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Homebush State-led Rezoning

Acoustics Study Report

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Homebush State-led Rezoning
Acoustics Study Report

Department of Planning, Housing and Infrastructure

WSP
Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

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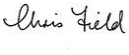
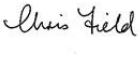
	Name	Date	Signature
Prepared by:	Guy Hopkins/Nicole Lanzer	04/11/2024	
Reviewed by:	Chris Field	04/11/2024	
Approved by:	Chris Field	04/11/2024	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Glossary

Term	Description
Noise terms	
Assessment period	The period in a day over which assessments are made.
Audible range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the a-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).
Decibels (dB)	The level of noise is measured objectively using a sound level meter. The range of pressure variations associated with everyday living may span over a range of a million to one. Instead of expressing pressure in this enormous range of unit, it is convenient to condense this range to a logarithmic scale and give it the units of decibels.
dBA: A-weighted decibels	The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the 'A' filter. A sound level measured with this filter switched in is denoted as dBA. Most environmental noise is measured using the 'A' filter.
Frequency	The time rate for each wave peak (of a sound wave) to pass a given point. Frequency is measured in hertz (Hz).
Human response to noise level changes	— Less than 3dBA = No perceivable difference — 3dBA = Barely perceptible difference — 5dBA = Readily perceptible difference — 10dBA = 'Doubling' (or 'halving') of perceived noise level Reference: *Cowan, J.P., 1994 "Handbook of Environmental Acoustics" & Bell, L.H. and D.H. Bell. 1994. "Industrial Noise Control Fundamentals and Applications"*
L_{90}	The level of noise exceeded for 90% of the time for which a given sound is measured. The bottom 10% of the sample is the L_{90} noise level expressed in units of dBA.
L_{eq}	Equivalent sound pressure level – the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring. The sound weighting of the noise measurement is commonly added, for example L_{Aeq} or L_{Ceq}.
L_{Max}	The maximum noise level during a specified period.
Rating Background Level (RBL)	Defined by the NSW EPA as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for day, evening or night periods, measured over a number of days during the monitoring period

Term	Description
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level (SPL)	The level of sound pressure at a specific location, expressed in decibels.
Sound Power Level (SWL)	A measure of the acoustic energy emitted from a source of noise, expressed in decibels.
Structure-borne noise	Vibration propagating through solid structures in the form of compression or bending waves, heard as sound.

Abbreviations

Acronym	Description
AS	Australian Standard
AVaTG	Assessing Vibration: A Technical Guideline
ANL	Amenity Noise Levels
BS	British Standard
dB	Decibel
dBA	Decibel (A-weighted)
DECC	Department of Environment and Climate Change
DCP	Development Control Plan
DIN	Deutsche Industrienorm (German Industry Standard)
DNRCBR	Development near rail corridors and busy roads – Interim guideline
DPHI	Department of Planning, Housing and Infrastructure
DoP	Department of Planning
EPA	Environment Protection Authority
VDV	Vibration dose value
ICNG	Interim Construction Noise Guideline
LGA	Local Government Area
NCA	Noise catchment area
NPfI	NSW Noise Policy for Industry
PPV	Peak particle velocity
PRCUTS	Parramatta Road Corridor Urban Transformation Strategy
RBL	Rating Background Level

Executive summary

Purpose of this report

The Department of Planning, Housing and Infrastructure (DPHI) has commissioned WSP to provide acoustic consultancy services to support the Homebush State-led Rezoning Project (the Project).

This Acoustics Study Report has been developed to provide a preliminary assessment of noise and vibration impacts to proposed sensitive land uses within the Project, including recommended planning and design strategies to avoid, minimise and manage any potential noise and vibration impacts to sensitive receivers during future planning stages.

It is noted that detailed acoustic investigations have not previously been conducted as part of the PRCUTS documentation.

Summary of key findings

Preliminary predictions of noise and vibration impacts have been undertaken for the proposed Homebush Rezoning Project. These predictions assess the likely impact that existing and future noise and vibration sources may have on sensitive receivers within the Precinct. For road and rail sources, *Development near rail corridors and busy roads – Interim guideline* (DNRCBR) has been used to identify zones potentially exposed to heightened noise and vibration impacts.

Key findings of the initial noise and vibration impact assessment include:

Road noise:

- Road traffic is identified as the dominating noise source within the Precinct.
- New residential developments fronting Parramatta Road, Homebush Bay Drive, Leicester Avenue and the M4 Motorway are at high risk of road noise impacts, likely requiring a high-level of noise mitigation treatment in building design.
- The majority of residential flat buildings within the Strathfield Council area of the Precinct and within the Strathfield Triangle will be impacted by road traffic noise and will require an assessment by a qualified acoustic engineer during future planning stages to ensure internal noise criteria can be achieved.

Rail noise: New sensitive developments adjacent to rail lines are considered high risk, likely to require comprehensive noise assessments, including:

- Residential and mixed-use developments located on George Street adjacent the T9 Northern Line to the east of the Precinct
- Residential developments along the western boundary of the Strathfield Triangle
- Mixed-use developments to the east of Homebush Station, particularly adjacent the tight radius curved track connecting the Western rail line with the Northern rail line.
- Residential and mixed-use developments located on Loftus Crescent along the T1 Western and T2 Inner West Line

Low risk properties would require mitigation measures similar to those suggested for Category 2 road noise assessments.

Rail vibration: New sensitive developments adjacent to rail lines are considered high risk, likely to require comprehensive noise assessments, including:

- Residential and mixed-use developments located on George Street adjacent the T9 Northern Line to the east of the Precinct

— Residential developments along the western boundary of the Strathfield Triangle

— Mixed-use developments to the east of Homebush Station

— Residential and mixed-use developments located on Loftus Crescent along the T1 Western and T2 Inner West Line

Developments near the new Metro West alignment are also considered high risk, with proposed building height increases may necessitate deeper foundations, potentially exposing buildings to vibration from sub-grade rail lines.

Industrial noise: Location of sensitive receivers closer to existing industrial noise sources or at higher elevations increases the risk of levels above the NPfI criteria due to increased exposure.

Residential building services noise: Increased residential density and building height may elevate cumulative noise levels in residential zones.

Recommendations

Mechanisms for controlling noise related land use conflicts within the Project have been identified as follows:

— Land use planning processes implemented under the applicable legislation, guidelines and standards for noise and vibration (listed in Section 6.2).

— Project features which contribute to shielding or masking of noise sources that may impact broad areas of residential receivers (such as industrial, road, rail or music/entertainment sources).

Noise and vibration impacts are to be assessed in accordance with the relevant NSW guidelines during the planning and approval stage of each project. Assessments are to be conducted by qualified personnel and consider both individual and cumulative noise impacts resulting from developments.

Key land use planning recommendations include:

- Grouping of similar land uses to reduce acoustic conflicts, e.g. separating residential areas from industrial zones.
- Introduction of buffer spaces (recreation, green spaces or insensitive land uses) to provide distances between land uses when a potential acoustic conflict emerges.
- Adaption of soundscape design principles to provide masking of unwanted urban noise. This may include water, features, indigenous music, bird noise or other natural sounds.
- Consideration of noise and vibration impacts early in the planning process.
- Location of building functions in appropriate spaces within buildings.
- Consideration of vibration constraints on future developments from existing train lines and the future Sydney Metro West alignment through the Precinct.
- Encouraging the adopting of Green Star, WELL or other ESD tools.

Key recommendations related to noise and vibration building design include:

- Building design to respond to the noise and vibration context of the development (accounting for position with respect to major roads, rail, entertainment and industrial activities).
- Application of standards and guidelines related to building design and internal noise levels:
  - *Development Near Rail Corridors and Busy Roads – Interim Guideline (DoP, 2008)*
  - *Apartment Design Guide, Tools for improving the design of residential apartment development (NSW Department of Planning and Environment, 2015)*
  - *AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors*

- Introduction of acoustically absorptive features such as gardens and green walls to provide noise mitigation to exterior spaces.

Conclusion

This Acoustics Study Report has provided a high-level assessment of potential noise and vibration impacts and opportunities associated with the proposed Homebush Rezoning Project.

Land use changes included as part of the Masterplan for the Project generally retains the existing land use avoiding additional potential land use conflicts.

A discussion of the preliminary review findings is provided with potential opportunities to minimise, avoid or manage noise and vibration impacts onto sensitive land uses during future planning and construction stages. Potential development and construction impacts will be assessed under existing legislation on a project-by project basis through the planning and approvals process.

1 Introduction

The Department of Planning, Housing and Infrastructure (DPHI) has commissioned WSP to provide acoustic consultancy services to support the Homebush State-led Rezoning Project (the Project) as part of implementing the Parramatta Road Corridor Urban Transformation Strategy which seeks to revitalise the Parramatta Road Corridor (the Corridor).

1.1 Background

The Homebush State-led rezoning project seeks to rezone part of the Homebush Precinct as defined in the NSW Government endorsed Parramatta Road Corridor Urban Transformation Strategy 2016 (PRCUTS).

The Homebush Precinct is located within the Strathfield and Canada Bay Local Government Areas (LGAs) and borders Burwood LGA to the south-east. The Precinct is positioned between Homebush Station, North Strathfield Station and Strathfield Station. The Precinct excludes the area at the northern part of the Homebush Precinct near Concord West Station which was rezoned by City of Canada Bay Council in December 2022.

The rezoning proposal will validate and update existing planning work and identify opportunities for further growth in the Homebush Precinct through refinements to the PRCUTS planning controls, where appropriate.

The rezoning proposal will result in a set of revised planning controls for the Precinct that aims to enable renewal and redevelopment of the area to provide additional housing, jobs, open space, transport connections and community infrastructure through good urban design and addressing infrastructure needs.

The Department is leading the rezoning in Homebush as part of the Transport Oriented Development (TOD) program.

1.2 Transport Oriented Development Program: Homebush

In December 2023, the NSW Government released the Transport Oriented Development (TOD) Program to unlock more well-located homes close to transport, jobs and services. Part of the program identified eight Sydney transport hubs (tier one – accelerated precincts) for State-led accelerated rezoning for the delivery of up to 47,800 new homes over the next 15 years. Homebush has been included as one of the eight accelerated precincts.

The objectives of the program are to:

- Increase housing supply in well-located areas.
- Enable a variety of land uses (residential, commercial, recreational) within walking distance of train and metro stations.
- Deliver housing that is supported by attractive public spaces, vibrancy, and community amenity.
- Increase the amount of affordable housing in these locations.

