational noise impacts of the intermodal facility and rail link, including the preparation of an Operational Noise Management and Monitoring Plan;	Section 7 & Section 8
	c) clearly demonstrate that at each stage a best practice facility (terminal, warehousing and rail link including locomotives and rolling stock) to minimise noise emissions at the terminal and rail link will be adopted;	BPR Report
	d) consider the need for an automatic rolling stock wheel defect detection and response system;	BPR Report
		BPR Report

Section / number	Requirement	Where addressed in this report
	e) include a framework for on and off-site noise monitoring during operation and f) be prepared in accordance with: NSW Industrial Noise Policy (EPA 2000), Interim Construction Noise Guideline (DECC 2009), Assessing Vibration: a technical guide (DEC 2006), the Rail Infrastructure Noise Guideline (EPA 2013), Development Near Rail Corridors and Busy Roads Interim Guideline (DoP 2008), and the NSW Road Noise Policy 2011.	All Sections

Section 11 of this report addresses the REMMs, identified in the MPW Concept Plan Approval, that are relevant to the Proposal.

The noise and vibration assessments within this document have been conducted in accordance with the following NSW Government Guidelines:

- *NSW Industrial Noise Policy* (INP) (EPA, 2000);
- *Noise Guide for Local Government* (NGLG) (EPA, 2013);
- *NSW Road Noise Policy* (RNP) (DECCW, 2011);
- *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013);
- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009); and,
- *Assessing Vibration: a technical guide* (Assessing Vibration) (DEC, 2006).

1.2 Proposal Overview

The MPW Stage 2 Proposal (the Proposal) involves the construction and operation of an Intermodal terminal (IMT) facility and associated warehousing.

The IMT facility would have the necessary infrastructure to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum. Specifically, the IMT facility within the Proposal site would include the following key components:

- Truck processing, holding and loading areas – with entrance and exit from Moorebank Avenue via an upgraded intersection and a round-about to distribute traffic between the warehousing precinct and the IMT
- Rail loading and container storage areas – installation of nine rail sidings, with an adjacent container storage area serviced by manual handling equipment
- Administration facility – office building with associated car parking and light vehicle access from Moorebank Avenue
- The Rail link connection – rail sidings within the IMT facility, which would be linked (to the south) to the Rail link (constructed as part of the MPE Project (SSD 14-6766)).

Also included within the Proposal are the following key components:

- Warehousing area – construction and operation of approximately 215,000 m^2 GFA of warehousing, with warehouses ranging in size from 4,000 m^2 to 71,000 m^2. Included within the warehousing area would be ancillary offices, truck and light vehicle parking, associated warehouse access roads.
- Freight village – construction and operation of approximately 800 m^2 of retail premises, with access from the internal road.
- Upgraded intersection on Moorebank Avenue and internal road – including works to Moorebank Avenue, Anzac Road to accommodate the proposed site entrance to Moorebank Avenue, and construction of an internal road.
- Ancillary works – including vegetation clearing, earth works, drainage and on-site detention, utilities installation/connection, signage and landscaping.

1.2.1 Proposal Components and Key Terms

Table 1-2 provides a summary of the key terms, in addition to the glossary provided above, which are included within this EIS. Figure 1-1 also provides an indication of the site areas discussed in

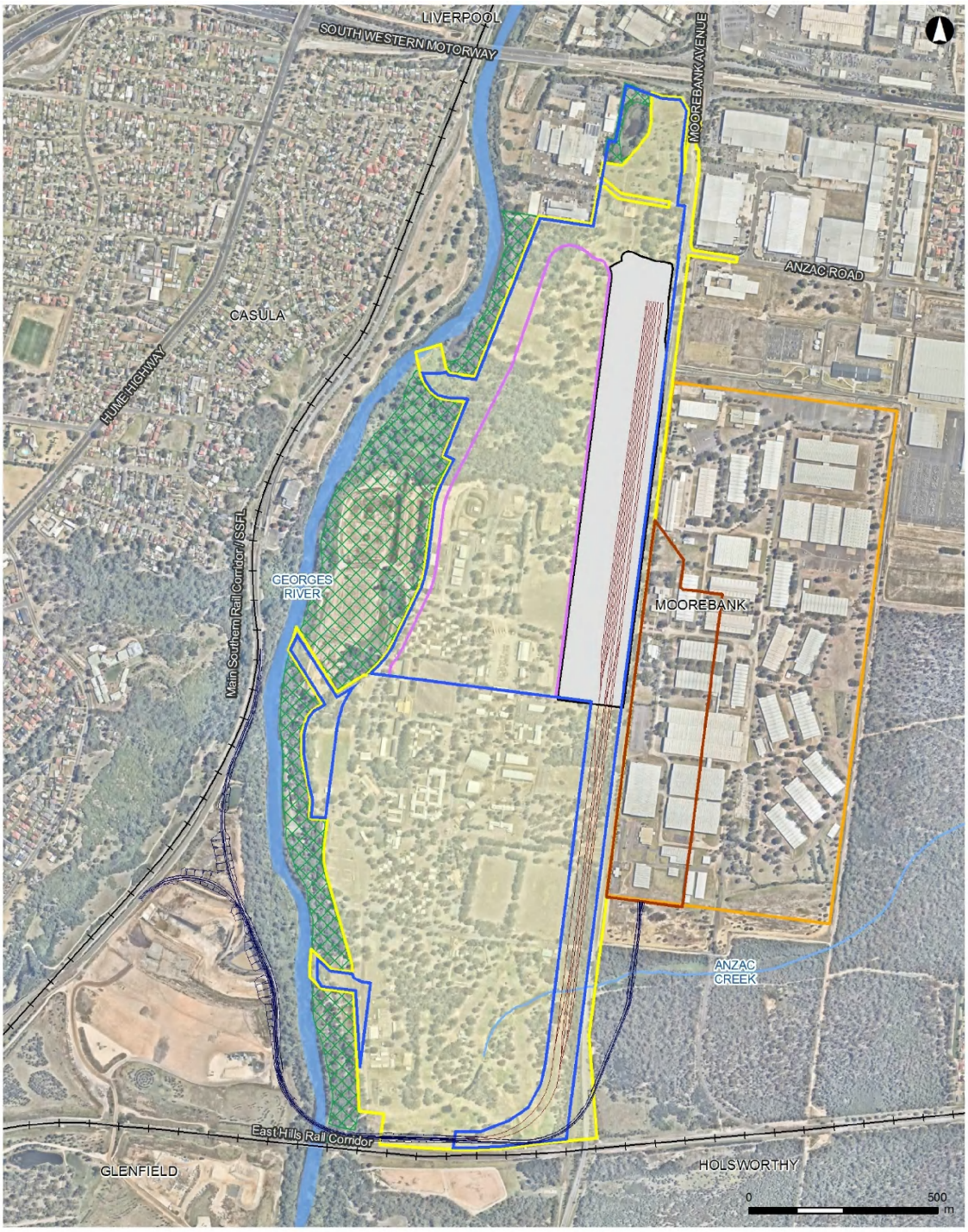
Table 1-2 EIS Key Terms

Term	Definition
Moorebank Precinct West (MPW) Concept Plan Approval (Concept approval and Early Works)	MPW Concept Plan and Stage 1 Approval (SSD 5066) granted on 3 June 2016 for the development of the MPW Intermodal terminal facility at Moorebank and the undertaking of the Early Works. Granted under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979*. This reference also includes associated Conditions of Approval and Revised Environmental Management Measures, which form part of the documentation for the approval. N.B. Previously the MIC Concept Plan Approval
Moorebank Precinct West (MPW) EPBC Approval	Commonwealth Approval (No. 2011/6086), granted in mid-2016 under the *Environmental Biodiversity Protection Conservation Act 1999*, for the impact of the MPW Project on listed threatened species and communities and impacts on the environment by a Commonwealth agency.
Moorebank Precinct West (MPW) Concept Plan EIS	The Environmental Impact Statement prepared to support the application for approval of the MPW Concept Plan and Early Works (Stage 1) under the *Environment Protection and Biodiversity Conservation Act 1999* and the *Environmental Planning and Assessment Act 1979*. N.B. Previously the MIC Concept Plan EIS
Revised Environmental Management Measures (REMMs)	The environmental management measures for the MPW Concept Plan Approval as presented within the MIC Supplementary Response to Submissions (SRtS) (PB, 2015) and approved under the MPW Concept Plan Approval.
Moorebank Precinct West (MPW) Planning Proposal	Planning Proposal (PP_2012_LPOOL_004_00) to rezone the MPW site from 'SP2- Defence to 'IN1- Light Industrial' and 'E3- Management', as part of an amendment to the *Liverpool Local Environmental Plan 2008* (as amended) gazetted on 24 June 2016.

Term	Definition
Moorebank Precinct West (MPW) Project	The MPW Intermodal Terminal Facility as approved under the MPW Concept Plan Approval (5066) and the MPW EPBC Approval (2011/6086). N.B. Previously the MIC Project
Moorebank Precinct West (MPW) site	The site which is the subject of the MPW Concept Plan Approval, MPW EPBC Proposal and MPW Planning Proposal (comprising Lot 1 DP1197707 and Lots 100, 101 DP1049508 and Lot 2 DP 1197707). The MPW site does not include the rail link as referenced in the MPW Concept Plan Approval or MPE Concept Plan Approval. N.B. Previously the MIC site.
Early Works	Works approved under Stage 1 of the MPW Concept Plan Approval (SSD 5066), within the MPW site, including: establishment of construction compounds, building demolition, remediation, heritage impact mitigation works and establishment of the conservation area.
Early Works Approval	Approval for the Early Works (Stage 1) component of the MPW Project under the MPW Concept Plan Approval (SSD 5066) and the (yet to be granted) MPW EPBC Approval. Largely contained in Schedule 3 of the MPW Concept Plan Approval.
Early Works area	Includes the area of the MPW site subject to the Early works approved under the MPW Concept Plan Approval (SSD 5066).
Proposal	MPW Stage 2 Proposal (the subject of this EIS), namely Stage 2 of the MPW Concept Plan Approval (SSD 5066) including construction and operation of an IMT facility, warehouses, a Rail link connection and Moorebank Avenue/Anzac Road intersection works.
Proposal site	The subject of this EIS, the part of the MPW site which includes all areas to be disturbed by the MPW Stage 2 Proposal (including the operational area and construction area).
IMT facility	The Intermodal terminal facility on the Proposal site, including truck processing, holding and loading areas, rail loading and container storage areas, nine rail sidings, loco shifter and an administration facility and workshop.
internal road	Main internal road through the Proposal site which generally travels along the western perimeter of the site. Provides access between Moorebank Avenue and the IMT and warehouses.
Rail link connection	Rail connection located within the Proposal site which connects to the Rail link included in the MPE Stage 1 Proposal (SSD 14-6766).
Proposal operational rail line	The section of the Rail link connection and Rail link between the SSFL and the Rail link connection (included in the MPE Stage 1 Proposal) to be utilised for the operation of the Proposal.
construction area	Extent of construction works, namely areas to be disturbed during the construction of the Proposal.
operational area	Extent of operational activities for the operation of the Proposal.
Moorebank conservation area/conservation area	Vegetated area to remain to the west of the Georges River, to be subject to biodiversity offset, as part of the MPW Project.
Moorebank Precinct (MP)	Refers to the whole Moorebank intermodal precinct, i.e. the MPE site and the MPW site.

Term	Definition
Moorebank Precinct East (MPE) Project	The Intermodal terminal facility on the MPE site as approved by the MPE Concept Plan Approval (MP 10_0913) and including the MPE Stage 1 Proposal (14-6766). N.B. Previously the SIMTA Concept Plan Approval
Moorebank Precinct East (MPE) site	The site which is the subject of the MPE Concept Plan Approval, and includes the site which is the subject of the MPE Stage 1 Approval. N.B. Previously the SIMTA site
Moorebank Precinct East (MPE) Stage 1 Proposal	MPE Stage 1 Proposal (14-6766) for the development of the Intermodal terminal facility at Moorebank. This reference also includes associated conditions of approval and environmental management measures which form part of the documentation for the approval. N.B. Previously the SIMTA Stage 1 Proposal
Rail link	Part of the MPE Stage 1 Proposal (14-6766), connecting the MPE site to the SSFL. The Rail link (as discussed above) is to be utilised for the operation of the Proposal.

Figure 1-1 Proposal Overview



2 SITE DESCRIPTION

The Proposal site is generally bounded by the Georges River to the west, Moorebank Avenue to the east, the East Hills Railway Line to the south and the M5 Motorway to the north. It is located on Moorebank Avenue, Moorebank and forms Lot 1 in Deposited Plan (DP) 1197707[1]. The Proposal site also contains Lots 100 and 101 DP1049508, which are located north of Bapaume Road and west of Moorebank Avenue. The Proposal site is located wholly within Commonwealth Land.

The Proposal would also require works to upgrade the intersection of the MPW site with Moorebank Avenue and would therefore be undertaken on the following parcels of land:

- Moorebank Avenue, owned by the Commonwealth Government, south of Anzac Road Lot 2, DP 1197707 (formerly part of Lot 3001, DP 1125930)
- Moorebank Avenue, owned by Roads and Maritime Services, north of Anzac Road
- A portion of Bapaume Road, a public road that is the responsibility of Liverpool City Council
- A portion of Anzac Road, owned by Liverpool City Council, to the east of Moorebank Avenue

The key existing features of the site are:

- Relatively flat topography, with the western edge flowing down towards the Georges River, which forms the western boundary to the MPW site
- A number of linked ponds in the south-west corner of the Proposal site, within the existing golf course, that link to Anzac Creek, which is an ephemeral tributary of the Georges River
- An existing stormwater system comprising pits, pipes and open channels
- Direct frontage to Moorebank Avenue, which is a publicly used private road, south of Anzac Road and a publicly owned and used road north of Anzac Road
- The majority of the site has been developed and comprises low-rise buildings (including warehouses, administrative offices, operative buildings and residential buildings), access roads, open areas and landscaped fields for the former School of Military Engineering (SME) and the Royal Australian Engineers (RAE) Golf Course and Club. Defence has since vacated and all buildings on the site are currently unoccupied and will be removed during the Early Works
- Native and exotic vegetation is scattered across the Proposal site
- The riparian area of the Georges River lies to the west of the Proposal site and contains a substantial corridor of native and introduced vegetation. The riparian vegetation corridor provides a wildlife corridor and a buffer for the protection of soil stability, water quality and aquatic habitats. This area has been defined as a conservation area as part of the MPW Concept Plan Approval

[1] Previously legally described as "Lot 3001, DP 1125930" in the MPW Concept Plan Approval (SSD 5066), however has since been subdivided.