1.3 Purpose of this report

The Acoustics Study Report has been developed to provide a preliminary desktop assessment of noise and vibration impacts to proposed sensitive land uses within the Project, including recommended planning and design strategies to avoid, minimise and manage any potential noise and vibration impacts to sensitive receivers during future planning stages.

This report identifies:

- Existing and future noise sensitive receivers
- Previous studies undertaken in the vicinity of the Project site

- Relevant legislation and indicative noise and vibration goals for sensitive receivers within and outside the Precinct
- Likely noise and vibration sources affecting the Project and
- Potential areas of risk from noise and vibration impacts to the Project
- Possible recommendations for noise control and planning to be considered as part of the Project.
- Possible recommendations to inform the Draft Design Guide and Local Environment Plan (LEP) amendments.

2 Homebush Rezoning Project

2.1 Site description

The Homebush Precinct is located immediately northwest of Strathfield Town Centre and Strathfield Rail Station. It is the largest of the eight PRCUTS Precincts along the Corridor and extends from the Main Western Rail Line northwards along the Main North Rail Line into Concord West.

The Project is situated in a heavily urbanised area of Sydney, where existing transport and commercial / industrial activities influence the noise environment, including the M4 Motorway and Parramatta Road, Sydney Trains corridors and several sub-arterial roads. The Project is also located adjacent the future Sydney Metro West corridor.

The Precinct is bounded to the north and west by Homebush Bay Drive, Mason and Bressington Parks and Parramatta Road and the Western Rail Line to the south (refer Figure 2.1). The Main Northern Rail Line, Concord Road and Swan Avenue mark the Precinct's eastern boundary.

The Project area comprises areas within Strathfield and Canada Bay Local Government Areas (LGAs) and bordering Burwood LGA to the south-east. The existing land use inside the boundary of the Project is characterised by low, medium and high-density residential and mixed-use developments with areas of industrial and public recreation land uses.

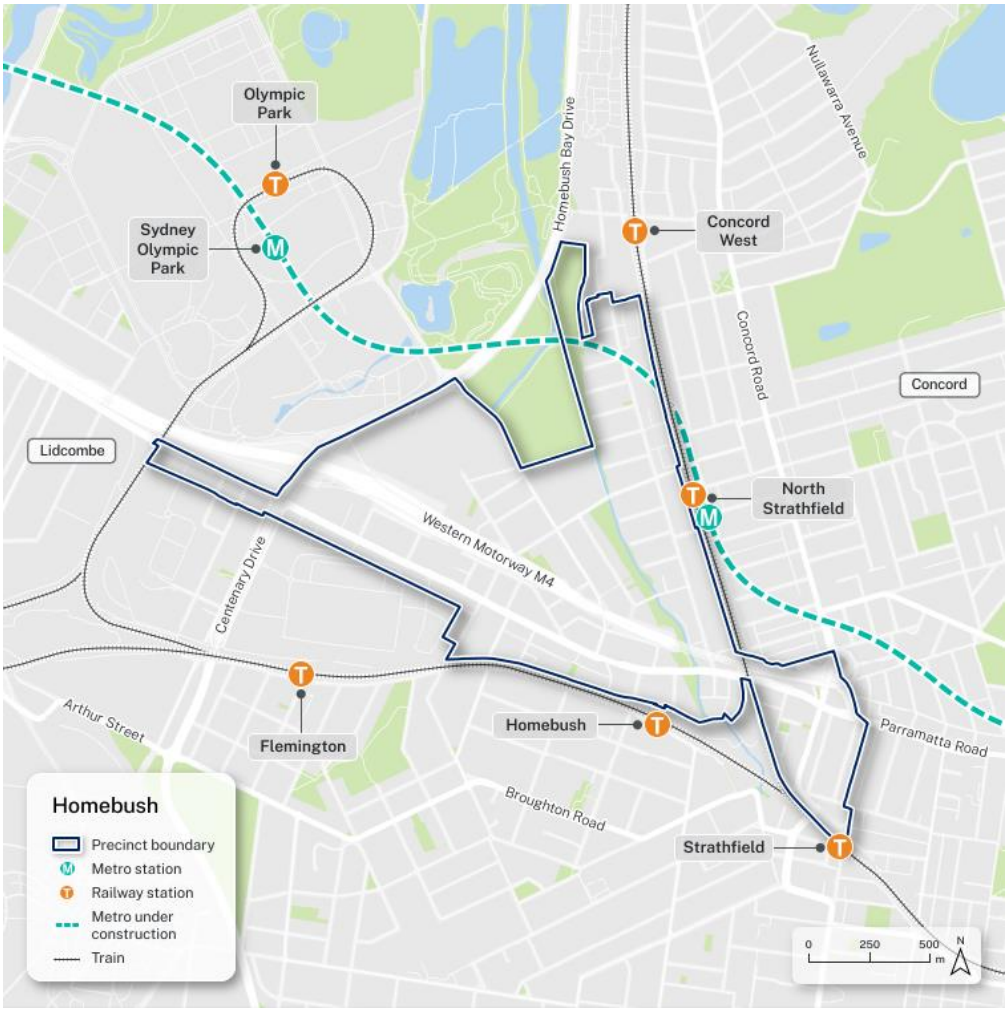

Figure 2.1 Homebush Precinct Boundary (Source: DPHI, 2024)

2.2 Project description

The vision for the Project is to transform Homebush into a vibrant and diverse hub situated between Sydney's two main central business districts (CBDs). This transformation involves blending higher density housing with a variety of different uses, all supported by a network of green links and open spaces. The aim is to create a dynamic area with convenient access to four train stations, fostering a focus on high-density housing and an active community. Main streets like Parramatta Road and George Street will enhance the character of the existing Bakehouse Quarter, while taller residential buildings will mark the core of the Precinct's activity. Surrounding streets will be designed for safe and easy pedestrian access, with high and medium-density housing and green spaces like the Powells Creek corridor.

The recommended planning controls for the Homebush Precinct outline a mix of land use zones to align with the envisioned development, with amended building heights as shown in Figure 2.2 and Figure 2.3 respectively.

Along Parramatta Road and the Bakehouse Quarter, a B4 Mixed Use zone is suggested to encourage activity and provide space for employment and other non-residential uses. The existing E3 Productivity Support zone is proposed to be retained along the western end of Parramatta Road to support commercial activities, while a B5 Business Development zone is proposed along the western end of Parramatta Road to support commercial activities with residential uses not supported in this zone.

The remainder of the Precinct is recommended to be zoned as R3 Medium Density and R4 High Density Residential to accommodate housing development, with preservation of existing character and amenity in certain areas. Powells Creek Reserve and new open space will be identified with appropriate zones.

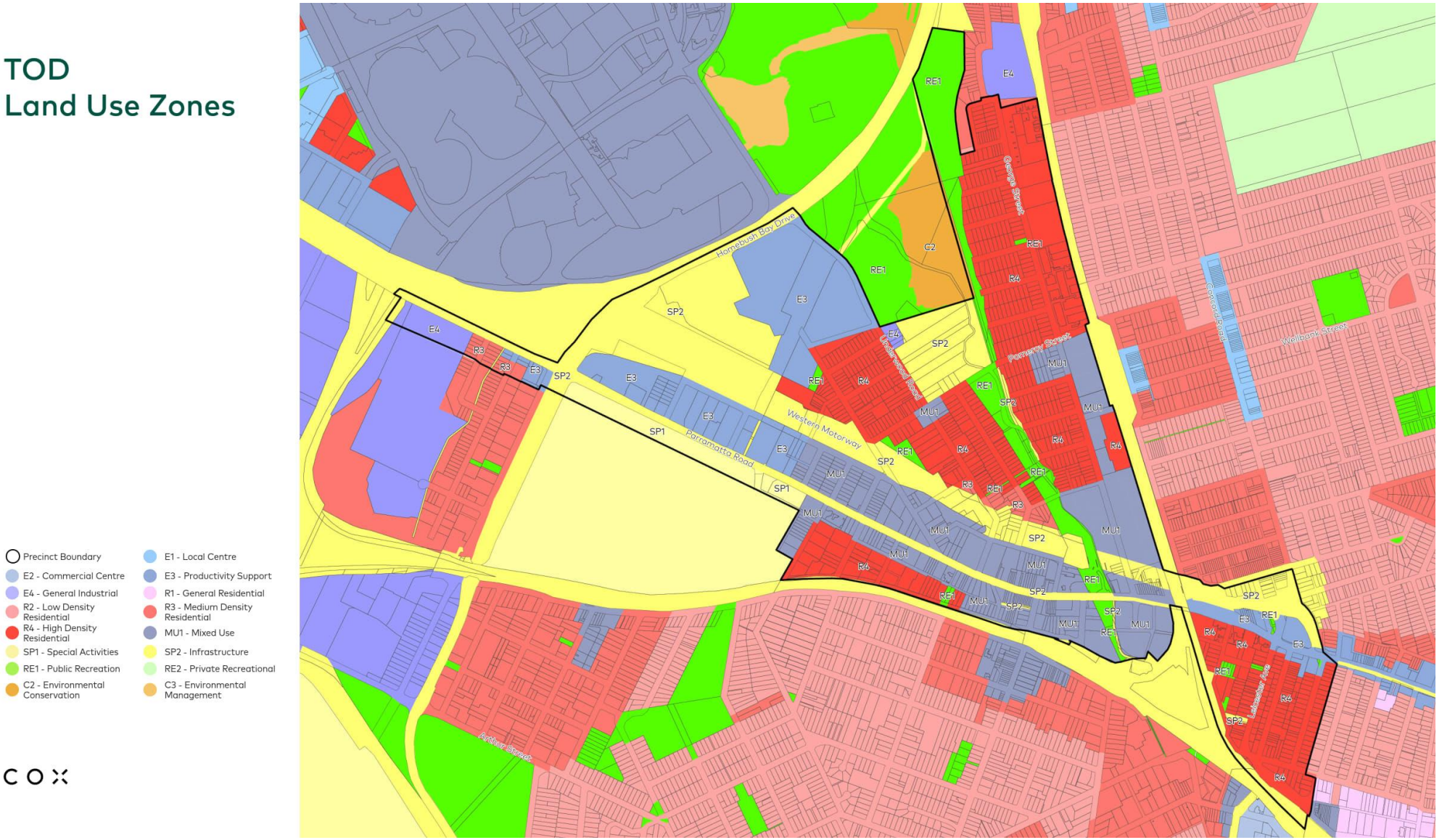

Figure 2.2 Proposed TOD land uses (Source: Homebush State Led Rezoning Draft LEP Controls, COX, June 2024)

Figure 2.3 Proposed TOD building heights (Source: Homebush State Led Rezoning Draft LEP Controls COX, June 2024)

2.3 Proposed site layout and building heights

Figure 2.2 shows the proposed land uses for the Project and Figure 2.3 presents the proposed building heights.

The region is proposed to be formed of the following sub-precincts:

- Active mixed-use zones around Parramatta Road and the Bakehouse Quarter.
- Medium and high-density housing zones throughout the entirety of the Precinct.
- Industrial land uses comprising the Mason Park Substation and Ausgrid Homebush Depot.

Land use types within the Project are generally consistent with existing, however, some notable changes include:

- Rezoning of the DFO site (E4) to Productivity Support (E3)
- Rezoning of R4 High Density Residential zones near Homebush Rail Station into MU1 Mixed-Use zones
- Rezoning of R4 High Density Residential zones between Parramatta Road and the M4 Western Motorway into MU1 Mixed-Use zones

The proposed rezoning of the Homebush Precinct focuses on maximising height along Parramatta Road, especially close to public transport options, allowing for buildings up to 103 m. Areas within 100 m of the WestConnex exhaust stack on Underwood Road may reach heights of up to 75 m.

The Bakehouse Quarter's proposed building heights are informed by existing heritage significance, with potential for increase to 27 – 53 m.

2.4 Objectives

The Project aims to review the published documentation for approved and future development and ensure that rezoning provides technically robust outcomes, while allowing for proposed rezoning for increased residential development. The rezoning would lead to changes in recommended land uses, building heights and recommended densities.

The objectives of the Project are to:

- Review and validate the Strategy and supporting technical analysis to ensure solutions are fit for purpose and respond to the current and future needs of the community.
- Optimise the urban design solution of the Precinct in line with current practice including applying principles from the Movement and Place framework.
- Address housing shortage by identifying opportunities for further growth in the Precinct through refinement to the Strategy planning controls having regard to feasibility.
- Develop an integrated and consistent approach to deliver housing, jobs and infrastructure across the Precinct.
- Leverage existing assets and investment such as the proximity to train stations and funding towards local infrastructure through the Parramatta Road Urban Amenity Improvement Program.

2.5 Project documentation

The following Project documents have been reviewed to support this study:

- *Parramatta Road Corridor Urban Transformation Strategy 2016-2023*
- *Implementation Tool Kit: Implementation Plan 2016 – 2023, including supporting documents such as the Planning and Design Guidelines*
- *Parramatta Road Corridor Urban Transformation Strategy Implementation Update 2021 July 2021*
- *Parramatta Road Corridor Traffic and Transport Study and Action Plan Strathfield, Burwood and Canada Bay Councils 18 February 2022*
- *Draft Parramatta Road Urban Design Guideline September 2015*
- *Parramatta Road Urban Amenity Improvement Plan September 2015*
- *Homebush State Led Rezoning Draft LEP Controls by COX, June 2024*
- *Homebush State Led Rezoning – Full Heritage Assessment by GML Heritage, May 2024*
- Relevant planning proposals for the Strategy
  - *Strathfield Triangle – Council Initiated Planning Proposal*
- Local Environment Plans, Development Control Plans and Masterplans (existing and proposed) including:
  - *Homebush North Precinct Master Plan Report (GroupGSA) – April 2021*
  - *PRCUTS Stage 2 Homebush Precinct Master Plan Report (GroupGSA), November 2023*
  - *Homebush Urban Village Masterplan scoping report (Strathfield Council), November 2023*

It is noted that detailed acoustic investigations have not previously been conducted as part of the PRCUTS documentation.

2.6 Stakeholder engagement

This report has been prepared using information provided by the DPHI. It incorporates publicly available data from the NSW Planning Portal Major Projects register for projects in the region of Homebush and North Strathfield.

Engagement with stakeholders throughout the Master planning process is primarily undertaken through the Department of Planning, Housing and Infrastructure.

3 Existing and future environment

This section outlines the existing acoustic environment for the Project, including existing and future receivers and current and future noise and vibration sources for consideration.

3.1 Existing studies

Several recent, local environmental studies are relevant to this study and have been referenced in the preparation of this report. These documents include:

- *Sydney Metro West Rail infrastructure, stations, precincts and operations Environmental Impact Statement*
  - *Chapter 10 – North Strathfield Metro Station, March 2022*
  - *Technical Paper 3: Operational Noise and Vibration, March 2022*
  - *Technical Paper 4: Construction Noise and Vibration – Part 1, March 2022*
- *WestConnex M4 East Project – Construction and Operational Road Traffic Environmental Impact Statement*
  - *Noise and Vibration Technical Paper, September 2015*
- *Parramatta Light Rail Stage 2 Environmental Impact Statement Technical Paper 3, 25 October 2022*

3.2 Sensitive receivers

The following sections identify existing and future noise and vibration sensitive receivers within the Precinct. A map showing the existing land use layout is provided in Figure 3.1.

Figure 3.1	Author: RV/GH	0 150 300 450 600 m	
Date: 04/07/2024	Approved by: RW	1:12,000 at A3	

To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

Homebush Precinct

Land Use Categories

- E1 - Local Centre
- E2 - Commercial Centre
- E3 - Productivity Support
- E4 - General Industrial
- MU1 - Mixed Use
- R2 - Low Density Residential
- R3 - Medium Density Residential
- R4 - High Density Residential
- RE1 - Public Recreation
- SP1 - Special Activities
- SP2 - Infrastructure

Homebush State-led Rezoning Project

Existing land use layout

3.2.1 Existing residential receivers

Existing residential areas include:

- Primarily single storey residential dwellings between Powells Creek and George Street, North Strathfield (R2)
- Medium density residential dwellings at either side of Underwood Road, Homebush (north of the Western Motorway M4), comprising single and double storey dwellings (R3)
- Medium density residential land use (R3) between George Street and the Main Northern Railway Line which are primarily low-rise apartment dwellings
- Single storey and low-rise apartment dwellings to the east of Leicester Avenue, Strathfield (R3)
- Multi-storey apartment and single storey dwellings immediately to the south of the Western Motorway M4 along Park Road, Homebush (R4)
- High Density Residential along the south side of Paramatta Road (along Loftus Lane, Station Street, Columbia Lane, and around Cooper Street, Strathfield) are currently populated with multi-storey and single storey dwellings (R4).

3.2.2 Existing non-residential receivers

Existing non-residential areas include:

- Educational – Our Lady of the Assumption, McDonald College and Victoria Avenue Public School, Kinda-Mindi Early Learning Centre Homebush, Papilio Early Learning North Strathfield, Montessori at North Strathfield
- Place of worship – Our Lady of the Assumption Catholic Church,
- Commercial / retail areas – The Bakehouse Quarter, Sydney Markets, Direct Factory Outlet (DFO) Homebush
- Active recreation – Allen Street Reserve, Arnotts Reserve, Ismay Reserve, Bill Boyce Reserve, Wentworth Reserve. Mason Park, Bressington Park and Bicentennial Park adjoin the Precinct
- Passive recreation – Futsal Court within Ismay Reserve

3.2.3 Heritage receivers

Heritage buildings are located within the site such that some may be affected by noise from road and rail noise sources. Heritage buildings are generally no more susceptible to the impacts of noise than more recent buildings. Exceptions to this are typically treated on a case-by-case basis.

Heritage structures can however be particularly susceptible to damage from ground vibration. Heritage items and conservation areas identified within the Project area include a pumping station, theatre, inter-war commercial buildings, federation houses, and the Mason Park wetlands, which are listed on the Register of the National Estate. The Bakehouse Quarter and the ‘Arnotts’ signage are some of the more recognisable heritage items in the Precinct. Residences in Manson Road, and the Parramatta Road Heritage Area are also identified as having heritage value.

Buildings for which the most stringent control of vibration is required are those heritage structures that have been identified as being structurally unsound. A dilapidation survey will be required to determine the integrity of heritage buildings as vibration receivers.

3.2.4 Future sensitive receivers

Future sensitive receivers include new residential and mixed-use developments proposed within the Precinct.

The Homebush North Precinct is located to the north of the Precinct and has recently been rezoned to include low and medium density residential to the George Street / Rothwell Avenue roundabout. Receivers within this precinct would be considered future sensitive receivers for the Project.

The Strathfield Triangle area at the south-east of the Project has been reviewed and certain areas have been rezoned and building heights increased. Where approved, future additional residences would be considered future sensitive receivers for the Project.

3.3 Noise environment

3.3.1 Existing noise sources

The Project is located within a heavily urbanised area of Sydney, characterised by various sources of transportation noise and commercial activities. Primary existing noise sources are summarised in Table 3.1.

Table 3.1 Existing noise sources

Noise source type	Noise sources
Road traffic on arterial roads	Parramatta Road, M4 Motorway, Homebush Bay Drive, Concord Road and Leicester Avenue
Road traffic on local roads	Underwood Road, Pomeroy Street, George Street, etc
Rail noise	T9 Northern Line, T1 Western Line, T2 Inner West and Leppington Line, T7 Olympic Park Rail lines to the north and west are used by both passenger and freight rail services.
Train stations	Train stations at Concord West, North Strathfield, Strathfield North and Homebush Noise sources include public address system announcements at the station platforms, pedestrian and patron noise
Commercial, business and industrial facilities	Bakehouse Quarters, DFO Homebush, Sydney Markets, The Mason Park electrical substation, commercial and industrial uses along Parramatta Road
Entertainment noise	Sydney Olympic Park during events including associated traffic.

3.3.2 Future noise sources

Several approved future projects have the potential to influence the Project noise environment, including:

- Future Sydney Metro West line and new station at North Strathfield
- Parramatta Light Rail Stage 2
- Proposed rezoning changes to Councils Masterplans and LEPs
- Potential rapid or suburban bus route between Homebush and Parramatta
- Potential rapid transit route between Burwood and the Sydney CBD
- Mechanical services noise from future developments
- Construction and remediation noise from future development and/or remediation activities.

Based on the proximity of each of the identified approved projects to the Precinct, the risk of noise impacts from Paramatta Light Rail or rapid transit routes between Burwood and the CBD upon sensitive receivers is considered low. The potential for impacts from other future sources has been considered based on available information.

The major existing and future noise sources with the potential to influence land use planning within the Precinct are presented in Figure 3.2.

Figure 3.2	Author: RV/GH	0 150 300 450 600 m
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To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

- Homebush Precinct
- Railway lines
- Railway station
- Metro West Stations
- Metro West Line
- Parramatta Light Rail
- Major Roads
- Local Roads
- Local Noise Sources

Homebush State-led Rezoning Project

Site Overview

3.4 Vibration environment

3.4.1 Existing vibration receivers

Vibration sensitive structures have been identified in the Project area, including buildings within the Bakehouse Quarter, the 'Arnotts' signage, a pumping station, theatre, inter-war commercial buildings and some federation houses.