- As stated above, the majority of the Proposal site has been developed, however heritage and biodiversity values still remain on the site

A strip of land (up to approximately 250 metres wide) along the western edge of the MPW site lies below the 1% annual exceedance probability (AEP) flood level

The site is privately owned by the Commonwealth and leased by SIMTA.

A number of residential suburbs are located in proximity to the Proposal site, including:

- Wattle Grove, located approximately 1,000 m from the Proposal site and 1,000 m from the Rail link connection to the east. The Rail link, which will be used during operation of the Proposal is 1,260 m to the west of Wattle Grove at its closest point
- Moorebank, located approximately 630 m from the Proposal site and more than 1,400 m from the Rail link connection to the north. The Rail link is 2,500 m to the south of Moorebank at its closest point
- Casula, located approximately 330 m from the Proposal site and 1,200 m from the Rail link connection to the west. The Rail link is approximately 290 m to the east of Casula at the closest point
- Glenfield, located approximately 820 metres from the Proposal site and 1,100 metres from the Rail link connection to the south-west. The Rail link is approximately 750 m to the east of Glenfield at its closest point.

3 CONSTRUCTION OVERVIEW

Subject to planning approval, construction of the Proposal is planned to commence in the third quarter of 2017. The total period of construction works for the Proposal is anticipated to be approximately 36 months. The indicative construction programme is shown in Table 3-1.

Table 3-1 Indicative Construction Program

Construction Phase	2017				2018				2019				2020			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Works period A – Pre-construction stockpiling																
Works period B – Site Preparation Activities																
Works period C – Bulk earthworks, drainage and utilities																
Works period D – Moorebank Avenue intersection works and internal road network																
Works period E – IMT facility and Rail link connection construction																
Works period F – Construction and fit-out of warehousing																
Works period G – Miscellaneous structural construction and finishing works																

3.1 Construction Program and Activities

The construction works have been divided into seven 'works periods' which are interrelated and also may potentially overlap. Subject to confirmation of construction staging, the order of these construction works periods may shift slightly.

A summary of the indicative activities included in each of these works periods, which is relevant to the construction of the IMT facility, the Rail link connection and the warehouses, is provided in Table 3-2.

Table 3-2 Works Periods and Activities

Works Period	Activities
Pre-construction fill placement and stockpiling	▪ Establishment of temporary erosion and sediment controls ▪ Minor clearing and grubbing of temporary stockpiling area ▪ Establishment of a temporary stockpiling pad and associated temporary access roads ▪ Installation of temporary construction compound, including amenities and office for bulk earthworks ▪ Importation and placement of approximately 400,000 cubic metres (m3) of clean fill
Site preparation activities	▪ Establishment of construction compound fencing and hoardings ▪ Installation of temporary sediment and erosion control measures ▪ Vegetation clearance ▪ Installation of temporary site offices and amenities ▪ Construction of hardstands for staff parking and laydown areas ▪ Establishment of temporary batch plant sites and installation of batch plant ▪ Construction of access roads, site entry and exit points and security (N.B. preference is to use existing access where practicable) ▪ Set up of construction monitoring equipment
Bulk earthworks, drainage and utilities	▪ Importation, stockpiling and placement of approximately 1,2000,000 m^3 of imported clean fill (Bulk Earthworks) and raising of the Proposal site to final level ▪ Installation of OSDs ▪ Drainage and utilities installation ▪ Establishment of a concrete batching plant
Moorebank Avenue intersection works and internal road network	▪ Relocation, adjustment and/or protection of all affected utilities, services and signage, as required ▪ Establishment of traffic management devices ▪ Installation of erosion and sediment controls ▪ Stripping and stockpiling of topsoil by excavators and trucks ▪ Drainage works ▪ Progressive stabilisation of exposed areas ▪ Compaction of widening areas ▪ Preparation of new lane surfaces ▪ Forming of new kerbs, gutters, medians and other structures ▪ Construction of asphalt and concrete pavement ▪ Landscaping of exposed earthworks areas ▪ New line marking, lighting and sign posting ▪ Removal of construction traffic management and progressive opening of new works to traffic

Works Period	Activities
IMT facility and Rail link connection construction	▪ Importation, placement and compaction of engineering fill ▪ Compaction of engineering fill ▪ Importation and placement of ballast material ▪ Establish formwork and reinforcement for sidings and bridge infrastructure ▪ Placement of concrete, curing and sealing ▪ Installation of permanent ways and rail systems ▪ Installation of permanent access gates, security gatehouse and permanent fencing ▪ Installation of the connection between the Rail link and the IMT facility sidings ▪ Erection of IMT facility administration building – excavation foundation and floor slab construction, structural wall and roof framework, and roofing ▪ Internal fit-out of building with control room, office, workshops, loco-shifter and staff amenities
Construction and fit-out of warehousing	▪ Establishment of construction compound, temporary fencing/ hoardings and temporary sediment and erosion control ▪ Installation of temporary site offices and amenities ▪ Excavation, foundation and floor slab installation ▪ Erection of framework and structural walls ▪ Installation of roof ▪ Internal fit out ▪ Landscaping and surrounds ▪ Preparation of warehouse access road subgrade ▪ Forming of new kerbs, gutters, medians and other structures ▪ Construction of asphalt and concrete pavement ▪ New line marking, lighting and sign posting ▪ Removal of construction traffic management and progressive opening of the internal road and warehouse access roads to traffic
Miscellaneous structural construction and finishing works	▪ Decommissioning/demobilisation of construction sites ▪ Commissioning of operational facilities ▪ Landscaping ▪ Rehabilitation of affected areas ▪ Post-construction condition surveys ▪ Removal of construction environmental controls ▪ Removal of construction ancillary facility related traffic signage

3.2 Plant and Equipment

A range of plant and equipment would be required for construction of the Proposal. A summary of the indicative plant and equipment likely to be utilised during each works period is provided in Table 3-3.

Table 3-3 Indicative Plant and Equipment by Works Period

Equipment	Construction Works Period						
	Pre-construction stockpiling	Site preparation	Bulk earthworks, drainage and utilities	Moorebank Avenue and internal roads	IMT facility and Rail link connection	Warehouse construction and fit out	Buildings and finishing works
Loaders	✓	✓	✓	✓	✓	✓	✓
Static and vibratory rollers, and high energy impact compaction	✓	✓	✓	✓	✓	✓	✓
Mobile cranes		✓			✓	✓	
Excavators	✓	✓	✓	✓	✓	✓	
Excavators with hammers			✓				
Backhoes		✓	✓	✓	✓	✓	✓
Crushing plant		✓	✓				
Concrete batch plant				✓	✓	✓	
Concrete agitators (or similar)				✓	✓	✓	✓
Concrete pumps				✓	✓	✓	✓
Concrete saws				✓	✓	✓	✓
Air compressors			✓	✓	✓	✓	✓
Jackhammers				✓	✓	✓	✓
Dozers		✓	✓	✓			
Mulchers		✓	✓				
20-40 tonne articulated tipper trucks	✓	✓	✓	✓	✓		
Scrapers	✓	✓	✓	✓			
Graders	✓	✓	✓	✓	✓	✓	
Water trucks	✓	✓	✓	✓	✓	✓	✓
Piling rigs					✓	✓	
Forklifts					✓	✓	✓
Small earthmoving equipment				✓	✓	✓	✓
Rail tamper					✓		
Welder					✓	✓	✓

3.3 Ancillary Compounds

Temporary construction compounds, a batching plant and communal parking areas would be required to support construction works for the Proposal. The locations of these compounds and facilities are indicative and subject to confirmation by the construction contractor and are shown in Figure 3-1.

At this stage, construction compounds identified for the Proposal include:

- Earthworks Compound
- IMT Facility Compound
- Rail Compound.

Access to the compound sites would be via existing access points to the MPW site from Moorebank Avenue. An area would be made available in the northern portion of the Proposal site to provide worker parking, once the Moorebank Avenue/Anzac Road intersection upgrade is complete. In addition, to the above compounds, individual smaller compounds would be established for the construction of each warehouse.

The indicative location of these compounds is shown in Figure 3-1. Table 3-4 outlines the proposed construction facilities and their uses during the construction of the Proposal. Details of each of these facilities are provided in the following sections.

Figure 3-1 Construction Area

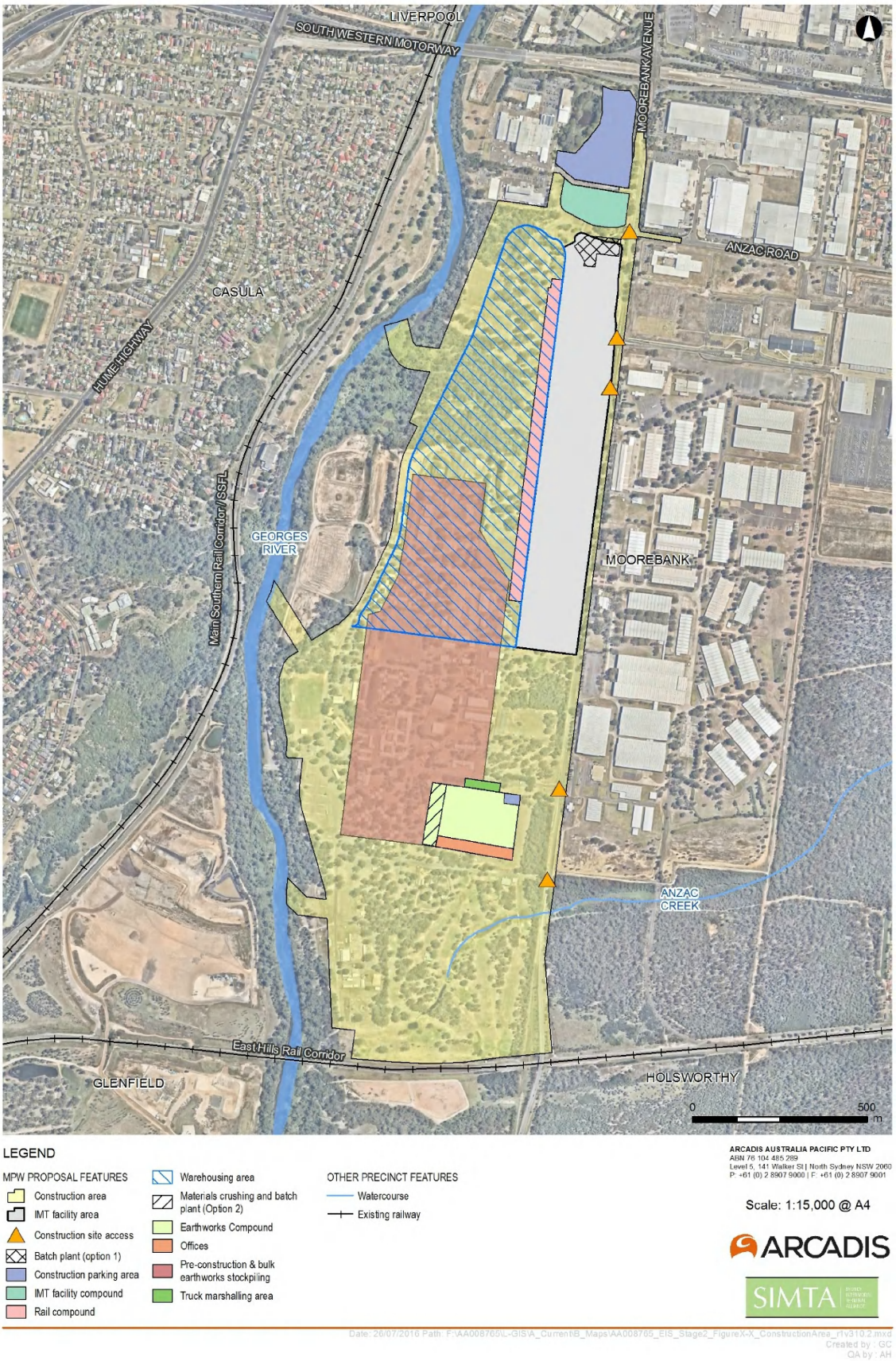


Table 3-4 Proposed Construction Ancillary Facilities and Activities

Ancillary Facility	Activity and Use				
	Site Office	Staff Amenities	Car Parking	Storage and Laydown	Materials Testing
Earthworks compound	✓	✓	✓	✓	✓
IMT facility Compound	✓	✓	✓	✓	✓
Rail Compound	✓	✓	✓	✓	✓
Construction parking area			✓		
Warehouse Compounds	✓	✓		✓	✓

Compound and stockpile sites would be temporary in nature and removed/decommissioned at the completion of construction. Where not within the footprint of the operational area, these areas would be rehabilitated upon completion of the works and the sites left in a stable condition.

3.4 Construction Hours

With the exception of certain works periods and activities, construction works would generally be undertaken during the standard daytime construction working hours, being:

- 7.00am to 6.00pm Monday to Friday
- 8.00am to 1.00pm Saturday
- No works on Sunday or Public Holidays.

It is proposed to undertake the importation and placement of fill to the Proposal site, during the Pre-construction stockpiling and Bulk earthworks works periods, over the following hours identified in Table 3-5.

Table 3-5 Proposed Working Hours for Fill Importation

Day	Proposed Hours	Activities
Weekdays	6.00am – 7.00am	• Material Delivery.
	7.00am – 6.00pm	• Material Delivery • Direct Placement; and • Stockpiling; and • Crushing.
	6.00pm – 10.00pm	• Material Delivery; and • Direct Placement; or • Stockpiling.
Saturdays	7.00am – 8.00am	• Material Delivery; and • Direct Placement; or • Stockpiling.
	8.00am – 1.00pm	• Material Delivery • Direct Placement; and • Stockpiling; and • Crushing.
	1.00pm – 6.00pm	• Material Delivery; and • Direct Placement; or • Stockpiling.

Any other construction works undertaken outside of standard construction hours would be undertaken in consultation with relevant authorities. Works outside standard hours that may be undertaken would include:

- Works associated with the upgrade of the Moorebank Avenue/Anzac Road intersection to minimise impacts on through traffic
- Works associated with the tie-in of the Rail connection to the Rail link to minimise disruption to services on the Rail link.
- Any works which do not cause noise emissions to be audible at any nearby sensitive receptors or comply with the 'Outside Standard Construction Hours'.
- The delivery of materials which is required outside of these hours as requested by Police or other authorities for safety reasons.
- Emergency work to avoid the loss of lives, property and/or to prevent environmental harm.
- Works required to be undertaken during rail corridor possessions.
- Any other work as approved through the Construction Noise and Vibration Management Plan.