GML Heritage (May 2024) identified the following buildings reaching threshold of local heritage significance:

- 7 Knight Street, Homebush
- 11 Knight Street, Homebush
- 41 Everton Road, Strathfield

Any utilities and underground infrastructure located within the Project area would not be considered highly vibration sensitive. The noise and vibration impact from future construction activities on existing utilities and underground infrastructure would, however, needs to be assessed and managed on a case-by-case basis.

Other vibration sensitive developments, such as micro-electronics, medical and imaging laboratories have not been identified within the Project area. Concord Hospital is located 500 m to the north of the Precinct, however vibration sources in the immediate vicinity of the hospital are more likely to be the cause of impact than vibration sources in the Precinct.

3.4.2 Existing vibration sources

Ground vibration impacts are generally limited to a concentrated area surrounding the vibration source and rarely extend beyond approximately 100 m. Existing ground vibration sources within the Project include road traffic, train pass-bys and construction activities.

Ground vibration impacts from road traffic are generally low. Given proximity of nearest buildings to the railway lines, sensitive receivers close to existing railway corridors are considered to be susceptible to vibration impacts from existing railway lines. Impacts to existing receivers would be consistent with current conditions.

3.4.3 Future vibration sources

Additional future vibration sources would likely be associated with temporary construction activities during the progression of the Project.

In the longer term, Sydney Metro rail operations could potentially generate ground vibration impacts during both construction and operation phases, although this would be limited to areas in close proximity to the track alignment. It would be expected that any vibration impacts from Sydney Metro rail operations would have been identified in the EIS and design documentation for Sydney Metro.

Any future Parramatta Light Rail construction and operations would generate low levels of ground vibration, however the alignment is at sufficient offset to the Project that impacts would be negligible.

3.5 Noise and vibration monitoring

3.5.1 Noise monitoring

For reference, background and ambient noise levels have been sourced from existing publicly accessible acoustic reports to understand the existing noise environment in the vicinity of the Project. Noise levels sourced from the historical background noise surveys are summarised in Table 3.2. In addition to the historical data, WSP conducted attended noise

monitoring across the project area for up-to-date information on ambient and background noise levels. This is presented in Section 3.5.2.

Table 3.2 Historical noise levels in the vicinity of the Project

Project	Location	Rating background level, L_{90} dBA Time period[1]			Ambient noise level, L_{eq} dBA Time period[1]		
		Day	Evening	Night	Day	Evening	Night
WestConnex M4	59 Pomeroy St, Homebush	53	52	46	-[2]	-[2]	-[2]
	2 Deworie Ave, Homebush	50	50	46	-[2]	-[2]	-[2]
Sydney Metro	17 George St, North Strathfield	47	47	44	60	60	55
	131 Queen St, North Strathfield	51	47	39	61	60	55
PLR 2	101/9 Australia Ave, Sydney Olympic Park[3]	50	48	41	59	59	55

Notes:

(1) Day, evening and night periods as defined in the NPfI.

(2) Not reported.

(3) Noise monitoring was undertaken during a period when there was COVID-19 related restrictions in NSW.

Noise sources listed as contributing to the above measurements included the nearby road and rail transport routes at each measurement location. Observations noted additional contributions from animals, birds and aircraft. Road sources were generally the main dominant noise sources identified at locations within and around the Precinct.

Sporting and live music events held within the entertainment precinct are likely to result in sporadic noise impacts at sensitive receivers within the western areas of the Precinct. Noise emissions from these occasions have not been included in previous environmental noise studies for the area. In addition to the noise from events, transport of attendees to and from the site may have a measurable impact on noise from road and rail sources. It is noted that the timeframe of such impacts would be limited to the day(s) of the event and are managed as part of relevant management plans under the jurisdiction of the Sydney Olympic Park Authority.

3.5.2 Attended noise monitoring

WSP carried out attended measurements to characterise and identify the contributors to the acoustic environment within the Precinct. Attended measurements were conducted between 2 and 14 May 2024. Noise and vibration monitoring locations are presented in Figure 3.3.

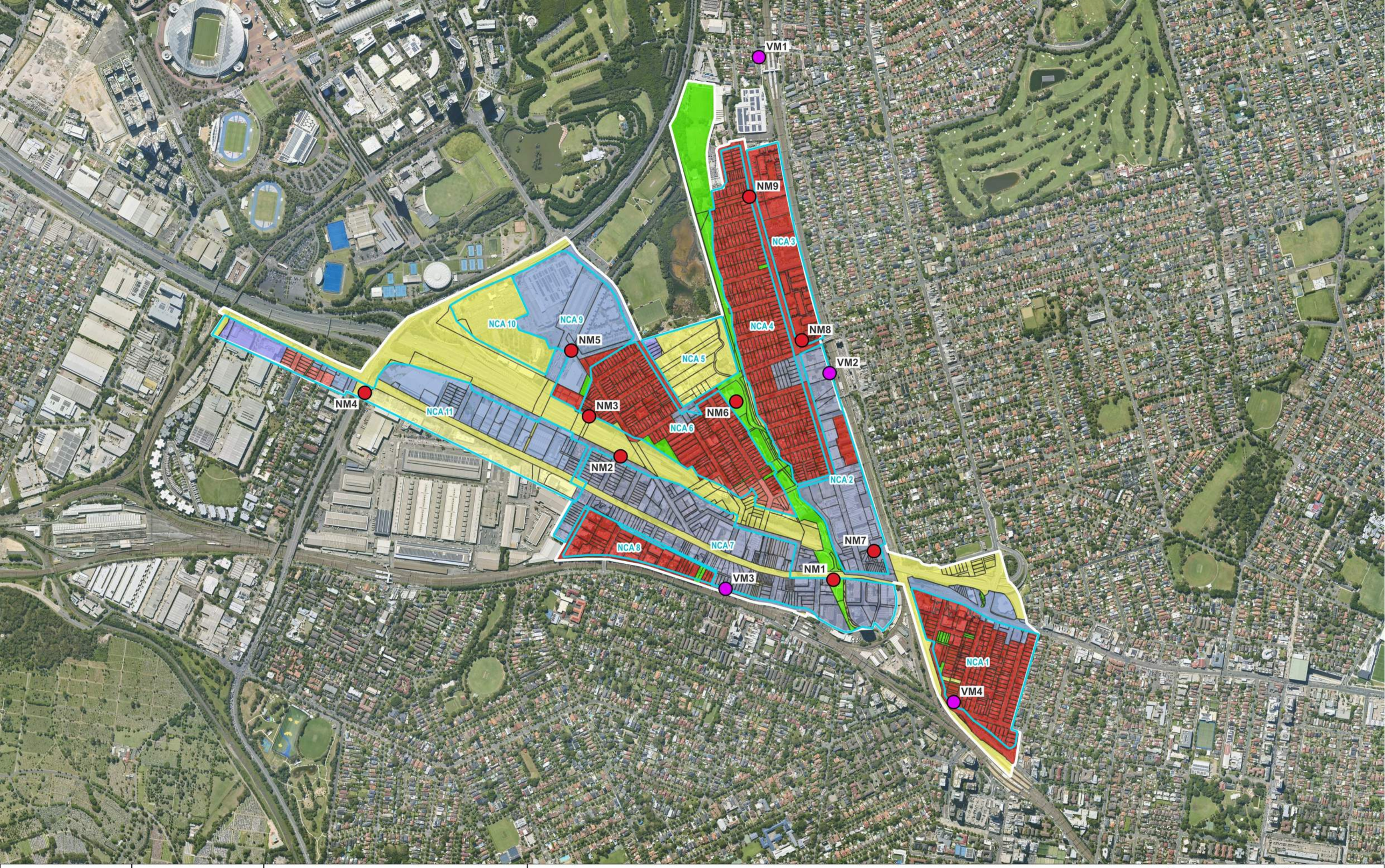


Figure 3.3	Author: RV/GH	0 150 300 450 600 m
Date: 04/07/2024	Approved by: RW	1:12,000 at A3

To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

- Homebush Precinct
- Noise Catchment Area
- Noise monitoring location
- Vibration monitoring location

Land Use Categories

- E3 - Productivity Support
- E4 - General Industrial
- MU1 - Mixed Use
- R3 - Medium Density Residential
- R4 - High Density Resident
- RE1 - Public Recreation
- SP1 - Special Activities
- SP2 - Infrastructure

Homebush State-led Rezoning Project

Noise and Vibration Monitoring Locations

wsp

3.5.2.1 Methodology and instrumentation

The prevailing noise levels within the Project site were determined through operator attended noise surveys in general accordance with the Australian Standard 1055:2018 *Acoustics – Description and Measurement of Environmental Noise* (AS 1055) and the NSW *Noise Policy for Industry* (NPfI).

Details of the equipment used to conduct the noise and vibration survey are outlined in Table 3.3.

Table 3.3 Monitoring equipment

Monitoring equipment	**Manufacturer and model No.**	**Serial No.**
Attended noise monitor	Norsonic - Nor140	4294981
	NTI XL3	A3A-00635-D1
Calibrator	Rion NC-73	11248294

The noise monitoring equipment was fitted with windshields and field calibrated before and after monitoring. No significant drifts in calibration (± 0.5 dB) were noted. All the monitoring equipment had valid certified calibration certificates (National Association of Testing Authorities, NATA) at the time of use.

Noise measurements were carried out at 1.5 m above the ground at locations presented in Figure 3.3.

3.5.2.2 Attended noise measurement results

The results of the attended noise surveys are detailed in Table 3.4.

Table 3.4 Attended noise measurements

Location	**Time**	**dBA $L_{eq,15min}$**	**dBA $L_{90,15min}$**	**dBA $L_{10,15min}$**	**dBA L_{Fmax}**	**Offset distance, m[(1)]**	**Road noise source**	**Observations**
NM1	7:50 AM	75	62	79	91	15	Parramatta Road	Road traffic from Parramatta Road dominant noise source. Road traffic noise from M4 audible.
	6:21 PM	73	60	77	88			
NM2	8:13 AM	63	59	65	71	15	Western Motorway (M4)	Road traffic from M4 dominant noise source.
	5:32 PM	62	59	63	68			
NM3	7:34 AM	66	63	68	73	20	Western Motorway (M4)	Road traffic from M4 dominant noise source.
	7:51 AM[(2)]	69	62	71	81			
	5:10 PM	65	63	67	78			
NM4	9:14 AM	71	65	75	81	35	Parramatta Road	Road traffic noise from Parramatta Road dominant noise source. Distant road traffic noise contribution from Centenary Drive making up background noise levels.
	6:06 PM	70	62	73	82			

Location	Time	dBA $L_{eq,15min}$	dBA $L_{90,15min}$	dBA $L_{10,15min}$	dBA L_{Fmax}	Offset distance, m(1)	Road noise source	Observations
NM5	8:40 AM	54	52	56	70	180 / 340	Western Motorway (M4)/ Homebush Bay Drive	Road traffic from M4 and Homebush Bay Drive contributing to background noise levels. Occasional heavy vehicle along Wentworth Road contributing to maximum noise levels.
	4:40 PM	52	51	53	73			
NM6	8:21AM	64	56	66	84	70	Pomeroy Street	Nearby construction equipment in operation across Pomeroy Street during measurement, contributing to maximum noise levels. Local road traffic along Pomeroy Street main contributor to background noise.
	5:20 PM	48	45	49	68			
NM7	7:28 AM	61	56	63	79	20	Western Motorway (M4)	Road traffic from M4 dominant noise source
	5:55 PM	62	58	63	79			
NM8	8:46 AM	68	60	71	82	25	Pomeroy Street	Local road traffic along Pomeroy Street dominant noise source.
	4:54 PM	69	59	70	92			
NM9	9:13 AM	64	49	69	78	15	George Street	Light traffic along George Street main source of ambient noise levels. Occasional heavy vehicle pass-by contributing to maximum noise levels.
	4:25 PM	63	47	68	76			

Notes:

(1) Approximate offset distance from measurement location to the nearest boundary of noted road corridor.

(2) Measurement at Bill Boyce Reserve, adjacent to west bound M4 tunnel

The road traffic noise measurements gathered in Table 3.4 are considered typical of locations adjacent heavily trafficked arterial roads at noted offset distances from the alignments.

3.5.3 Noise catchment areas

Receivers in the Precinct have been categorised geographically into Noise Catchment Areas (NCAs), based on similar noise environments and noise sources.

Figure 3.4 shows the NCAs overlaid onto the Project's future land use zoning. Details of the NCAs and contributing noise sources are provided in Table 3.5.

Figure 3.4	Author: RV/GH	0 150 300 450 600 m	
Date: 04/07/2024	Approved by: RW	1:12,000 at A3	

To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

- Homebush Precinct
- Noise Catchment Area

Land Use Categories

- E3 - Productivity Support
- E4 - General Industrial
- MU1 - Mixed Use
- R3 - Medium Density Residential
- R4 - High Density Resident
- RE1 - Public Recreation
- SP1 - Special Activities
- SP2 - Infrastructure

Homebush State-led Rezoning Project

Noise catchment areas

Table 3.5 Noise catchment areas and current noise contributors

Noise catchment designation	Primary land use area	Dominant noise sources at location	Noise sensitivity of NCA
NCA 1	Residential (high density)	Adjacent rail and road corridors to west and north	High
NCA 2	Mixed use	Parramatta Road, M4 Motorway and Main Northern Line (T9)	Medium
NCA 3	Residential (high density)	Main Northern Line (T9), George Street	High
NCA 4	Residential (high density)	George Street, Homebush Bay Drive, Pomeroy Street Recreation Industrial	High
NCA 5	Infrastructure	Homebush Bay Drive, Pomeroy Street, Underwood Road Recreation Residential zones	Low
NCA 6	Residential (medium and high density)	Traffic from M4 Motorway, Pomeroy Street, Underwood Road Recreation noise Industrial	High
NCA 7	Mixed use	M4 Motorway, Parramatta Road Rail noise from T1 and T2	Medium to high
NCA 8	Residential (high density)	Rail noise from T1 and T2 Mixed use	High
NCA 9	Productivity support	Homebush Bay Drive, Underwood Road Mason Park substation operation	Low
NCA 10	Infrastructure	Homebush Bay Drive and M4 Motorway	Low
NCA 11	Productivity support Residential (medium density)	Homebush Bay Drive/ Centenary Drive and M4 Motorway	Low High

3.5.4 Vibration monitoring

WSP conducted attended vibration monitoring within the Precinct on 10 and 11 April 2024. Details of the vibration survey are presented in the following sections.

3.5.4.1 Methodology and instrumentation

The prevailing train induced vibration levels were determined through operator attended vibration surveys. Vibration measurements were carried out at locations presented in Figure 3.3 using a triaxial accelerometer mounted on a steel base plate with ground spike attachments. The topsoil layer was removed and the unit was driven into the ground so that the base plate was raised only a few millimetres above ground surface.

Details of the equipment used to conduct the vibration survey are outlined in Table 3.3.

Table 3.6 Vibration monitoring equipment

Monitoring equipment	Manufacturer and model No.	Serial No.
Ground vibration monitor	SVAN 598A	45591
		36693
Tri-axial accelerometer	SVAN SV80	E0193
		E0194

All the monitoring equipment had valid certified calibration certificates (National Association of Testing Authorities, NATA) at the time of use.

3.5.4.2 Attended vibration measurement results

The measured vibration results of train pass-by events at measurement locations in Figure 3.3 are summarised in Table 3.7. These results were obtained from attended measurements conducted on 10 and 11 April 2024.

Table 3.7 Summary of attended ground-borne vibration results

Measurement location	Time	Train type	Number of pass-bys	Distance from track, m(1)	Vibration velocity(2), $L_{max,slow}$ dBV (re: 10^{-9})	Vibration dose(3), $VDV_{b(z\text{-}axis)}$, $m/s^{1.75}$
VM1	07:51 AM – 09:02 AM	Passenger	26	7	97	0.008
VM2	01:30 PM – 02:51 PM	Passenger	18	10	99	0.012
		Freight	2		85	0.0032
VM4	04:32 PM – 05:55 PM	Passenger	46	5	102	0.046

Notes:

(1) Noted distance from measurement location to nearest track.

(2) Arithmetic averaged maximum 1 second rms of each recorded pass-by event.

(3) Arithmetic averaged vibration dose value of each isolated train pass-by event.

It is important to note that not all track features inducing high vibration levels along the rail lines may have been accounted for in this survey.

Location VM4 was located near a point where features of the rail line caused impulsive vibration, specifically track junctions.

The measured pass-by vibration levels obtained over attended survey periods are considered to be typical during the noted measurement time periods. Vibration levels with respect to human comfort (VDV) over the day /evening and night periods have been reviewed by extrapolating the pass-by measurement results. Based on a high-level review at these discrete measurement locations, the buffer distances as per the *Development near rail corridors and busy roads – Interim guideline* (DNRCBR) are considered valid. Refer to Section 5.5 for further details.

3.6 Meteorological influences

Meteorological conditions can influence or reduce the transmission of noise. In particular weather conditions, including atmospheric temperature inversions and wind conditions, can have a substantial impact on noise levels. These impacts are most noticeable at distances of more than 500 m.

Typical meteorological conditions in the area, including seasonal and time-based wind-roses, are discussed in the Air Quality Assessment for the Project.

3.6.1 Local meteorological conditions

At the time of writing of this report, it is understood that the meteorological conditions at the Project consist predominantly of wind from the southeast and south-southeast (occurring for approximately 8 % and 7.5 % of the year respectively). Few winds occur from the south-southwest and east (less than 3.5 % of the year). Moderate wind speeds (3-7.5 m/s) occur predominantly from the south-southeast and the southeast and light wind speeds (0.5-3 m/s) occur predominantly from the northwest, west-northwest and west.

The wind roses for each season are provided in the Air Quality Assessment for the Project and show the following:

- The predominant wind direction in summer is southwest, occurring approximately 15 % of the time.
- Calm winds occur approximately 11.6 % of the time in summer.
- The predominant wind direction in winter is west and northwestern sectors.
- Light winds occur approximately 20.8 % of the time in winter.
- Autumn and spring contain characteristics of both summer and winter. The predominant wind direction in autumn is southeast, occurring for approximately 8 % of the time. In spring, the predominant wind direction is southeast, occurring for approximately 9 % of the time.
- Calm winds occur approximately 22.4 % of the time in autumn and 16.4 % of the time in spring.

3.6.2 Meteorological noise impact

Sensitive receivers within the Project include residential receivers to the south-east and north-west of the Precinct. Wind conditions impacting noise propagation would come from the north-west or south-west. These meteorological conditions are not considered to be a feature of the area or have a major influence on noise transmission to receivers in the Precinct.

4 Legislative and planning context

4.1 Noise Policy for Industry

The NSW Noise Policy for Industry (NPfI) provides the framework and process for deriving the noise limits for new industrial developments under the *Protection of the Environment Operations Act, 1997*. These limits do not apply to existing facilities, as such, they do not form any type of project criteria and are only included to identify the likely acceptability of predicted noise levels.

4.1.1 Overview

The NPfI outlines a procedure to assess industrial noise impacts utilising two assessment criteria for environmental noise. The first relates to the intrusiveness of a noise source, allowing for the noise under assessment to marginally exceed background noise, whilst the other procedure relates to the acceptability of the resulting noise, in relation to the use of the surrounding landscape. Generally, the more stringent of the intrusive or amenity criteria is adopted as the project-specific noise criterion.

In assessing the noise impact of industrial sources, both components must be considered for residential receivers. In most cases, only one will become the limiting criterion and thereby determine the project-specific noise levels applied to noise from the Project's industrial sources.

Therefore, for the purposes of this assessment, only the amenity criteria have been used to provide a general indication of the acceptability of predicted noise. Potential impacts of specific projects will be assessed during the planning process in accordance with the NPfI.

4.1.2 Assessment periods

The assessment time periods defined by the NPfI are presented in Table 4.1.

Table 4.1 NPfI time periods

Assessment period	**Time**
Day	7:00 am to 6:00 pm Monday to Saturday 8:00 am to 6:00 pm Sundays and public holidays
Evening	6:00 pm to 10:00 pm all days
Night	10:00 pm to 7:00 am all days

4.1.3 Amenity criteria

Existing and potential future residential receivers would likely be categorised as a mix of "suburban" and "urban" residential as defined in the NPfI. A variety of non-residential receivers are also proposed. The relevant NPfI amenity criteria for these land uses are presented in Table 4.2. It is noted that the Amenity Noise Levels relate to the maximum permissible noise levels *onto* the development, not the maximum permissible noise emissions *from* the development.

The recommended Amenity Noise Levels (ANLs) represent the objective for total industrial noise at a receiver location. The amenity noise level emissions for any individual proposed development would be 5 dBA below these levels.