4 OPERATIONS OVERVIEW

The Proposal would involve the operation of the IMT facility, Rail link connection, Rail link and warehousing. The Proposal would provide a freight transport facility to support the transport of freight by rail between Victoria, Queensland, regional NSW and Port Botany, with freight distributed through one of the following container flows:

- Transferred directly between trains within the Proposal site
- Temporarily stored in the IMT facility
- Transferred directly to warehousing within the Proposal site
- Transferred directly by truck to the MPE site
- Loaded directly on to heavy vehicles for distribution to markets via the nearby major road network.

Once operational, the IMT facility would handle an annual container freight volume of 500,000 TEU.

Access (entrance and exit) to the Proposal site for heavy and light vehicles would be via the new site access off Moorebank Avenue. Trucks accessing the warehousing area of the Proposal site would continue to the internal road on the western perimeter of the Proposal site and onto the warehouse access roads to the warehousing.

4.1 IMT Facility

The main vehicle entrance to the IMT facility would be controlled through the use of truck processing gates. Truck processing gates would include gantry structures which would be located over the extent of the entrance and exit lanes.

The circulation of trucks through the IMT facility would be as follows:

- Trucks would enter the site via the main entrance off Moorebank Avenue and would be processed at the truck processing gates. Only authorised/cleared trucks would be permitted to proceed into the IMT facility. Non authorised trucks would be instructed to turn around and exit via the main access to the Proposal site.
- Authorised trucks would be held within the truck holding area and/or progress to the loading areas.
- Once in location these trucks would be loaded/unloaded using manual container handling equipment.
- Once loaded/unloaded, trucks would exit the IMT facility via weighbridges (as necessary). Subject to being determined to be at the approved weight, trucks would proceed via the truck processing gates onto Moorebank Avenue.

The anticipated daily truck and car numbers associated with operation of the Proposal are provided in Table 4-1.

Table 4-1 Operational Truck and Car Trips

	Trip Type	Vehicle Movements per Day (2-way round trip)
Truck movements	External truck trips via external road network	1,458
Car movements	IMT facility	292
	Warehouses/freight village	2,378
	Total Daily Employee Car Trip Generation (IMT facility and warehouses)	**2,670**

The IMT facility would accommodate 12 train movements per day (6 in each direction). It is anticipated that, subject to unloading, trains would be processed within two and a half hours of entering the IMT facility. The IMT facility would operate 24 hours a day, 7 days a week.

4.2 Warehousing

Heavy and light vehicles would access the warehouses via the main site access off Moorebank Avenue. Light vehicles would park in the allocated parking area adjacent to each warehouse, and heavy vehicles would progress to the truck loading/unloading areas alongside each warehouse. Once in location these trucks would be loaded/unloaded via manual handling equipment. Once loaded the trucks would then be distributed to markets via the nearby major road network, transported to the adjacent MPE site, or transported directly to the IMT facility for dispatch via rail.

The warehouses on the Proposal site would generally be operational for 18 hours a day, and five to seven days a week.

4.3 Freight Village (Precinct Amenities)

Vehicles would access the precinct amenities area via the main site access off Moorebank Avenue and the internal road. Light vehicles would access and egress the area directly via the allocated parking area adjacent to the precinct amenities area. Whereas service vehicles would enter the area via the one-way service road, which loops around the rear of the precinct amenities area and exits via the car park.

The operational hours of the freight village would be 7.00am to 6.00pm, seven days per week, and there would be a total of 25 staff members during operation.

5 SENSITIVE RECEIVERS AND EXISTING NOISE LEVELS

5.1 Sensitive Receivers

The potentially most affected residential receivers in the vicinity of the Proposal site are located in the suburbs of Casula, Glenfield and Wattle Grove. In addition to residential receivers, a number of potentially affected non-residential receivers have been identified near the Proposal site. All Saints Senior College and the Casula Powerhouse are located to the west of the Proposal site, across the Georges River, and the nearest industrial receivers, MPE and the Defence Joint Logistics Unit (DJLU) are located to the east of the Proposal site, across Moorebank Avenue. Table 5-1 presents a summary of the potentially most affected receivers near the Proposal site.

Table 5-1 Potentially Affected Receivers

Receiver / Suburb	Category	Distance to Proposal Site1
Casula	Residential	350 m
Glenfield		1,800 m
Wattle Grove		640 m
All Saints Senior College (S1)	Educational	630m
Casula Powerhouse (S2)		360 m
MPE (I1)	Industrial	50 m
DJLU (I2)		50 m
ABB (I3)		Boundary

1. Approximate minimum distance from Proposal site to potentially most affected receiver.

The locations of residential suburbs and discrete non-residential receivers, in relation to the Proposal site, are presented in Figure 5-1.

5.2 Existing Ambient Noise Levels

The existing ambient noise environment at locations representative of the potentially most affected residential receivers in Casula, Glenfield and Wattle Grove were established through long-term background noise monitoring. The monitoring was conducted, in general accordance with the *INP*, by SLR Consulting and presented in the MPW Concept Plan EIS.

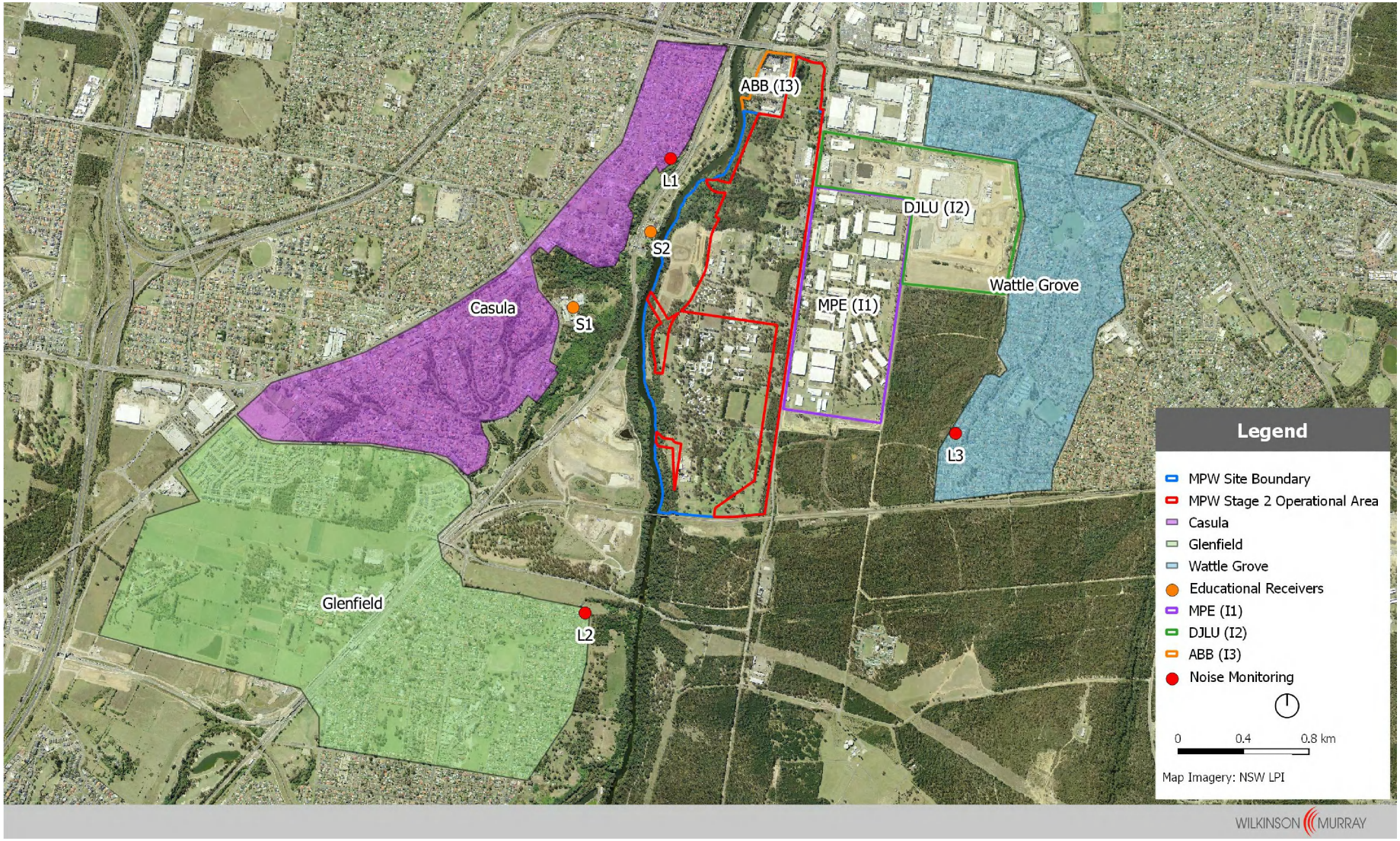
The existing ambient noise levels, as established in the MPW Concept Plan EIS, are presented in Table 5-2. The noise monitoring locations are shown in Figure 5-1.

Table 5-2 Existing Ambient Noise Levels

Suburb	Monitoring Location	Noise Levels (dBA)					
		RBL			L_{Aeq}		
		Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
Casula	L1	39	39	33	55	54	53
Glenfield	L2	35	37	33	48	47	44
Wattle Grove	L3	35	36	32	55	49	46

1. Daytime 7.00am-6.00pm; Evening 6.00pm-10.00pm; Night 10.00pm-7.00am.

Figure 5-1 Sensitive Receivers and Noise Monitoring Locations



6 NOISE AND VIBRATION CRITERIA

The noise and vibration criteria for the MPW site were presented in the MPW Concept Plan EIS and were subsequently reviewed and accepted by relevant regulatory and approval authorities. The noise and vibration criteria for the Proposal should be consistent with those established for the MPW Concept Approval, and are presented in this Section.

6.1 Operational Noise Criteria

The *NSW Industrial Noise Policy* (INP) recommends two sets of criteria, 'intrusiveness' and 'amenity', for the assessment of operational noise. Intrusiveness criteria are only applied to residential receivers. The intrusiveness and amenity criteria established for sensitive receivers near the Proposal are presented in Table 6-1 and Table 6-2, respectively.

Table 6-1 Operational Noise Criteria – Intrusiveness

Receiver	Intrusiveness Criteria ($L_{Aeq, 15min}$)		
	Daytime[1]	Evening[1]	Night Time[1]
Casula	44	44	38
Glenfield	40	42 (40)	38
Wattle Grove	40	41 (40)	37

2. Daytime 7.00am-6.00pm; Evening 6.00pm-10.00pm; Night 10.00pm-7.00am.

The evening intrusiveness criteria for Glenfield and Wattle Grove, as established in the MPW Concept Plan EIS, are greater than the respective daytime criteria. The *INP* Application Notes (www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm) recommend that intrusiveness noise criteria in the evening should not be greater than that during the daytime. Accordingly, the evening intrusiveness criteria in Glenfield and Wattle Grove have been adjusted downwards.

It should be noted that the above minor amendments to the evening intrusiveness criteria in Glenfield and Wattle Grove are inconsequential to the assessment of operational noise for both the MPW Concept Plan, and the Proposal. Due to the proposed 24/7 operational nature of the site, noise emissions from the site are expected to vary by small amounts over the 24 hour period. The night time intrusiveness criteria are the most stringent criterion for all residential receivers near the site, and will dominate the assessment of operational noise.

The *INP* amenity criterion for educational facilities is an internal $L_{Aeq, 1hour}$ noise level of 35 dBA. For the purposes of assessment, this criterion has been converted to an equivalent external $L_{Aeq, 1hour}$ noise level. It can be conservatively assumed that the attenuation of noise from outside to inside, via partially open windows, is 10 dB. Therefore, the equivalent external amenity criterion for educational facilities is 45 dBA.

Table 6-2 Operational Noise Criteria – Amenity

Receiver	Indicative Noise Amenity Area	Time Period[1]	Amenity Criteria ($L_{Aeq, period}$)
Casula Glenfield Wattle Grove	Residential Suburban	Daytime	55
		Evening	45
		Night Time	40
S1, S2	School/Classroom	Noisiest 1-hour period (when in use)	35 (internal) (45 external)
I1, I2, I3	Industrial	When in use	70

3. Daytime 7.00am-6.00pm; Evening 6.00pm-10.00pm; Night 10.00pm-7.00am.

6.2 Sleep Disturbance Screening Levels

Screening levels for maximum operational noise levels during the night time period (10.00pm – 7.00am) were established in accordance with the *INP* Application Notes (www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm) and are presented in Table 6-3.

Table 6-3 Sleep Disturbance Screening Levels

Receiver / Suburb	Night Time RBL	Sleep Disturbance Screening Level ($L_{A,1min}$ / L_{Amax})
Casula	33	48
Glenfield	33	48
Wattle Grove	32	47

6.3 Road Noise Criteria

Applicable noise criteria for proposals which have the potential to indefinitely increase traffic on roads are presented in the *NSW Road Noise Policy* (RNP) (DECCW, 2011).

The Proposal will generate additional traffic along the M5 Motorway, Moorebank Avenue and Anzac Road. According to the *RNP*, the M5 Motorway is classified as a Freeway, while Moorebank Avenue and Anzac Road are classified as sub-arterial roads.

The *RNP* assessment criteria for residential land uses are shown in Table 6-4.

With regard to the permissible increase in road traffic noise from a land use development the *RNP* states:

> "*For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.*"

Table 6-4 Road Noise Criteria

Road	Category	Assessment Criteria - dBA	
		Day (7am-10pm)	Night (10pm-7am)
M5 Motorway	Freeway	$L_{Aeq,\ 15\ hour}$ 60 (external)	$L_{Aeq,\ 9\ hour}$ 55 (external)
Moorebank Avenue, Anzac Road	Arterial Road	$L_{Aeq,\ 15\ hour}$ 60 (external)	$L_{Aeq,\ 9\ hour}$ 55 (external)

6.4 Rail Noise Criteria

Airborne noise from freight rail movements are assessed using the *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013). In accordance with *RING*, the section of the rail link between the Southern Sydney Freight Line (SSFL) and the Proposal site is classified as a 'non-network line servicing an industrial site'.

Appendix 3 of *RING* recommends that noise from a section of non-network track which extends beyond the boundary of an industrial premises should be assessed against the recommended acceptable *INP* amenity $L_{Aeq,period}$ noise levels.

RING does not recommend specific L_{Amax} noise levels from non-network rail lines. However, a submission from the NSW EPA to the MPE Stage 1 EIS requested that L_{Amax} noise levels associated with the operation of the Rail link be assessed in accordance with the *INP* Application Notes. Accordingly, the sleep disturbance screening levels presented in Section 6.2 have been adopted to assess potential sleep disturbance impacts due to the operation of the Rail link.

The relevant rail noise criteria for the assessment of potential impacts from the Rail link between the Proposal site and the SSFL are summarised in Table 6-5.

Table 6-5 Rail Noise L_{Aeq} Criteria

Receiver	Indicative Noise Amenity Area	Time Period[1]	$L_{Aeq,\ period}$ Criteria	
			Acceptable	Recommended Maximum
Casula, Glenfield, Wattle Grove	Residential Suburban	Day	55	60
		Evening	45	50
		Night	40	45
S1, S2	School/Classroom	Noisiest 1-hour period when in use	45	50
I1, I2, I3	Industrial	When in use	70	75

1. Daytime 7.00am-6.00pm; Evening 6.00pm-10.00pm; Night 10.00pm-7.00am.

Table 6-6 Rail Noise L_{Amax} Screening Levels

Receiver / Suburb	Night Time RBL	L_{Amax} Screening Level
Casula	33	48
Glenfield	33	48
Wattle Grove	32	47

6.5 Construction Noise Management Levels

The NSW EPA's *Interim Construction Noise Guideline* (DECC, 2009) (ICNG) recommends noise management levels (NML) to reduce the likelihood of noise impacts arising from construction activities. The *ICNG* NML for residential receivers are shown in Table 6-7.

Table 6-7 Construction Noise Management Levels at Residences

Time of Day	Management Level $L_{Aeq,15min}$ (dBA)	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

Based on the RBL presented in Table 5-2, the NML for residential receivers are presented in Table 6-8. Table 6-8 includes NML for the following out of hours (OOH) work periods:

- OOH Period 1: 6.00am – 7.00am weekdays;
- OOH Period 2: 6.00pm – 10.00pm weekdays;
- OOH Period 3: 7.00am – 8.00am Saturday; and,
- OOH Period 4: 1.00pm – 6.00pm Saturday.

Table 6-8 Noise Management Levels for Residential Receivers

Receiver	Noise Management Levels				
	Standard Hours	OOH Period 1	OOH Period 2	OOH Period 3	OOH Period 4
Casula	49	44	44	44	44
Glenfield	45	40	40	40	40
Wattle Grove	45	40	40	40	40

The *ICNG* also recommends NML for other sensitive land uses, such as schools, hospitals and places of worship. Pertinent to this assessment, the recommended NML for schools and other educational institutions is an internal $L_{Aeq,\ 15min}$ noise level of 45 dBA. It is conservative to assume that noise levels are attenuated by approximately 10 dBA through normally open windows. Therefore, an external $L_{Aeq,\ 15min}$ noise level of 55 dBA is an equivalent NML for receivers S1 and S2. The NML for S1 and S2 apply only when these facilities are in use.

Finally, the *ICNG* recommends an external NML of 75 dBA at industrial premises, such as I1, I2 and I3.

6.6 Construction Vibration Criteria

When assessing the effects of vibration from construction activities; both human exposure to vibration and the potential for building damage from vibration are typically considered. However, vibration levels with the potential to cause building damage are typically more than 10 times greater than those which cause annoyance. For this reason, human comfort vibration criteria have been used to assess potential vibration impacts from the Proposal. It is noted that vibration intensive construction plant are anticipated to be operated intermittently, and not continuously.

Assessing Vibration: a technical guideline (DEC, 2006) provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS6472:1992, which sets 'preferred' and 'maximum' vibration levels for human comfort.

Criteria for intermittent vibration, which is caused by plant such as rock breakers, are expressed as a Vibration Dose Value (VDV) and are shown in Table 6-9.

Table 6-9 Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night Time[1]	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8
Workshops	0.08	1.6	0.8	1.6

1. Daytime 7.00am-10.00pm; Night 10.00pm-7.00am.

Vibration intensive equipment is likely to be used during the proposed bulk earthworks. However, as the distance from vibration intensive plant to the nearest residential receiver is considered to be large (approximately 500 m), ground vibration at surrounding residential receivers would be low. On this basis, the recommended safe working distances for vibration intensive plant suggested in the Transport Construction Authority's *Construction Noise Strategy* (2012) have been adopted in this assessment to evaluate the vibration impacts. Table 6-10 sets out the recommended safe working distances for various vibration intensive plant.

Table 6-10 Recommended Safe Working Distances for Vibration Intensive Plant

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	(300 kg – 5 to 12t excavator)	2m	7m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7m	23m
Pile Boring	≤ 800 mm	2m (nominal)	N/A
Jackhammer	Hand held	1m (nominal)	Avoid contact with structure

Source: Construction Noise Strategy, 2012, Transportation Construction Authority

A review of the information in Table 6-10 indicates that the human comfort vibration impacts at surrounding residences would be negligible during construction activities. Furthermore, structural damage vibration criteria in residential buildings are much higher than human comfort criteria, and the nearest residential receiver is situated far enough for impacts to be minimal in all circumstances. Therefore, no further assessment of construction vibration is warranted.

7 OPERATIONAL NOISE ASSESSMENT

7.1 Operational Noise Prediction Methodology and Assumptions

7.1.1 Computer Noise Model

Operational and noise emissions associated with the Proposal were modelled using the CadnaA V4.6 acoustic noise prediction software and the CONCAWE noise prediction algorithm. The CONCAWE noise propagation model is used around the world and is widely accepted as an appropriate model for predicting noise over significant distances. Factors that were addressed in the noise modelling are:

- Equipment noise level emissions and locations;
- Shielding from structures;
- Noise attenuation due to geometric spreading;
- Meteorological effects;
- Ground absorption; and,
- Atmospheric absorption.

7.1.2 Meteorological Effects

At relatively large distances from a source, the resultant noise levels at receivers can be influenced by meteorological conditions, particularly temperature inversions and winds; and can therefore vary from hour to hour and night to night. Where these factors are a feature of an area their effect on resultant noise levels is required to be taken into account.

It has been determined that the area surrounding the Proposal site is subject to temperature inversions. In accordance with the *INP*, default parameters have been used in this assessment to include the effects of meteorological conditions that enhance noise levels. These parameters comprise an F-class temperature inversion during the night time period. As the potentially most affected receivers are located at heights similar to, or greater than the Proposal site, drainage winds are unlikely to occur with temperature inversions and as such have not been modelled.

There is potential for gradient winds to enhance noise levels at sensitive receivers, and such conditions have the potential to arise in any of the daytime, evening or night time periods. The default parameters for the assessment of gradient winds in accordance with the *INP* is a 3 m/s wind from source to receiver.

The CONCAWE noise propagation model divides the range of possible meteorological conditions into six separate "weather categories", from Category 1 to Category 6. Weather Category 1 provides "best-case" (i.e. lowest noise level) weather conditions for the propagation of noise, whilst weather Category 6 provides "worst-case - Adverse Meteorological Conditions" (i.e. highest noise level), when source to receiver gradient winds exist and/or there are temperature inversions. The categories are described as follows:

- Categories 1, 2 and 3 weather conditions are generally characterised by wind blowing from the receptor to the noise source during the daytime with a temperature lapse (Pasquill stability class A, B and C).

- Weather Category 4 provides "neutral" weather conditions for noise propagation. Category 4 conditions can be characterised by no wind and a mild temperature lapse (Pasquill stability class D). Typically this weather condition occurs during the day.
- Category 5 and 6 are "worst-case – Adverse Meteorological Conditions" conditions, when winds up to 3m/s source to receiver exist and/or and temperature inversion (Pasquill stability class E, F and G).

For noise modelling purposes, consistent with the *INP*, typical daytime "calm meteorological conditions" conditions were modelled using Category 4 and "adverse meteorological conditions" where modelled using worst-case Category 6.

7.1.3 Noise Barriers

Warehouses and other nearby buildings are likely to provide some level of shielding to sensitive receivers. The following buildings are included in the operational noise model:

- Proposed warehouse buildings on the Proposal site;
- Warehouse buildings on the MPE site, not proposed to be demolished under the MPE Stage 1 Proposal; and,
- Existing large buildings associated with ABB, DJLU and the industrial area to the north of DJLU.

In addition to shielding from buildings, a noise wall, approximately 5 metres high, is proposed to be established along the western operational boundary of the Proposal site.

The location and extent of the noise wall, and the footprints of buildings included in the operational noise modelling are presented in Figure 7-1.

Figure 7-1 Noise Wall and Buildings included in Noise Model

7.2 Operational Noise Sources and Scenarios

7.2.1 Operational Noise Sources

The dominant sources of noise associated with the operation of the Proposal site are:

- Trucks accessing the IMT facility and warehouse areas;
- Container handling equipment, specifically reach stackers;
- The locomotive shifter; and,
- Locomotives idling and moving within the IMT terminal and the Rail link connection.

The sound power levels (SWLs) of the key operational noise sources identified for the Proposal site operations are presented in Table 7-1.

Table 7-1 Operational Source Sound Power Levels

Source	Sound Power Level at Octave Band Centre Frequency									Overall SWL (dBA)
	31.5	63	125	250	500	1k	2k	4k	8k	
Reach Stacker (diesel)	110	111	107	103	105	101	97	96	87	106
Car – 40 km/h	98	102	93	87	88	87	83	74	64	91
Truck – Idling	98	97	94	91	90	91	88	80	72	95
Truck – 10 km/h	100	103	101	99	98	99	96	90	79	103
Truck – 40 km/h	91	101	103	104	103	101	98	94	86	106
Locomotive – Idling	103	107	104	101	98	93	89	88	90	100
Locomotive – 10 km/h	142	126	113	99	91	86	83	80	80	106
Locomotive Shifter	75	80	82	85	89	89	89	85	83	95

7.2.2 Operational Noise Modelling Scenario – Amenity

Trucks would access a number of areas within the Proposal site throughout the day. Approximately 250 trucks would enter the site each day, and travel directly to the warehousing area, via the access road along the western operational boundary of the Proposal site. A further 480 trucks would enter the site each day to access the IMT terminal.

The client has provided an hourly breakdown of the expected distribution of truck movements within the site. The distribution data is presented in Table 7-2. This distribution has been used to model the total number of trucks travelling along various internal roads during the daytime, evening and night time.

Table 7-2 Daily Distribution of Truck Movements

Time	Employee Cars (2 Shifts)	Terminal Trucks	Warehouse Rigid+Semi	Warehouse Bdouble
Midnight - 1am	0.2%	2.0%	0.5%	6.0%
1 am - 2am	0.2%	2.0%	0.5%	5.5%
2am - 3am	4.4%	3.0%	0.5%	4.5%
3am - 4am	4.4%	3.0%	0.8%	4.0%
4am - 5am	5.7%	4.0%	2.0%	3.5%
5am - 6am	4.2%	9.5%	4.0%	3.0%
6am - 7am	4.2%	9.5%	6.3%	2.5%
7am - 8am	19.1%	3.7%	7.6%	2.0%
8am - 9am	6.4%	2.8%	8.5%	1.5%
9am - 10am	0.7%	1.5%	9.2%	1.5%
10am - 11am	0.7%	1.0%	8.5%	2.0%
11am - Midday	0.7%	1.0%	8.5%	2.5%
Midday - 1pm	0.7%	4.9%	7.9%	3.5%
1 pm - 2pm	0.7%	10.3%	7.0%	5.0%
2pm - 3pm	2.9%	10.1%	7.2%	5.5%
3pm - 4pm	8.0%	3.0%	5.9%	4.0%
4pm - 5pm	17.4%	2.0%	4.8%	2.5%
5pm - 6pm	17.4%	1.0%	3.3%	2.5%
6pm - 7pm	0.7%	1.0%	2.3%	3.0%
7pm - 8pm	0.2%	1.0%	1.8%	5.0%
8pm - 9pm	0.2%	2.0%	1.0%	7.5%
9pm - 10pm	0.2%	10.0%	0.8%	8.0%
10pm - 11pm	0.2%	10.0%	0.5%	8.0%
11pm - Midnight	0.2%	2.0%	0.6%	7.0%
Total	**100%**	**100%**	**100%**	**100%**

A total of 12 reach stackers would be used to transfer containers to and from rail wagons. On average, each reach stacker would operate for 50% of the time. Therefore, the modelling of reach stackers for the amenity scenario is based on 6 reach stackers operating simultaneously, with a combined SWL of 114 dBA, on a 24/7 basis.

The client has advised that, on average, there would be eight locomotives within the rail terminal simultaneously. Some of the locomotives would be idling and stationary, while some would be moving along the length of the terminal. The locomotives have been modelled as an area source over the extent of the rail siding, with a combined SWL of 111 dBA, operating on a 24/7 basis.

7.2.3 Operational Noise Modelling Scenario – Intrusiveness

Noise emissions associated with trucks during a worst-case 15-minute period have been estimated using the distribution data in Table 7-2. The highest percentage of total truck movements along both the terminal and warehouse access roads during the daytime, evening and night time have been modelled.

Although considered unlikely to occur regularly, for the purposes of assessment, all 12 reach stackers are assumed to be operating during the worst-case 15-minute period, with a combined SWL of 117 dBA. This SWL has been applied to the daytime, evening and night time.

Similarly, the wort-case 15 minute scenario for locomotives assumes that eight locomotive are all moving within the terminal. This represents a combined SWL of 115 dBA, operating during the daytime, evening and night time.

7.3 Predicted Operational Noise Levels

The predicted $L_{Aeq,\ period}$ operational noise levels at nearby sensitive receivers are presented below in Table 7-3, and assessed against the relevant amenity criteria. Noise levels are presented for calm isothermal conditions and meteorological conditions that enhance noise levels.

Table 7-3 Predicted Amenity $L_{Aeq,\ period}$ Operational Noise Levels

Receiver	Predicted $L_{Aeq,\ period}$ Noise Level (dBA)				Criteria (dBA)			Exceedance
	Day[1]	Evening[1]	Night[1]		Day[1]	Evening[1]	Night[1]	
			Calm[2]	Adverse[3]				
Casula	33	33	32	36	54	45	40	0 dB
Glenfield	<20	<20	<20	<20	54	45	40	0 dB
Wattle Grove	29	29	28	33	54	45	40	0 dB
S1	<20	<20	<20	22	45 (external, when in use)			0 dB
S2	24	24	23	27	45 (external, when in use)			0 dB
I1 (MPE)	60	60	60	60	70 (external, when in use)			0 dB
I2 (DJLU)	56	56	56	57	70 (external, when in use)			0 dB
I3 (ABB)	51	48	48	48	70 (external, when in use)			0 dB

1. Daytime = 7.00am-6.00pm; Evening = 6.00pm-10.00pm; Night = 10.00pm-7.00am.
2. CONCAWE Category 4.
3. CONCAWE Category 6.