Table 4.2 Amenity criteria

Type of receiver	**Indicative noise amenity area**	**Assessment period**	**Recommended ANL, dBA $L_{eq, period}$**
Residential	Urban	Day	60

Type of receiver	Indicative noise amenity area	Assessment period	Recommended ANL, dBA $L_{eq, period}$
		Evening	50
		Night	45
Residential	Suburban	Day	55
		Evening	45
		Night	40
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
School classroom	All	Noisiest 1-hr period when in use	35 (internal) 45 (external)
Active recreation	All	When in use	55
Passive recreation	All	When in use	50

4.2 Road and rail noise intrusion

Development Near Rail Corridors and Busy Roads – Interim Guideline (DNRCBR) has been developed by the Department of Planning for use by authorities and proponents to consider road and rail noise at new residential and other developments alongside railway corridors and busy roads. The guideline details the requirements and implementation of the relevant provisions in the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP).

The DNRCBR applies to development adjacent to rail corridors and busy roads. While consideration of the guideline is a requirement for development specified under the TISEPP, it can also provide a useful guide for all development that may be impacted by, or may impact on, road and/or rail corridors.

It aims to protect the safety and integrity of key transport infrastructure from adjacent development, and ensure these developments maintain appropriate acoustic amenity by meeting internal criteria specified in the TISEPP.

The DNRCBR provides internal noise criteria for noise from road and rail traffic at residential and non-residential land-uses, presented in Table 4.3.

Table 4.3 Internal noise criteria

Residential buildings		
Type of occupancy	**Noise level dBA**	**Applicable time period**
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40	At any time
Non-residential buildings		
Type of occupancy	**Recommended max level dBA**	
Educational Institutions including childcare centres	40	

The DNRCBR has been used as the preliminary tool for assessing potential road and rail noise and vibration impacts to sensitive receivers within the Project area, as discussed in Section 5.3 and 5.4 respectively. This assessment method will be refined as the Project is progressed.

4.3 Local traffic noise

In NSW road traffic noise is assessed in accordance with the *NSW Road Noise Policy* (RNP) (DECC, 2011).

While no new roads are currently proposed within or adjacent to the Project, the Project will result in additional traffic on the wider road network. The RNP can be used by individuals and agencies to assess and mitigate the impacts of traffic noise from new and redeveloped road projects, and traffic-generating developments on residential and other sensitive lands.

The policy links with other NSW Government policies and plans to ensure that where road traffic exists, its noise impacts are appropriately identified and addressed. As relevant to the existing roads associated with this Project, the noise criteria in Table 4.4 would be considered at residential properties.

Table 4.4 Road traffic noise criteria

Road category	**Type of project**	**Assessment criteria dBA (external)**	
		Day (7am to 10pm)	**Night (10pm to 7am)**
Arterial / sub arterial roads	Existing residences affected by noise from NEW roads	$L_{Aeq\ (15\ hour)}$ 55	$L_{Aeq\ (9\ hour)}$ 50
	Existing residences affected by noise from REDEVELOPED roads	$L_{Aeq\ (15\ hour)}$ 60	$L_{Aeq\ (9\ hour)}$ 55
Local roads	Existing residences affected by noise from NEW roads	$L_{Aeq\ (1\ hour)}$ 55	$L_{Aeq\ (1\ hour)}$ 50
	Existing residences affected by noise from REDEVELOPED roads		

The RNP application notes state that '*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 as a result of the development should be limited to 2 dBA above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dBA of, or exceeds, the relevant day or night noise assessment criterion*.'

Therefore, if the road traffic noise levels increase by more than 2 dBA as a result of Project traffic and the criteria in Table 4.4 are exceeded, investigation of mitigation options would be required. It is noted that in order to generate an increase of 2 dB in noise, an increase in traffic numbers of 60% is required.

4.4 Ground-borne vibration

Vibration may be generated within the site during the operation of industrial facilities and rail lines or during construction, demolition and remediation activities. These impacts may result in adverse impacts on human comfort or the damage of physical structures such as dwellings. These two impacts are assessed against different criteria, with the effects of vibration on human comfort having a lower threshold.

4.4.1 Cosmetic building damage and structural integrity

There are no vibration limits for buildings and structures in *Assessing Vibration: A Technical Guideline* (AVaTG). Therefore, limits have been adopted from the British Standard *BS 7358-2: Evaluation and measurement for vibration in buildings guide to damage levels from ground-borne vibration*.

Importantly, cosmetic damage is regarded as minor in nature; it is readily repairable and does not affect a building's structural integrity. If there is no significant risk of cosmetic damage, then structural damage is not considered a risk.

A summary of the relevant limits from BS7358-2 is presented in Table 4.5. These peak vibration limits are set so that the risk of cosmetic damage is minimal. They have been set at the lowest level above which damage has been credibly demonstrated. The limits assume that the equipment causing the vibration is used intermittently.

Table 4.5 BS 7385-2 Guideline vibration limits for cosmetic damage

Group	**Type of structure**	**Peak component particle velocity, mm/s (1)**		
		4–15 Hz	**15–40 Hz**	**> 40 Hz**
1	Reinforced or framed structures Industrial and heavy commercial buildings	50		
2	Un-reinforced or light framed structures Residential or light commercial buildings	15 – 20	20 – 50	50

Note:

(1) Values referred to are at the base of the building, on the side of the building facing the source of vibration (where feasible).

At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

4.4.2 Human comfort (amenity)

Table 4.6 presents the AVaTG limits (vibration dose values or VDV) above which there is considered to be a risk to the amenity and comfort of people occupying buildings from intermittent vibration.

Table 4.6 Human comfort (amenity) guideline vibration limits (intermittent work)

Location	**Assessment period**	**Vibration dose value, m/s$^{1.75}$**	
		Preferred values	**Maximum values**
Critical areas	Anytime	0.10	0.20
Residences	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions, and places of worship	Anytime	0.40	0.8
Workshops	Anytime	0.8	1.6

4.4.3 Heritage structures

Building structures classified as being of heritage significance are to be considered on a case-by-case basis, as a heritage listed structure may not be assumed to be more sensitive to vibration unless it is structurally unsound which is unlikely for a regularly maintained structure. Where a historic structure is deemed to be sensitive to damage from vibration following inspection by qualified structural and / or civil engineers, more conservative superficial cosmetic damage criterion based on Peak Component Particle Velocity (PPV) should be considered.

Where a historic building is deemed to be sensitive to damage from vibration (structurally unsound), a conservative superficial cosmetic damage criterion of 3 mm/s PPV may be applicable (based on *DIN 4150-3 Vibration in buildings – Part 3: Effects on structures*).

With the exception of construction induced ground vibration from sources such as piling or demolition, it has been assumed that the operation of existing the Sydney Trains Services and future Sydney Metro West would be the only sources of ground borne noise or vibration throughout the Project.

5 Methodology and assessment

5.1 Overview

A preliminary review of noise and vibration impacts has been undertaken using modelling and screening assessments to identify potential noise and vibration risks to sensitive receivers based on the future land use zoning, discussed in Section 2.3.

Possible noise impacts from industrial, residential and entertainment sources have been modelled based on identified locations within the Project which have the potential to impact future sensitive receiver areas.

Potential impacts from major roads and rail noise and vibration sources have been mapped as impact zones using buffer distances applicable to each transport type per the DNRCBR.

Preliminary noise and vibration impact maps are presented in Appendix C.

5.2 Industrial noise

5.2.1 Methodology

High-level noise predictions have been conducted for the following scenarios:

- Industrial noise emissions from Mason Park Substation and Ausgrid Homebush Depot
- Residential building services noise emissions
- Entertainment noise emissions from ACCOR stadium within Sydney Olympic Park

Noise generated under each scenario has been modelled using spatial information supplied by the Department and includes typical noise emissions for each land use type. Given the lower noise criteria for night-time hours at sensitive receiver locations, noise levels have been modelled for night-time periods only. Where compliance during night-time is shown, the risk of daytime noise impacts is considered low.

A 3D noise model was created using SoundPLAN software and included terrain, buildings and ground absorption. Existing buildings were retained within the model where relevant, to consider shielding to other properties and land uses noting the Project generally increases permissible building heights.

Table 5.1 summarises the modelling parameters and assumptions.

Table 5.1 Industrial noise modelling parameters

Item	Assumptions
Calculation method	CONCAWE noise prediction algorithm within SoundPLAN v8.2
Assessment period	Night-time only (10pm to 7am)
Ground topography	From a combination of survey data and existing topographical maps provided by NSW Lands and Property Information.
Existing buildings and receivers	Provided by Geoscape and developed from a combination of satellite and aerial imagery.
Proposed buildings and receivers	Typical building types, heights and footprints are indicative only and have been based on the latest building height allowances provided by the Department.
Ground absorption	— Set at 60% soft ground for lawn, natural areas and park land

Item	Assumptions
	— Set at 50% soft ground for residential land use — Set at 25% hard ground for commercial land uses — Set at 0% for water
Source and receiver locations	Where indicative area noise sources have been used, they have been set at 1.5m above ground. For other specific industrial noise sources, they have been modelled at heights representative of the identified plant or equipment. Noise levels are predicted at 1.5m height above ground.
Meteorological conditions	As described in Section 3.6 (low to moderate breeze from source to receiver, Pasquil stability category D (Neutral category))

Existing industrial noise considered for the assessment includes industrial, building services in residential and mixed-use land uses, and entertainment.

Noise emissions from existing industrial noise sources are assumed to meet the requirements of the NPfI at existing sensitive receivers. On this basis, the noise emission from each land use is taken as the maximum compliant source level at existing receivers.

Modelled sound power/ pressure levels for each noise source are listed in Table 5.2.

Table 5.2 Modelled noise levels

Noise source	Modelled sound power/pressure levels
Mixed residential	SWL 45 dBA L_{eq} / m^2
Industrial (Mason Park Substation)	SWL 60 dBA L_{eq} / m^2
Industrial (Ausgrid Homebush Depot)	SWL 55 dBA L_{eq} / m^2
Ausgrid transformers	SWL 95 dBA L_{eq}(1)
Entertainment noise	SPL 110 dBA at mixing desk (40 m from stage)(2)

Notes:

(1) Emissions from transformers within the Ausgrid Depot have been sourced from measurements from similar equipment to provide a conservative estimation of the potential emissions.

(2) Noise level sources from measurements at mixing desk during event noise monitoring of large stadium events.

Entertainment noise has been assessed as a sound pressure level within ACCOR arena. The perimeter of the arena is considered a solid barrier. The modelling assumes that noise is emitting from the arena via the open top of the venue.

The existing residential land uses around the two industrial sites are typically one or two storey. The sound level from the site has been calculated based on a receiver height of 1.5 m.