Review of Table 7-3 indicates that predicted $L_{Aeq,\ period}$ operational noise levels comply with the established criteria at all sensitive receiver locations at all times.

The predicted $L_{Aeq,\ 15min}$ operational noise levels at nearby sensitive receivers are presented below inTable 7-4, and assessed against the relevant intrusiveness criteria. Noise levels are presented for calm isothermal conditions and meteorological conditions that enhance noise levels.

Table 7-4 Predicted Intrusive $L_{Aeq,\ 15min}$ Operational Noise Levels

Receiver	Predicted $L_{Aeq,15min}$ Noise Level (dBA)				Criteria (dBA)			Exceedance?
	Day[1]	Evening[1]	Night[1]		Day[1]	Evening[1]	Night[1]	
			Calm[2]	Adverse[3]				
Casula	36	36	35	**39**	44	44	38	Up to 1 dB
Glenfield	<20	<20	<20	<20	40	40	38	0 dB
Wattle Grove	28	28	28	33	40	40	37	0 dB

1. Daytime = 7.00am-6.00pm; Evening = 6.00pm-10.00pm; Night = 10.00pm-7.00am.
2. CONCAWE Category 4.
3. CONCAWE Category 6.

Review of Table 7-4 indicates that the predicted $L_{Aeq,\ 15min}$ operational noise levels comply with the established criteria in Glenfield and Wattle Grove.

During periods where noise levels are enhanced by meteorological conditions, $L_{Aeq,\ 15min}$ operational noise levels are predicted to exceed the established night time intrusiveness criterion at the most affected receivers in Casula. At six residential receivers in Casula, the noise levels are predicted to exceed the criterion by up to 1 dB.

Exceedances of up to 1 dB are considered negligible. Notwithstanding, modelling indicates that these predicted exceedances can be effectively mitigated by establishing a noise wall between the two northernmost warehouses. It is noted that establishing a noise wall in this location is not preferred, as it could interfere with efficient site operations. Other mitigation options, such as modifying the warehouse footprints, are expected to achieve appropriate levels of noise reduction, and would be investigated during detailed design.

It should be noted that the modelling of the additional noise wall near the two northernmost warehouses indicated that the height of the main noise wall, running along the western boundary of the Proposal site, could be significantly reduced. Therefore, in addition to achieving compliance with the established noise criteria, optimal design of noise barriers as well as further optimising the efficiency of operations to reduce the peak equipment used on the site will be investigated further during detailed design.

Contour plots of night time operational $L_{Aeq,\ 15min}$ noise levels during calm and adverse meteorological conditions are presented in Appendix A.

7.4 Sleep Disturbance Assessment

Transient noise events associated with the operation of the site, with the potential to cause sleep disturbance include horns, tonal reversing alarms, pneumatic trailer brakes, and 'banging' noises associated with moving containers.

The use of horns and tonal reversing alarms within the Proposal site would be strongly discouraged, and promulgated via the Operational Noise Management Plan. The occasional use of horns by trucks and other mobile equipment may be required under emergency situations, and therefore is beyond the scope of the assessment. Due to the open access arrangement of the Proposal, there is potential for tonal reversing alarms to occasionally be used on site, most likely by trucks accessing the terminal or warehouse areas. The L_{Amax} SWL of a tonal reversing alarm is up to 110 dBA.

Notwithstanding the above, the loudest L_{Amax} noise source, with potential to cause sleep disturbance impacts, is pneumatic trailer brakes on trucks. The L_{Amax} SLW of a truck trailer brake is up to 122 dBA. It should be noted that this is significantly louder than a tonal reversing alarm.

The predicted L_{Amax} noise levels at nearby receivers due to pneumatic trailer brakes are shown in Table 7-5.

Table 7-5 Predicted L_{Amax} Noise Levels at Sensitive Receivers

Receiver	Predicted L_{Amax} Noise Level (dBA)		Sleep Disturbance Screening Level (dBA)	Exceedance
	Calm[1]	Adverse[2]		
Casula	43	47	48	0 dB
Glenfield	<20	23	48	0 dB
Wattle Grove	20	24	47	0 dB

1. CONCAWE Category 4.
2. CONCAWE Category 6.

Review of Table 7-5 indicates that the predicted L_{Amax} levels at all receivers are less than the sleep disturbance screening levels, and therefore; no further assessment of sleep disturbance is warranted.

7.5 Cumulative Operational Noise Assessment

It is anticipated that the Proposal site will operate concurrently with the MPE Stage 1 site. Since the noise sources within the two sites are very similar, they are expected to have noise 'signatures' which are almost identical. Therefore, it is likely that sensitive receivers will look upon the two facilities as a single noise generating activity.

Accordingly, the following section presents the predicted cumulative noise levels from the intermodal facilities, and assesses them against the relevant amenity criteria.

The $L_{Aeq,\ period}$ noise levels at sensitive receivers due to the concurrent operation of the Proposal site and the MPE Stage 1 site have been predicted by combining the computer noise models developed for each proposal. The predicted cumulative operational noise levels due to the operation of the intermodal facilities are presented in Table 7-6.

Table 7-6 Predicted Cumulative Operational Noise Levels

Receiver	Predicted $L_{Aeq,\ period}$ Noise Level (dBA)				Criteria (dBA)			Exceedance
	Day[1]	Evening[1]	Night[1]		Day[1]	Evening[1]	Night[1]	
			Calm[2]	Adverse[3]				
Casula	33	33	32	36	54	45	40	0 dB
Glenfield	20	20	20	24	54	45	40	0 dB
Wattle Grove	32	32	32	36	54	45	40	0 dB
S1	29	29	29	34	45 (external, when in use)			0 dB
S2	24	24	23	27	45 (external, when in use)			0 dB
I2 (DLJU)	56	56	56	57	70 (external, when in use)			0 dB
I3 (ABB)	51	48	48	48	70 (external, when in use)			0 dB

1. Daytime = 7.00am-6.00pm; Evening = 6.00pm-10.00pm; Night = 10.00pm-7.00am.
2. CONCAWE Category 4.
3. CONCAWE Category 6.

Review of Table 7-6 indicates that cumulative operational noise levels at sensitive receivers, due to the concurrent operation of the Proposal site and the MPE Stage 1 site, comply with the relevant amenity criteria at all times of the day.

Contour plots of night time cumulative operational noise levels during calm and adverse meteorological conditions are presented in Appendix A.

Glenfield Waste Services are proposing to develop a Materials Recycling Facility on a parcel of land south west of the Proposal, between the Georges River and the SSFL. The facility is proposed to operate during daytime hours.

Since the cumulative operational noise levels due to the intermodal facilities are more than 10 dB below the relevant daytime criteria at all sensitive receivers, they would be considered unlikely to contribute to any exceedance of daytime amenity criteria.

8 RAIL NOISE ASSESSMENT

8.1 Operation of the Rail Link

A detailed assessment of potential noise impacts associated with the operation of the Rail link between the MPE Stage 1 IMEX Terminal and the Southern Sydney Freight Line (SSFL) was conducted for the MPE Stage 1 Proposal (SSD-6766). Following that assessment, Planning NSW has issued a set of recommended conditions for the operation of the Rail link. These conditions require that:

- Wagons on the Rail link incorporate available best practice technologies for reducing wheel squeal, such as permanently coupled "multi-pack" steering wagons using Electronically Controlled Pneumatic braking with a wire based distributed power system;
- Friction modifiers and automatic rail lubrication systems are installed within the Rail link; and,
- Track grinding is carried out within the Rail link to ensure the correct profile is maintained on the track to encourage proper rolling stock steering.

The above suite of measures is considered best practice for avoiding curve squeal. These measures would be incorporated into the design and operation of the Rail link for the Proposal and therefore, the occurrence of curve squeal is considered unlikely.

8.2 Rail Noise Prediction Methodology

Predicted levels of rail noise at sensitive receivers have been calculated using the NORDIC rail noise prediction algorithm, implemented in the CadnaA noise prediction software.

Rail noise predictions are made for all trains travelling between the Proposal site and the SSFL[2]. Previous assessments and approval of the SSFL are understood to account for freight movements generated by an intermodal terminal facility, in the Moorebank area. Therefore, no assessment is included of noise emissions from movements on the SSFL generated by the Proposal.

Measurements of freight locomotives and wagons are contained in the current (Version 3, 2015) and previous (Version 2, 2000) Transport for New South Wales (TfNSW) Rail Noise Databases. The latest version of the database contains a significant number of measurements of freight wagons, however does not contain any octave band information for the movements, which is a necessary requirement for the NORDIC algorithm. Therefore, octave band information has been taken from the previous version (Version 2) of the database. Locomotive data has been taken from the previous version (Version 2) of the database as it contains significantly more freight locomotive measurements. The model has been calibrated to the 95th percentile of measured levels for freight wagons and Class 81 locomotives and is therefore conservative.

Between the Proposal site and the SSFL, it is expected that typical average trains speeds will be approximately 35km/h, however the speed limit on the Rail link is 60km/h. Due to the relatively low train speeds, no corrections have been applied for turnouts and crossovers.

[2] The Proposal proposes the use of the Rail link to be constructed under the MPE Stage 1 Approval (SSD 14-6766).

The crossing bridge over the Georges River is expected to be a concrete span construction. No corrections have been applied for radiated noise from this bridge type.

Due to the use of best practice rolling stock and track maintenance, as required by the draft conditions of approval for MPE Stage 1, wheel squeal and flanging are considered unlikely to occur.

The NORDIC rail prediction method is designed to predict the L_{Amax} noise levels from train movements. In practice however, under Australian conditions, Wilkinson Murray's experience is that the NORDIC algorithm typically predicts the 50th percentile L_{Amax} levels, rather than the 95th percentile levels which are typically used for assessment purposes. Therefore, a correction of +3 dBA is applied to the predicted L_{Amax} levels to better represent the expected 95th percentile levels. The correction has been developed from analysis of measurement data in the Rail Noise Databases.

It should be noted that since the rolling stock operating within the Rail link would use best practice technologies for reducing wheel squeal, such as permanently coupled "multi-pack" steering wagons using Electronically Controlled Pneumatic braking with a wire based distributed power system; the associated noise levels are anticipated to be lower than those based on measurements of existing rolling stock currently in use throughout NSW.

8.2.1 Sources of Rail Noise

Intermodal freight trains travelling between the Proposal site and Port, via the northern SSFL connection, will typically comprise one 81 Class locomotive and 38 wagons, with a total length of approximately 900 metres. Interstate freight trains, accessing the site via the southern SSFL connection, will typically comprise four 81 Class locomotives and up to 74 wagons, with a total length of up to 1,800 metres.

81 Class locomotives are understood to comply with the EPA Noise Limits for Locomotives contained within the NSW operational rail licences for operation of new or substantially modified locomotives operating on the NSW network.

A worst-case 24 hour period would typically involve the following trains accessing the Proposal site:

- Two trains of up to 900 metres in length, with one locomotive and 38 wagons;
- Two trains of up to 1,500 metres in length, with four locomotives and 62 wagons; and,
- Two trains of up to 1,800 metres in length, with four locomotives and 74 wagons.

Train movements to and from the Proposal site will be subject to a number of factors including availability of network rail lines and activities at Port and the Proposal site, however are anticipated to be approximately evenly distributed throughout a 24 hour period.

8.2.2 Predicted L_{Aeq} Rail Noise Levels at Sensitive Receivers

Table 8-1 presents the predicted $L_{Aeq,\ period}$ noise levels at sensitive receivers due to freight rail movements associated with the Proposal, as discussed in Section 8.1.

Table 8-1 Predicted $L_{Aeq, period}$ Rail Noise Levels

Receiver	Predicted Level (dBA)			Criteria (Recommended)			Exceedance
	Day	Evening	Night	Day	Evening	Night	
Casula	50	**50**	**48**	55	45	40	8 dB
Glenfield	43	43	**41**	55	45	40	1 dB
Wattle Grove	41	42	39	55	45	40	0 dB
S1	**48**	**48**	**47**	45 (when in use)			2 dB
S2	43	43	42	45 (when in use)			0 dB

Review of Table 8-1 indicates that $L_{Aeq, period}$ noise levels exceed the relevant criteria at the most sensitive receivers in Casula during the evening and night time, and in Glenfield during the night time. The predicted $L_{Aeq, period}$ noise levels also exceed the criteria at S1.

Sensitive receivers within Casula and Glenfield where the predicted $L_{Aeq, period}$ rail noise levels exceed the relevant criteria, based on the *INP* amenity levels, are already subject to significant levels of rail noise from the existing network rail lines – SSFL and the Main Southern Line). The existing numbers of rail movements due to both passenger and freight trains travelling along network rail lines in the vicinity of the sensitive receivers are significantly higher than the additional movements associated with the Proposal. Therefore, it is expected that the existing $L_{Aeq, period}$ levels of rail noise at the most affected receivers within Casula and Glenfield are unlikely to noticeably increase due to the Proposal.

The highest exceedances of L_{Aeq} rail noise criteria are predicted to occur at Lot 21 Leacocks Lane, Casula. At this location, the predicted $L_{Aeq, period}$ noise levels during the night time are 48.1 dBA. The *Southern Sydney Freight Line Operational Noise and Vibration Management Plan*, available on the ARTC website (www.artc.com.au/community/environment/), presents predicted $L_{Aeq, 24hour}$ noise levels at a number of sensitive receiver locations along the SSFL alignment. According to this document, the predicted noise level at a nearby residence, 77 Leacocks Lane is 48.4 dBA.

77 Leacocks Lane is approximately 60 metres to the west of Lot 21. Due to the complex topography in the area adjacent to the SSFL in Casula, the existing rail noise levels from SSFL are expected to be higher at Lot 21 Leacocks Lane, than at 77 Leacocks Lane. From the front façade of 77 Leacocks Lane, the surrounding topography obstructs the direct line of sight to the nearest sections of SSFL. Alternatively, the rear façade of Lot 21 Leacocks Lane has a direct line of site to the nearest section of track. Therefore, the existing $L_{Aeq, period}$ noise levels at Lot 21 Leacocks Lane are anticipated to be 3-5 dBA higher than those at 77 Leacocks Lane.