Noise from the future Strathfield North Metro Station is detailed as satisfying the amenity and intrusiveness noise criteria at the nearest sensitive receivers within the Sydney Metro West EIS (March 2022). Future receivers may be subject to higher noise levels than existing buildings. Impacts from future industrial sources will be considered further as part of subsequent Development Application investigations, when building heights are confirmed near the future Metro Station.

5.2.2 Assessment results – industrial noise

Potential noise impacts from industrial, residential, entertainment have been assessed upon sensitive receivers within the Precinct. Preliminary noise impact maps are presented in Appendix C.

Indicative night-time noise levels from the Mason Park Substation and the Homebush Ausgrid Depot are presented in Figure C1. Figure C2 presents indicative night-time noise levels from building services from residential and mixed-use developments. Figure C3 displays indicative night-time noise levels from events at Sydney Olympic Park.

The noise level impacts for industrial noise sources in Figures C1, C2 and C3 are broadly classified per Table 5.3.

Table 5.3 Industrial noise level impacts

Colour	Industrial noise impact	Night-time noise level, $L_{eq,15\ min}$ dBA
Dark green	Low	40 to 45
Green		45 to 50
Yellow	Medium	50 to 55
Orange		55 to 60
Red	High	> 60

5.3 Road noise

5.3.1 Screening methodology

Preliminary road noise impacts have been assessed using the screening test outlined in the DNRCBR. The screening test is only applicable to parts of a development (or building facades) that are exposed to traffic noise and have a clear line-of-sight to the road up to a distance of 300 m from the road kerb.

No changes to traffic volumes or speed of the existing roads within the Project have been assumed for the purposes of this preliminary assessment. Posted speed limits on the sub-arterial roads throughout the Precinct are generally 40-80 km/h. The nearest screening test for 60/70 km/h zones has been adopted as per Figure 5.1.

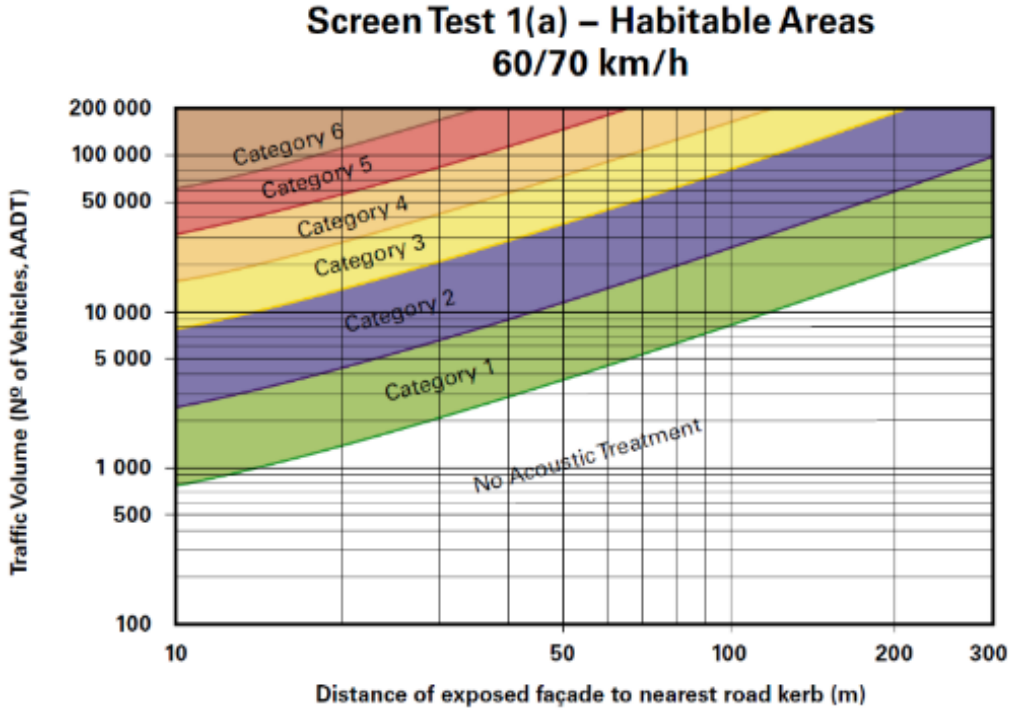


Figure 5.1 DNRCBR screening test for habitable areas (if any exposed façade is direct line-of-sight)

The DNRCBR defines relevant categories of noise control treatments required, depending on distance to the road and traffic volumes. Standard noise control treatments are classified into six categories outlining standard construction methods and building materials that are likely to meet the internal performance criteria for noise as outlined in Table 4.4. Additional information on each category can be found in Appendix A.

At this stage of the assessment, traffic volumes have been sourced from the WestConnex M4 East Project EIS. The traffic numbers have been adjusted from 2021 to the year 2025 using growth data from the Transport for NSW Traffic Volume Viewer for Silverwater Road, as a conservative estimate of regional growth in the area. Traffic numbers for existing roads are outlined in Appendix B. These values will be updated as the Project progresses.

This data was adopted as it is considered to provide indicative representation of the existing traffic at the Project site from publicly available traffic information. It is noted that a doubling of road traffic numbers leads to an increase in road traffic noise of approximately 3 dB, as such, the sensitivity of the assessment to smaller variations in traffic volumes is low. Variations in the traffic volumes are not predicted to have a significant impact on the noise level from roads.

Road noise assessment categories have been presented in Table 5.4 based on total traffic volume and the distance to the road. Categories have been calculated in accordance with Figure 5.1.

Table 5.4 Road noise assessment categories based on estimated traffic volumes

Vehicle volumes, AADT	**Acoustic treatment category distances, m**						
	No treatment(1)	**Cat 1**	**Cat 2**	**Cat 3**	**Cat 4**	**Cat 5**	**Cat 6(2)**
120,000	-(3)	-(3)	≤ 300	≤ 140	≤ 75	≤ 40	≤ 20
70,000	-(3)	-(3)	≤ 220	≤ 90	≤ 45	≤ 24	≤ 15
60,000	-(3)	-(3)	≤ 200	≤ 80	≤ 40	≤ 21	≤ 13
50,000	-(3)	-(3)	≤ 180	≤ 70	≤ 35	≤ 18	-
40,000	-(3)	-(3)	≤ 145	≤ 55	≤ 28	≤ 14	-
30,000	-(3)	≤ 300	≤ 110	≤ 41	≤ 21	-	-
20,000	>210	≤ 210	≤ 80	≤ 30	≤ 15	-	-
10,000	>120	≤ 120	≤ 45	≤ 15	-	-	-

Notes:

(1) Subject to impacts from other noise sources.

(2) An assessment is required by an acoustic consultant and a report detailing findings and recommendations should be prepared.

(3) Screen test only applies up to 300 m from the road kerb due to practical prediction limits.

5.3.2 Assessment results – road noise

Figure C4 presents indicative noise impact zones for the following major roads based on the DNRCBR screening method:

- Parramatta Road
- Homebush Bay Drive
- WestConnex M4 East (and interchange)
- Concord Road / Leicester Avenue.

The road noise impact zones shown in Figure C4 are broadly classified by noise treatment requirements in Table 5.5.

Table 5.5 Road noise impact zones

Colour	Road noise impact	Noise control treatment category[(1)]
Green	Low	Category 1 and 2 (refer Appendix A)
Yellow	Medium	Category 3 and 4 (refer Appendix A)
Red	High	Category 5 and 6 (refer Appendix A)

Note:

(1) Noise control treatment for sleeping areas and other habitable areas of single / dual occupancy dwellings as per DNRCBR.

5.4 Rail noise

5.4.1 Methodology

The DNRCBR provides a distance-based assessment to assess rail noise on noise sensitive receivers, applicable to operation of Sydney Train lines south and northeast of the Project.

Figure 5.2 presents the distance-based triggers for acoustic assessment zones under the DNRCBR (Zone A and Zone B), indicating where sensitive receivers are at risk of acoustic impact. Noise sensitive developments located within Zone A would necessitate a full acoustic assessment, and within Zone B would require specific acoustic treatments to manage noise levels.

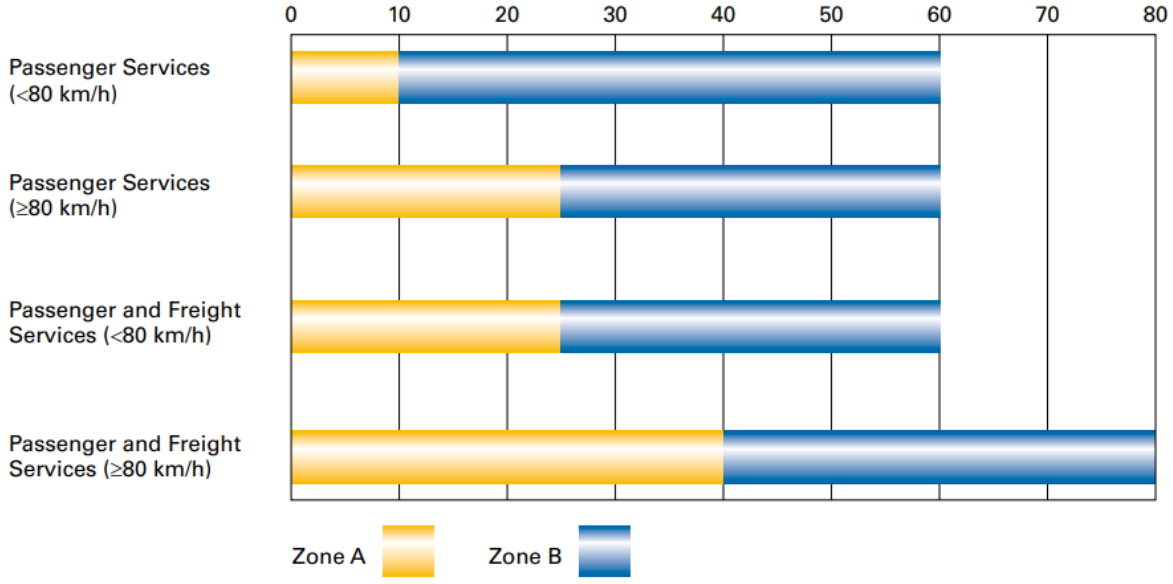


Figure 5.2 Rail noise assessment zones based on distance (m) of noise-sensitive-development from operational track (not corridor)

The surface rail lines within the Project are used by both passenger and freight trains. Due to the close proximity of stations, it is expected that trains are travelling at < 80 km/h within the Project area, therefore buffer distances of 25 m and 60 m have been adopted for this assessment.