Based upon the conservative assumption that the existing $L_{Aeq, period}$ rail noise level at Lot 21 Leacocks Lane is 51.4 dBA, then the cumulative night time $L_{Aeq, period}$ rail noise level with the Proposal is 53.1 dBA. Therefore, freight rail movements associated with the Proposal are anticipated to increase $L_{Aeq, period}$ noise levels at sensitive receivers by up to 1.7 dBA. This difference is considered negligible, and would not be noticeable to most people. Accordingly, no mitigation of the increased noise levels is warranted.

8.2.3 Predicted L_{Amax} Rail Noise Levels at Sensitive Receivers

Table 8-2 presents the predicted L_{Amax} noise levels at sensitive receivers due to freight rail movements associated with the Proposal as discussed in Section 8.1.

Table 8-2 Predicted L_{Amax} Rail Noise Levels

Receiver	Predicted Level (dBA)	Sleep Disturbance Screening Level	Exceedance
Casula	67	48	19 dB
Glenfield	62	48	14 dB
Wattle Grove	54	47	7 dB

Review of Table 8-2 indicates that the predicted L_{Amax} noise levels at sensitive residential receivers due to freight rail movements exceed the relevant sleep disturbance screening levels. Accordingly, a more detailed assessment of potential sleep disturbance impacts is warranted.

The *INP* Application Notes recommend that detailed assessments of sleep disturbance adopt the guidance on potential impacts from the review of research results presented in the *NSW Road Noise Policy* (RNP), and that they consider:

- How often the noise events will occur;
- Time of day (normally between 10.00pm and 7.00am); and,
- Whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).

The *RNP* advises that:

> *"From the research on sleep disturbance to date it can be concluded that:*
>
> - *Maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep*
> - *One or two noise events per night, with maximum internal noise levels of 65-70 dB(A), are not likely to affect health and wellbeing significantly."*

To aid in assessing the potential for sleep disturbance, it is useful to convert the above internal noise levels to equivalent external noise levels. The attenuation of noise through a window left ajar, is approximately 10 dBA. Therefore, it is appropriate to say that, according to NSW Government noise guidelines, external L_{Amax} noise levels of below 60-65 dBA are unlikely to awaken people from sleep, and one or two noise events per night, with external L_{Amax} levels of 75-80 dBA are not likely to affect health and wellbeing significantly.

Maximum noise level events, as predicted in Table 8-2, will occur only during train movements. It is proposed that up to 7 trains would access the Proposal site per day, resulting in up to 14 noise events. Subject to activities on the Proposal site and at Port, the distribution of train movements throughout the day will be somewhat constant, and it is most likely that approximately 6 movements will occur during the night time (10.00pm – 7.00am) period.

Review of Table 8-2 indicates that in the absence of rail squeal, predicted external L_{Amax} rail noise levels marginally exceed 60-65 dBA at the most sensitive receiver locations in Casula, and are below 65 dBA at all other residential receivers.

As presented in Section 8.2, corrections have been applied to the rail noise model in order to predict 95th percentile L_{Amax} levels. Therefore, if the predicted L_{Amax} noise level at the most affected receiver in Casula due to freight rail movements is 67 dBA, it would be expected that the majority of maximum noise events would be below 67 dBA. Similarly, there is the potential for up to one event per night to result in L_{Amax} noise levels in excess of 67 dBA. In accordance with the available research, as presented in the *RNP*, freight rail movements associated with the Proposal, in the absence of rail squeal, are considered unlikely to awaken people from sleep, or affect health and wellbeing significantly.

It should also be noted that sensitive receivers in Casula and Glenfield are located in close proximity to the SSFL and Main Southern Lines, where the existing L_{Amax} noise levels associated with rail movements are considered likely to exceed 65 dBA. Therefore, L_{Amax} noise levels due to the Proposal are unlikely to cause a noticeable change to the existing acoustic environment.

9 ROAD NOISE ASSESSMENT

The most affected residential receivers to potential increases in road noise resulting from the development are those residents located immediately adjacent to the M5 Motorway, on Moorebank Avenue, north of the M5 Interchange, and on Anzac Road east of Moorebank Avenue. No sensitive receivers are identified along Moorebank Avenue between the Proposal site and the M5 Interchange.

9.1.1 Road Traffic Volume and Mix

It has been determined by the client that the operational traffic flow to and from the Proposal will be primarily along the M5 Motorway in both the east and west directions, and along Moorebank Avenue between the site and the M5 Motorway. It is expected that a small volume of traffic travelling to and from the site will do so along Moorebank Avenue, to the north of the M5 Interchange, and along Anzac Road east of Moorebank Avenue.

Based on throughput of 500,000 TEU per annum, the current and predicted daily traffic volume and percentage heavy vehicles (mix) along the identified routes are shown in Table 9-1.

Table 9-1 Traffic Volume and Mix[1]

Location	Time[2]	Current (no Development)		Future (with Development)	
		Volume	Mix	Volume	Mix
M5 Motorway – East of Moorebank Avenue	Day	106,140	10%	106,590	10%
	Night	20,850	11%	20,980	11%
M5 Motorway – West of Moorebank Avenue	Day	124,950	11%	126,860	11%
	Night	24,460	11%	24,880	12%
Moorebank Avenue – North of M5 Motorway	Day	27,290	11%	27,970	12%
	Night	6,290	10%	6,440	11%
Anzac Road – East of Moorebank Avenue	Day	9,000	4%	9,150	4%
	Night	2,130	4%	2,180	4%

Source: Arcadis

1. Day = 7.00am – 10.00pm, Night = 10.00pm – 7.00am

Using the data in Table 9-1, the increase in traffic noise levels along the M5 Motorway and Moorebank Avenue has been calculated. The calculations have been conducted using the *Calculation of Road Traffic Noise (CORTN)* algorithm, and are based upon the following assumptions:

- Vehicle speeds are 100 km/h along the M5 Motorway and 60 km/h along Moorebank Avenue and Anzac Road.

- Typical receiver setbacks are approximately 25 metres along the M5 Motorway and approximately 12 metres along Moorebank Avenue and Anzac Road. It is important to highlight that receiver setbacks are important when calculating absolute traffic noise levels, however setbacks are not important when calculating increases in traffic noise levels due to changes in traffic volume and mix.

The predicted increases in traffic noise levels are shown in Table 9-2.

Table 9-2 Increases in Traffic Noise Levels

Location	Predicted Increase (dBA)	
	Day[1]	Night[1]
M5 Motorway – East of Moorebank Avenue	0.0	0.0
M5 Motorway – West of Moorebank Avenue	0.1	0.2
Moorebank Avenue – North of M5 Motorway	0.3	0.3
Anzac Road – East of Moorebank Avenue	0.1	0.1

1. Day = 7.00am – 10.00pm, Night = 10.00pm – 7.00am

Review of Table 9-2 shows that increases in road traffic noise levels along the M5 Motorway, Moorebank Avenue, and Anzac Road are considerably less than 2 dBA. In accordance with the *RNP*, no mitigation of traffic noise levels is warranted.

10 CONSTRUCTION NOISE ASSESSMENT

The following section presents an assessment of potential noise impacts associated with the construction of the Proposal.

10.1 Construction Equipment and Noise Source Levels

Sound Power Levels (SWLs) associated with typical construction plant to be used throughout the construction of the Proposal are identified in Table 10-1. These SWLs have recently been measured at other similar construction sites. The table gives both Sound Power Level and Sound Pressure Levels (SPL) at 7m for the equipment. Sound Power Level is independent of measurement position.

Table 10-1 Typical Construction Plant Sound Levels – dBA

Plant	Sound Power Level	Sound Pressure Level at 7m
Loaders	112	87
Static and vibratory rollers	109	84
Mobile cranes	110	85
Excavators	110	85
Excavators with hammers	122	97
Backhoes	105	80
Crushing plant	118	93
Concrete batch plant	113	88
Concrete agitators (or similar)	105	80
Concrete pumps	103	78
Concrete saws	112	87
Air compressors	100	75
Jackhammers	113	88
Dozers	118	93
Mulchers	118	93
20-40 tonne articulated tipper trucks	110	85
Scrapers	110	85
Graders	109	84
Water trucks	105	80
Piling rigs	121	96
Forklifts	106	81
Small earthmoving equipment	95	70
Rail tamper	118	93
Welder	90	65

10.2 Assessment of Construction Noise during Standard Working Hours

The following section presents predicted $L_{Aeq,\ 15min}$ construction noise levels during standard working hours, and assesses the predicted levels against the established NML.

Table 10-2 presents the construction plant items expected to be used in each works period, and the total combined sound power level (SWL) of all equipment in each works period.

Table 10-2 Works Periods, Equipment and Total SWL

Equipment	Construction Works Period						
	Pre-construction stockpiling	Site preparation	Bulk earthworks, drainage and utilities	Moorebank Avenue and internal roads	IMT facility and Rail link connection	Warehouse construction and fit out	Buildings and finishing works
Loaders	✓	✓	✓	✓	✓	✓	✓
Static and vibratory rollers	✓	✓	✓	✓	✓	✓	✓
Mobile cranes		✓			✓	✓	
Excavators	✓	✓	✓	✓	✓	✓	
Excavators with hammers			✓				
Backhoes		✓	✓	✓	✓	✓	✓
Crushing plant		✓	✓				
Concrete batch plant				✓	✓	✓	
Concrete agitators (or similar)				✓	✓	✓	✓
Concrete pumps				✓	✓	✓	✓
Concrete saws				✓	✓	✓	✓
Air compressors			✓	✓	✓	✓	✓
Jackhammers				✓	✓	✓	✓
Dozers		✓	✓	✓			
Mulchers		✓	✓				
20-40 tonne articulated tipper trucks	✓	✓	✓	✓	✓		
Scrapers	✓	✓	✓	✓			
Graders	✓	✓	✓	✓	✓	✓	
Water trucks	✓	✓	✓	✓	✓	✓	✓
Piling rigs					✓	✓	
Forklifts					✓	✓	✓
Small earthmoving equipment				✓	✓	✓	✓
Rail tamper					✓		

Equipment	Construction Works Period						
	Pre-construction stockpiling	Site preparation	Bulk earthworks, drainage and utilities	Moorebank Avenue and internal roads	IMT facility and Rail link connection	Warehouse construction and fit out	Buildings and finishing works
Welder					✓	✓	✓
Combined SWL for Works Period (dBA)	**117**	**124**	**128**	**122**	**125**	**124**	**119**

The predicted $L_{Aeq,\ 15min}$ noise levels at sensitive receivers during standard hours for each identified works period are presented in Table 10-3.

Table 10-3 Predicted Construction Noise Levels During Standard Hours

Receiver	Construction Works Period							NML
	Pre-construction stockpiling	Site preparation	Bulk earthworks, drainage and utilities	Moorebank Avenue and internal roads	IMT facility and Rail link connection	Warehouse construction and fit out	Buildings and finishing works	
Casula	39	46	**50**	44	47	46	41	49
Glenfield	25	32	36	30	33	32	27	45
Wattle Grove	26	33	37	31	34	33	28	45
S1	38	45	49	43	46	45	40	55
S2	37	44	48	42	45	44	39	55
I1	40	47	51	45	48	47	42	75
I2	33	40	44	38	41	40	35	75
I3	42	49	53	47	50	49	44	75

Review of Table 10-3 indicates that $L_{Aeq,\ 15min}$ construction noise levels at the most sensitive residential receivers in Casula are predicted to exceed the established NML by up to 1 dB. A 1 dB exceedance is considered negligible and does not warrant mitigation.

10.3 Assessment of Construction Noise during OOH Work Periods

The following section presents the identified OOH work activities associated with the Proposal, and presented the predicted construction noise levels at sensitive receivers for each identified OOH work period.

10.3.1 Predicted Construction Noise Levels during OOH Period 1

During OOH period 1, 6.00am – 7.00am weekdays, Material Delivery is the only proposed activity.

$L_{Aeq,\ 15min}$ noise levels at sensitive receivers have been predicted where all plant is operating simultaneously, with a modelled SWL of 117 dBA over the works area. The predicted levels are presented in Table 10-4.

Table 10-4 Predicted Construction Noise Levels during OOH Period 1

Receiver	Predicted $L_{Aeq,\ 15min}$ Noise Level	NML	Exceedance
Casula	39	44	0 dB
Glenfield	26	40	0 dB
Wattle Grove	26	40	0 dB
S1	38	55	0 dB
S2	47	55	0 dB

Review of Table 10-4 indicates that construction noise levels are not predicted to exceed applicable NML at sensitive receivers during OOH Period 1

10.3.2 Predicted Construction Noise Levels during OOH Period 2, 3 and 4

During OOH period 2 (6.00pm – 10.00pm weekdays) OOH Period 3 (7.00am – 8.00am Saturday) and OOH Period 4 (1.00pm – 6.00pm Saturday), the following activities are proposed:

- Material Delivery; and,
- Direct Placement, or Stockpiling.

$L_{Aeq,\ 15min}$ noise levels at sensitive receivers have been predicted where all plant is operating simultaneously, with a modelled SWL of 122 dBA over the works area. The predicted levels are presented in Table 10-5.

Table 10-5 Predicted Construction Noise Levels during OOH Period 2, 3 and 4

Receiver	Predicted $L_{Aeq,\ 15min}$ Noise Level	NML	Exceedance
Casula	44	44	0 dB
Glenfield	31	40	0 dB
Wattle Grove	35	40	0 dB
S1	44	55	0 dB
S2	43	55	0 dB

Review of Table 10-5 indicates that construction noise levels are not predicted to exceed applicable NML at sensitive receivers during OOH Period 2, 3 or 4.

10.4 Cumulative Construction Noise Assessment

In addition to the construction works associated with the Proposal, a number of other large-scale construction activities are expected to occur simultaneously in the vicinity of the Proposal site. Specifically, the approved Early Works of the MPW project, and the Site Preparation, Bulk Earthworks and Engineering Fill phases of the MPE Stage 1 Proposal.

The highest predicted $L_{Aeq, 15min}$ construction noise levels at sensitive receivers, during relevant phases, for each project have been added to provide an indication of potential cumulative construction noise impacts. Predicted $L_{Aeq, 15min}$ construction noise levels for the MPW Early Works have been taken from *Moorebank Intermodal Terminal EIS – Noise and Vibration Impact Assessment*, prepared by SLR Consulting, dated October 2014. Predicted $L_{Aeq, 15min}$ construction noise levels for the MPE Stage 1 project have been taken from *SIMTA Intermodal Terminal Facility – Stage 1 – Noise and Vibration Impact Assessment*, prepared by Wilkinson Murray, dated May 2015.

Worst-case cumulative $L_{Aeq, 15min}$ construction noise levels at sensitive receivers, during standard construction hours, are presented in Table 10-6

Review of Table 10-6 indicates that the predicted worst-case cumulative construction noise levels exceed the NML at the most affected residential receivers in Casula by up to 2 dB. This is considered a negligible exceedance.

Table 10-6 Worst-Case Cumulative Construction Noise Levels

Receiver	Predicted $L_{Aeq, 15min}$ Noise Levels				NML	Exceedance
	MPW Stage 2 Proposal	MPW Early Works	MPE Stage 1	Cumulative		
Casula	**50**	44	40	**51**	49	2 dB
Glenfield	36	40	32	42	45	0 dB
Wattle Grove	37	38	40	43	45	0 dB
S1	49	49	39	52	55	0 dB
S2	48	49	37	52	55	0 dB

11 MITIGATION

As outlined in Section 7.1.3, a large noise wall would be established along a portion of the western boundary of the Proposal site. The need for this noise wall was identified in the MPW Concept Plan EIS, and subsequent modelling in this assessment has confirmed the need for such a barrier. The indicative height and extent of the noise wall was presented in Section 7.1.3. The actual height and extent of the noise wall, and any other required noise walls, would be confirmed during detailed design. It should be noted that the height and/or extent of the noise wall could differ from that presented in this assessment.

A number of measures to mitigate noise levels from the operation of the Rail link were identified in the MPE Stage 1 Proposal and the associated draft conditions of consent. No additional rail noise mitigation measures, due to the Proposal, are considered necessary.

The preceding sections have identified the potential for $L_{Aeq,\ 15min}$ construction noise levels to exceed the established management levels. Best practice mitigation and management measures will be used to minimise construction noise and vibration at noise sensitive receivers, and will be described in a Construction Noise and Vibration Management Plan (CNVMP), as required under Ministers Condition of Approval D20(b) (SSD_5066) and Revised Environmental Management Measures (REMMs) 5A to 5T. In accordance with the MCoAs, the CNVMP will be developed in accordance with the *ICNG*, and will give consideration to the relevant REMMs.

Best practice noise mitigation measures would be implemented for the operational phase of the Proposal including:

- Noise monitoring
- A gate appointment system would be implemented to minimise truck loading/unloading wait times and resultant queueing. Trucks would be turned away from facility if arriving too early
- Truck marshalling lanes would be included to minimise congestion and queueing
- The provision of information signs and communication of MPW idle reduction policy.

No further mitigation measures, additional to those identified in the MCoAs and REMMs or detailed above, are considered warranted for the Proposal.

The relevant REMMs, relating to both the operation and construction of the Proposal are presented in Table 11-1.

Table 11-1 Relevant REMMs

REMM Number	Measure
5A	A construction noise and vibration management plan (CNVMP) (or equivalent) would be developed for construction activities.
5B	The appropriateness of the noise and vibration management and mitigation measures in 5C to 5T are to be further investigated as part of the future development applications. These measures, or their replacement measures, are to be implemented through the CNVMP (or equivalent) prior to and during all noise-generating construction works for each of the Project phases.
5C	Standard construction hours

REMM Number	Measure
	Construction activities associated with the Development shall be undertaken during the following standard construction hours: a) 7.00 am to 6.00 pm Mondays to Fridays, inclusive; and b) 8.00 am to 1.00 pm Saturdays; and c) at no time on Sundays or public holidays
5D	Construction works outside of the standard construction hours identified in condition 5C may be undertaken in the following circumstances: a) construction works that generate noise that is: i. no more than 5 dB(A) above rating background level at any residence in accordance with the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009); and ii. no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009) at other sensitive receivers; or b) for the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or c) where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm; d) works approved through an EPL, or e) works as approved through the out-of-hours work protocol outlined in the CEMP.
5E	During site inductions and toolbox talks, all site workers (including subcontractors and temporary workforce) are to be made aware of the hours of construction and how to apply practical, feasible and reasonable measures to minimise noise and vibration when undertaking construction activities.
5F	Quieter and less vibration-emitting construction methods would be applied where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles would minimise noise and vibration impacts.
5G	The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.
5H	Where possible, equipment that emit directional noise would be oriented away from sensitive receptors.
5I	Reversing of vehicles and mobile equipment would be minimised so as to prevent nuisance caused by reversing alarms. This could be achieved through one-way traffic systems and the use of traffic lights which could also limit the use of vehicle horns.
5J	Where work is proposed in the vicinity of residences, potentially affected residents would be advised, at least two weeks prior to the commencement of works, of the potential noise and vibration levels and the proposed management measures to control environmental impacts.
5K	Whenever possible, loading and unloading areas would be located away from the nearest residences.
5L	Broadband reversing alarms would be considered instead of tonal reversing alarms, in particular outside standard working hours (such as during night-time rail possession works).
5M	Equipment that is used intermittently would be shut down when not in use for extended periods of time.
5N	Where possible, all engine covers would be kept closed while equipment is operating

REMM Number	Measure
5O	Where possible, trucks associated with the work would not be left standing with their engines operating in streets adjacent to or within residential areas.
5P	Traffic speeds would be signposted. All drivers would be expected to comply with speed limits and to implement responsible driving practices to minimise noise associated with unnecessary acceleration and braking. Traffic movements should be scheduled to minimise continuous traffic flows (convoys).
5Q	The site manager (as appropriate) should provide a community liaison phone number and permanent site contact so that any noise and/or vibration related complaints can be received and addressed in a timely manner. Consultation and cooperation between the site and its neighbours would assist in limiting uncertainty, misconceptions and adverse reactions to noise and vibration.
5R	Attended noise and ground vibration measurements would be undertaken at monthly intervals, In areas within close proximity to sensitive receivers and upon receipt of adverse comment/complaints during the construction program, to confirm that noise and vibration levels at adjacent communities and receptors are consistent with the predictions in this assessment and any approval and/or licence conditions.
5S	If noise generating construction works are undertaken outside the standard daytime construction hours and/or measured construction noise levels at nearest residences are greater than 75 dB(A) L_{Aeq}, the following additional noise mitigation measures would be considered: • Localised acoustic screens, comprising a solid structure such as plywood fencing to surround noise generating construction plant or work locations. To be effective for ground level noise, the screens would be lined with acoustic absorptive material, at least 2 m in height and installed within 5 m of the noise source. • Dominant noise-generating mechanical plant would be fitted with feasible noise mitigation controls such as exhaust mufflers and engine shrouds. • Respite periods of one hour are recommended for every continuous three-hour period of work; alternatively, daytime works would be scheduled between 9.00 am and 12.00 pm, and between 2.00 pm and 5.00 pm. • Where practical, and when night works are being undertaken, noisy construction work would be undertaken during the less sensitive 6.00 pm to 10.00 pm evening period.
5T	Depending on the specific construction works undertaken, construction noise mitigation may need to be implemented: • where piling works (required for all rail access connection options) are undertaken within approximately 600 m of residences in Casula and within approximately 800 m of residences in Glenfield; • for rail access connection works where daytime construction works undertaken within 450 m of nearest receptors in Casula; and where rail construction is required up to 1400 m from residences outside the standard daytime hours, such as during track possession works.
5U	To achieve the noise reductions outlined in Table 7.30 of the Response to Submissions report and the Revised Project Noise and Vibration Impact Assessment report in Appendix F, mitigation treatments may be required to reduce noise from all dominant noise sources. The Project would implement reasonable and feasible noise mitigation to control potential noise levels. In the event that the Project does not meet the assessment criteria at receptors, if the Project has reduced noise levels to be as low as practicable, the NSW Industrial Noise Policy (INP) (EPA 2000b) notes that: • achievable noise limits can be negotiated with regulators and the community; and

REMM Number	Measure
	• the Project specific noise mitigation measures and noise levels outlined in Table 7.30 of this report and in the Noise and Vibration Assessment (Appendix F) should not automatically be interpreted as conditions for approval without consideration of other factors (environmental, social and economic) consistent with the objectives of the EP&A Act. In this regard, where appropriate, the INP notes that noise limits can be set above the Project specific noise levels.
5V	Where practical operational plant and equipment would be selected to reduce noise emissions.
5W	Mechanical components on fixed and mobile equipment, such as motors, gearboxes and exhausts, would include enclosures and acoustic insulation (lagging) (as necessary) to limit noise emissions.
5X	Where feasible, motors and mechanical noise-generating components of the rail mounted gantries (RMGs) would be located near to ground level rather than at the top of the gantry.
5Y	Where reasonable and feasible, and where it would produce a lower noise emission, electric motors would be operated instead of diesel powered equipment.
5Z	The following measures would be considered and where possible incorporated into the design and operation of the freight trains on the rail track on the main IMT site to control potential operational noise: • The track on the rail access connection would be designed to minimise adverse changes in vertical alignment, to reduce the requirement for locomotives to operate at high throttle on the ascent or under heavy braking on the descent. • The rail access connection bridge would be designed as a concrete or composite/concrete structure or more suitably noise mitigating structure to minimise potential re-radiated noise from vibrating sections of the elevated track. Detailed noise analysis would be undertaken to identify both airborne and re-radiated noise contributions, to effectively mitigate total noise emissions. • Locomotives accessing the main IMT site should have approval to operate on the network consistent with the noise limits for locomotives detailed in the ARTC Environmental Protection Licence No. 3142.
5AA	Unless for health and safety reasons, heavy vehicles should avoid the use of horns within the main IMT site.
5AB	To further control potential rail noise from wheel squeal the following measures are proposed: • Track greasing systems should be investigated on curved sections of track to lubricate and reduce friction at the wheel-rail interface. • The track maintenance system would include measures such as grinding to remove rail roughness, treatment of roughness on the wheels of locomotives and wagons, and adjustment of bogie-suspension tracking and brake system set up.
5AC	Where feasible, all rail tracks would be designed to maximise the separation distance between rail lines and the nearest residences.
5AD	Noise walls or noise barriers would be installed within the main IMT site where required In regard to noise walls or barriers, if required: • Noise walls/barriers would need to be solid structures, typically constructed of concrete or similar material. • Additional absorptive material could be applied to the internal facades of the noise walls/barriers to reduce reflected noise from the wall/barriers. • TEU containers could be used as noise barriers where they are stacked, to effectively impede the direct line of sight to nearest receptors.

REMM Number	Measure
	• Onsite noise walls/barriers would be constructed at the earliest opportunity in the Project development to provide noise attenuation during all subsequent construction and operation phases. • Subject to further consideration of environmental, social and economic impacts, earth mounding could be considered as an alternative to, or in conjunction with, noise walls/barriers to attenuate the propagation of noise between the site and nearest affected receptors. For the southern rail access, it is proposed that earth mounding be considered on the main IMT site, at the western extent of the IMEX and interstate rail lines.
5AE	Where feasible, all onsite buildings and structures would be designed and constructed to impede noise from ground level operation of heavy vehicles, side picks and ITVs.
5AF	Before the start of each phase of operations, an operational noise and vibration management plan (ONVMP) (or equivalent) would be developed and implemented. The ONVMPs would detail the operation of the relevant Project phase, the potential offsite operational noise levels as determined during the detailed design process, and all measures to manage and mitigate operational noise and vibration.
5AG	As a minimum, the ONVMP (or equivalent) would include: • The operational noise criteria/limits as defined by the relevant Project approvals and Environmental Protection License; • identification of all surrounding receptors and land use that would be potentially sensitive to noise and vibration; • identification of all noise and vibration generating operations and the timing of these operations; • the location and specification of any onsite and offsite noise mitigation, including the requirement for future mitigation as part of the staged operation; • detailed measures for managing operational noise, including checklist and auditing procedures to ensure measures are implemented before the start of noise generating activity; • procedures for the monitoring and reporting of operational noise and vibration; • procedures for consultation with the community regarding operational noise and vibration; and • complaint handling procedures.
5AH	During detailed design, where practical and feasible to do so, consideration would be given to: • undertaking locomotive maintenance during the daytime and evening period between 7.00 am and 10.00 pm; • operating heavy vehicles to limit the requirement for reversing and audible reversing alarms; and • appropriate commitment - either contractual or operational -that rail operators accessing the site would be required to undertake regular maintenance of all trains to address wheel flat spots and locomotive exhausts.
5AI	The noise and vibration measures described in 5U-5AH above would be subject to further consideration during detailed design. At that point, the predicted noise impacts and the likely effectiveness of the measures (or equivalent alternative measures) would be further investigated. This further investigation would include consideration of potential environmental, social and economic impacts of the measures. It is also proposed that the following points be considered in the further assessment of potential impacts and design of mitigation

REMM Number	Measure
	• Assessment of potential noise emissions from any concrete batching plant, and implementation of any required noise mitigation, would be undertaken by the appointed construction contractor upon confirmation of the design and operation of the concrete batching plant. • During detailed design of the Project, consideration of either an automated container handling area or electrically powered plant for the interstate terminal (as per the IMEX terminal), or alternatively the use of plant with the lowest available noise emissions. • During the detailed design of the Project, more detail on the operating plant and machinery for the Project may be known. This may include the provision of one-third octave band noise emission data from equipment vendors to facilitate a detailed assessment of annoyance characteristics in accordance with the NSW Industrial Noise Policy (INP) (EPA 2000b). • To the west of the site, consideration of a noise barrier 4.5 m in height at the haul road to mitigate noise from trucks operating within the Project site using a combination of acoustic barriers, solid walls or earth mounding to fully impede the line of sight between the nearest receptors in Casula and the haul road. • To verify the predicted noise levels and recommended noise mitigation in the noise and vibration assessment, the predictive assessment of potential noise levels would be revised for the detailed design of the construction and operation of the southern rail access. This would include an assessment of sleep disturbance impacts from rail spur operations. Where deemed necessary, mitigation measures may be required to reduce and control maximum noise events from sources such as locomotive exhausts and wagon bunching. • The specific vibration propagation characteristics can be highly variable depending on the ground conditions at a given location. It is recommended that ground vibration impacts be reviewed during the detailed design, particularly where Project rail track would pass within 50 m of residences.
5AJ	The ambient noise monitoring surveys within Casula, Wattle Grove and Glenfield would be continued throughout the construction and operation of the Project (with annual reporting of noise results up to two years beyond the completion of Full Build). The noise surveys would 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 and contribution from the operation of the Project would be continually applied to the detailed design of the Project to ensure it includes appropriate mitigation measures to reduce and control noise during construction and operation. The monitoring data would also include any changes to the ambient noise environment from new or changed developments in the area. In the event of any noise or vibration related complaint or adverse comment from the community, noise and ground vibration levels would be measured at the potentially affected premises, where reasonable and feasible. 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.

12 CONCLUSION

Wilkinson Murray Pty Limited (WM) has conducted a Noise and Vibration Impact Assessment for Stage 2 (the Proposal) of the Moorebank Precinct West Project (MPW Project). This report forms part of the Environmental Impact Statement (EIS) for approval of the Proposal.

Potential noise and vibration impacts have been assessed in general accordance with relevant NSW Government guidelines and policies.

Noise levels at sensitive receivers have been predicted using a computer noise model created with the CadnaA software package. Noise source and receiver locations, and details of warehouse buildings and surrounding topography have been incorporated into the noise model.

The study has found that operational levels from the Proposal can comply with the relevant criteria, including relevant sleep disturbance goals. Additionally, cumulative noise levels due to the concurrent operation of the Proposal and the Moorebank Precinct East (MPE) Stage 1 Proposal are predicted to comply with the established criteria.

The Proposal has the potential to increase road noise levels at sensitive receivers along the M5 Motorway, Moorebank Avenue and Anzac Road. Any increases in road noise levels at sensitive receivers along these roads are predicted to be well below 2 dB, and in accordance with the *NSW Road Noise Policy* no mitigation is necessary.

Project specific L_{Aeq} and L_{Amax} criteria have been developed in accordance with RING and previous submissions from the EPA. These criteria are considered particularly stringent to the extent that the existing L_{Aeq} and L_{Amax} noise levels are already above the criteria. L_{Aeq} and L_{Amax} rail noise levels at the most sensitive residential receivers near the Rail link are predicted to exceed the established noise goals. However, due to the proximity of these receivers to the Southern Sydney Freight Line, rail movements associated with the Proposal are not expected to result in a noticeable change to the existing L_{Aeq} and L_{Amax} rail noise levels.

Construction noise levels during all anticipated works periods for the Proposal are anticipated to comply with the established Noise Management Levels (NML) at most sensitive receivers. At the most affected receivers in Casula, construction noise levels during bulk earthworks may exceed the NML by 1 dBA, which is considered a negligible exceedance. Construction noise levels during all proposed out of hours works periods are predicted to comply with the NML at all times.

Due to the large separation distances between the Proposal and nearby sensitive receivers, construction vibration impacts are considered unlikely.

A Construction Noise and Vibration Management Plan (CNVMP) would be developed for the Proposal, considering all reasonable and feasible measures to reduce noise levels at sensitive receivers.

On the basis of the assessments conducted by WM, it is concluded that noise and vibration impacts associated with the construction and operation of the Proposal are not expected to degrade the existing acoustic environment, or create significant annoyance to nearby sensitive receivers.

APPENDIX A

NOISE CONTOUR PLOTS

Figure A-1 Night Time $L_{Aeq, 15min}$ Operational Noise Levels – Calm Meteorological Conditions

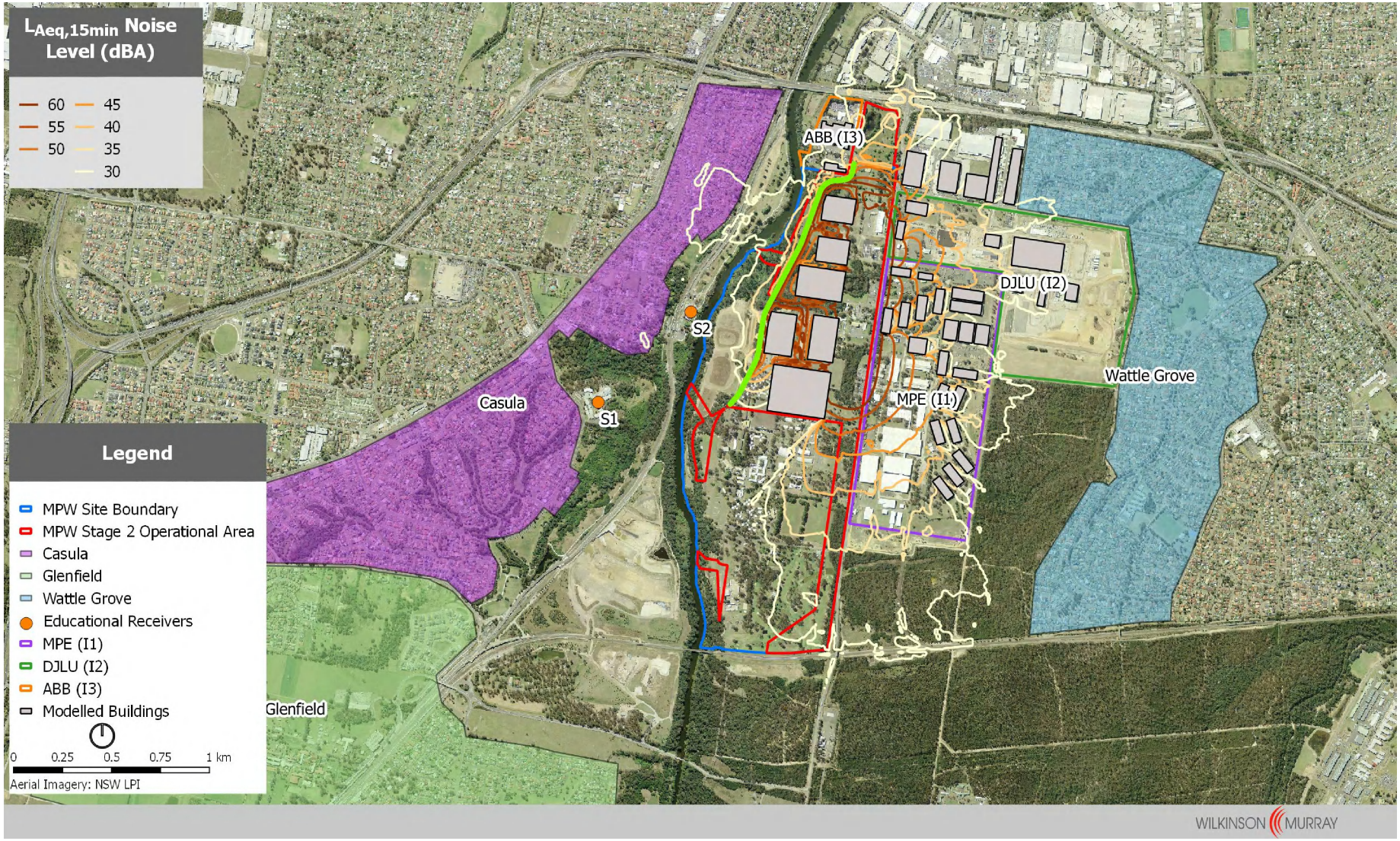


Figure A-2 Night Time $L_{Aeq, 15min}$ Operational Noise Levels – Adverse Meteorological Conditions

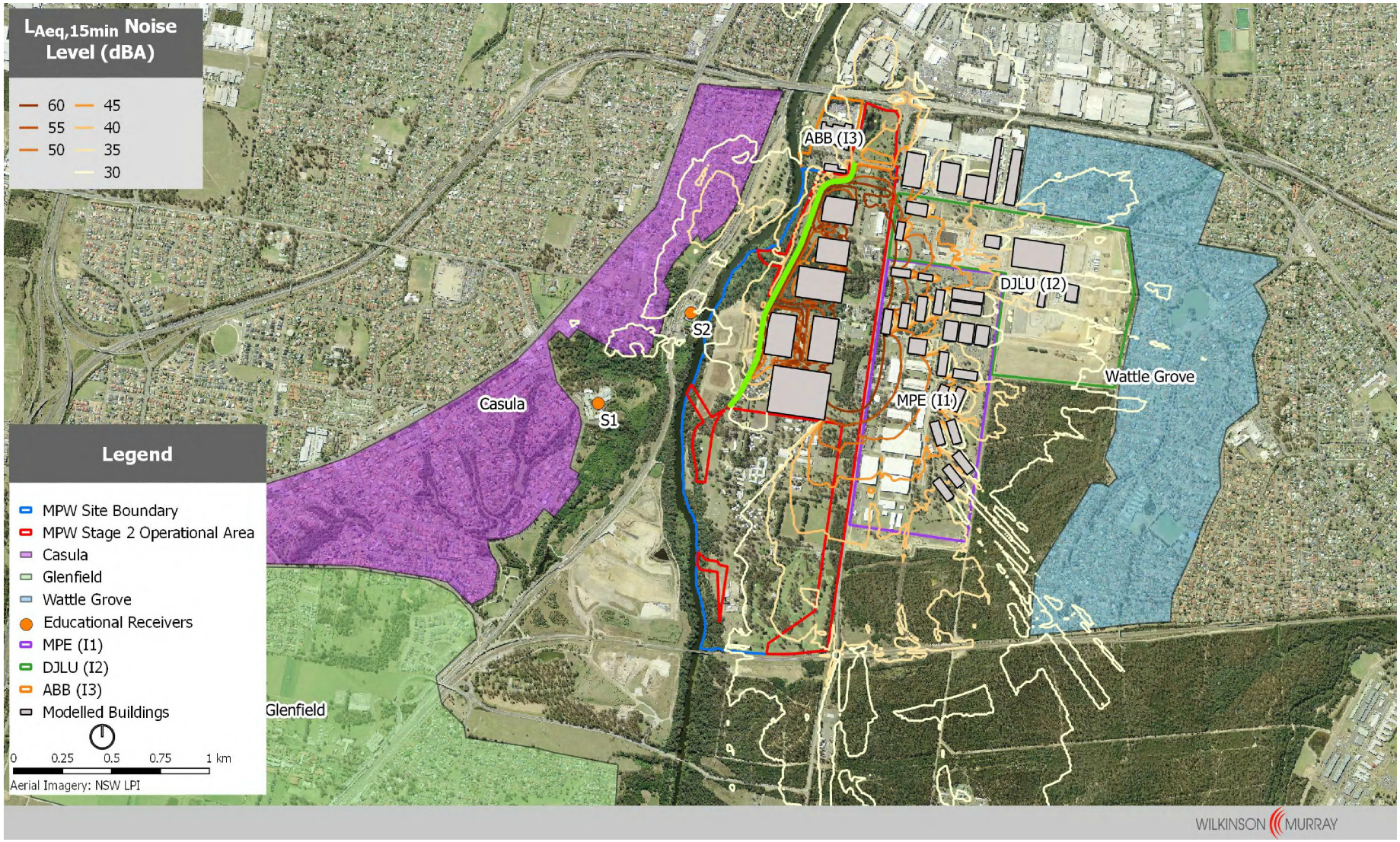


Figure A-3 Night Time $L_{Aeq, period}$ Cumulative Operational Noise Levels – Calm Meteorological Conditions

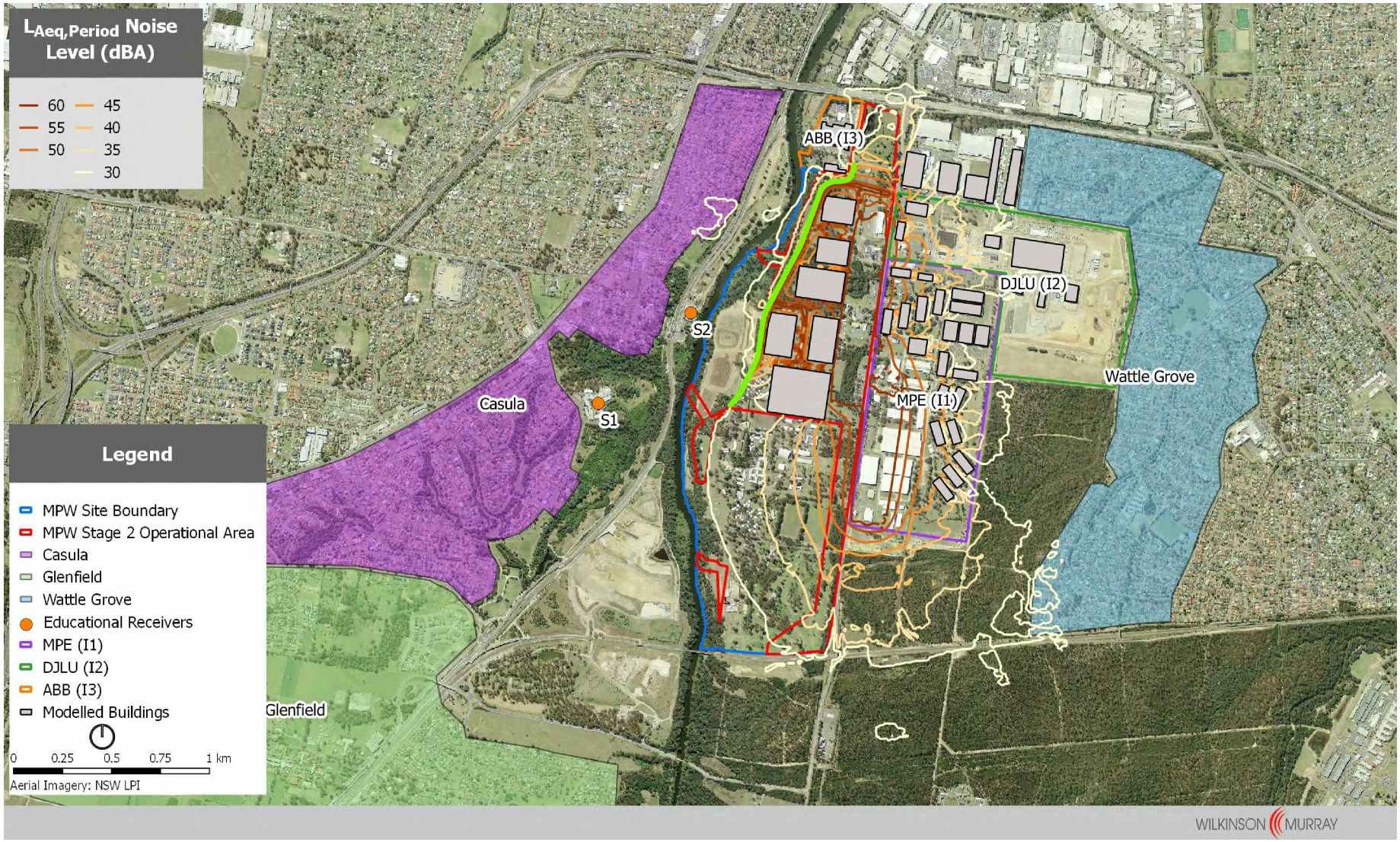


Figure A-4 Night Time $L_{Aeq, period}$ Cumulative Operational Noise Levels – Adverse Meteorological Conditions