Given that the future Sydney Metro West will be an underground alignment where interfacing with the Project, it is considered that noise emissions from rail movements would be managed as part of EIS approvals process.

5.4.2 *Assessment results – rail noise*

Figure C5 presents rail noise impact zones for existing Sydney Trains rail corridors, broadly classified per Table 5.6. It is considered that the future Sydney Metro West is unlikely to generate airborne noise impacts.

Table 5.6 Rail noise impact

Colour	Rail noise impact	Description
Green	Low	Zone B – equivalent to noise control treatment category 2 for road noise (refer Appendix A)
Red	High	Zone A – Assessment required by an acoustic consultant.

5.5 Rail vibration

5.5.1 *Methodology*

The DNRCBR provides a distance-based assessment for the requirement to assess rail vibration on sensitive developments, applicable to operation of Sydney Train lines south and northeast of the Project, and the future Sydney Metro West alignment. Figure 5.3 presents the distance-based triggers for vibration assessment zones. The DNRCBR states that developments within these distances would necessitate a vibration assessment.

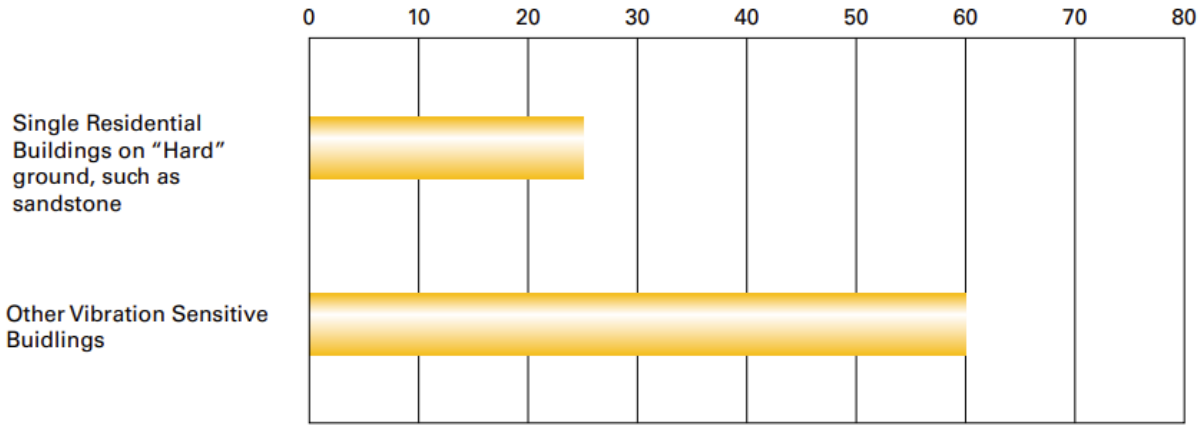


Figure 5.3 Vibration assessment zones based on distance (m) of buildings from operational track (not corridor)

5.5.2 *Assessment results – rail vibration*

Figure C6 presents indicative rail vibration impact zones for existing Sydney Trains corridors and the future Sydney Metro West sub surface tunnel. The impact zones in Figure C6 are classified by receiver type as outlined in Table 5.7.

Table 5.7 Rail vibration impact

Colour	Rail vibration impact	Description
Red – dashed line	High	Assessment required for other sensitive buildings within 60m of operational rail track
Red – solid line	High	Assessment required for single residential dwellings on hard ground within 25m of operational rail track

5.6 Project traffic noise generation

The RNP also requires an assessment of noise impacts where a land use development generates additional traffic on existing roads. These aspects will be assessed in more detail as the project progresses, however a high-level assessment of relative impact on the regional network has been conducted.

Population, dwelling and jobs growth projections within the Precinct are summarised in Table 5.8.

Table 5.8 Proposed growth projections (source: COX Urban Design Report 2024)

	Existing 2024 (built)	**2050 Projections**
Population	-(1)	55,000
Dwellings	6,800	22,900
Jobs	6,200	8,870

Note:

(1) DPHI to confirm existing population.

An approximate 60 per cent increase in traffic is required to increase traffic noise levels by more than 2 dB.

When compared to traffic volumes on the regional traffic network (refer Appendix B), traffic generation from these additional dwellings will have negligible impact on the overall network. Noise impacts on the existing roads as a result of Project generated traffic on the local road network are anticipated to be negligible in the context of major arterial roads.

Impacts may be more noticeable on local roads within the Precinct. Noise impacts on the existing roads as a result of Project generated traffic are not anticipated to result in a 2 dB increase on existing traffic noise levels, however this would be considered as part of subsequent stages when traffic projections are finalised.

6 Findings and recommendations

6.1 Discussion

Preliminary predictions of noise and vibration impacts have been undertaken for the Project. These predictions assess the potential impact that existing and future noise and vibration sources may have on sensitive receivers within the Precinct.

The results presented in Appendix C indicate that road and rail sources are the dominant contributors to potential noise and vibration risks for the Project.

Table 6.1 presents a summary of findings and of the key noise and vibration impacts as well as potential opportunities to minimise, avoid or manage these impacts.

Table 6.1 Noise and vibration impacts and opportunities

Source	Identified impacts	Potential opportunities
Road noise	— Road traffic is identified as the most significant noise contributor in the Project. — New residential developments fronting Parramatta Road, Homebush Bay Drive, Leicester Avenue and the M4 Motorway would be exposed to high road noise levels, likely requiring high category noise mitigation treatment in building design and detailed acoustic assessments during future planning stages. — The majority of residential buildings within the Precinct will be impacted by road traffic noise and will require an assessment by a qualified acoustic engineer during future planning stages to ensure internal noise criteria can be achieved. — New residential developments within 70 m of major road alignments would be medium risk, requiring Category 3 or 4 noise treatment for building facades. Low risk impacts requiring Category 1 or 2 treatment extend up to 300 m. High risk impacts are localised to within 20 m of major road alignments, requiring Category 5 and 6 treatment.	— Locate noise insensitive uses along road frontages. In mixed-use areas elevate noise sensitive uses to provide vertical separation between sensitive receivers and roads. — Use medium to high-rise buildings adjacent to major roads to maximise shielding to create quieter spaces within the Precinct, providing additional opportunities for recreational areas, such as open spaces along Powells Creek, and increasing acoustic amenity for shielded buildings. — Use built form as noise screen, using podium/tower design to maximise screening to upper residential floors, with the residential building component setback from the noise impacted façade of the podium. — Orient buildings and structures to minimise direct exposure to road traffic noise, utilising site design techniques such as clustering buildings or angling structures. — Conduct thorough noise impact assessments as part of the planning process for new developments to identify potential noise-sensitive areas and implement appropriate mitigation measures. — Design proposed residential buildings per DNRCBR and Apartment Design Guide, including acoustically rated windows and façade elements, per Appendix A.

Source	Identified impacts	Potential opportunities
Rail noise	Rail noise from existing Sydney Trains rail corridors impact sensitive receivers along the T1, T2 and T9 alignments to the south and east of the Project. New sensitive developments within 25 m of the track are considered at high risk of rail noise impact and are likely to require comprehensive noise assessments, including: — Residential and mixed-use developments located on George Street adjacent the T9 Northern Line to the east of the Precinct — Residential developments along the western boundary of the Strathfield Triangle — Mixed-use developments to the east of Homebush Station, particularly adjacent the tight radius curved track connecting the Western rail line with the Northern rail line. — Residential and mixed-use developments located on Loftus Crescent along the T1 Western and T2 Inner West Line New sensitive developments within 60 m of the track are considered low risk, likely to require noise mitigation measures equivalent to those applicable to Category 2 for road noise assessments.	— Do not locate noise sensitive land uses adjacent to or above train line and station. — Locate noise insensitive uses along rail frontages. In mixed-use areas elevate noise sensitive uses to provide vertical separation between sensitive receivers and the rail line. — Design per DNRCBR and Apartment Design Guide. — Orient sensitive uses within the building away from railway tracks to minimise exposure to noise and vibration. — Conduct thorough rail noise and vibration impact assessments as part of the planning process for new developments near railway corridors to ensure that noise and vibration impacts are adequately addressed during the design stages.
Existing rail vibration	Rail vibration from existing from existing Sydney Trains rail operations impact sensitive receivers along the T1, T2 and T9 alignments to the south and east of the Project. New residential developments within 25 m of the track are considered at high risk of rail vibration impact and are likely to require comprehensive assessment, including: — Residential developments located on George Street adjacent the T9 Northern Line to the east of the Precinct — Residential developments along the western boundary of the Strathfield Triangle	— Do not locate vibration sensitive land uses adjacent to or above train line and station. — Orient sensitive uses within the building away from railway tracks to minimise exposure to noise and vibration. — Conduct thorough rail noise and vibration impact assessments as part of the planning process for new developments near railway corridors to ensure that noise and vibration impacts are adequately addressed during the design stages.

Source	Identified impacts	Potential opportunities
	— Residential developments located on Loftus Crescent along the T1 Western and T2 Inner West Line New non-residential sensitive developments within 60 m of the track are considered high risk, likely to require comprehensive assessment, including: — Mixed-use developments located on George Street adjacent the T9 Northern Line to the east of the Precinct — Mixed-use developments located on Loftus Crescent along the T1 Western and T2 Inner West Line — Mixed-use developments to the east of Homebush Station	
Future rail vibration	Rail vibration from the future Sydney Metro West is a potential risk to sensitive receivers to the north-east of the Project area. New residential developments within 25 m of the future track are considered at high risk of rail vibration impact and are likely to require comprehensive assessment, including residential developments located on George Street adjacent the T9 Northern Line to the east of the Precinct. New non-residential sensitive developments within 60 m of the track are considered high risk, likely to require comprehensive assessment, including Mixed-use developments located on George Street adjacent the T9 Northern Line to the east of the Precinct. The depth of the Metro West tunnel is unknown at this stage. Assessment zones for sub-surface rail represent a three-dimensional envelope around the tunnel. Proposed increases in building heights considered for the Project may necessitate deeper foundations for structural support. If these building foundations are within the assessment envelope, they could be susceptible to vibration from the rail lines.	— Do not locate vibration sensitive land uses adjacent to or above train line and station. — Orient sensitive uses within the building away from railway tracks to minimise exposure to noise and vibration. — Conduct thorough rail noise and vibration impact assessments as part of the planning process for new developments near railway corridors to ensure that noise and vibration impacts are adequately addressed during the design stages.
Industrial noise	— Noise from industrial sources (Mason Park Substation and Ausgrid Depot) are existing features. Noise impacts are localised with minor encroachment into future residential areas. This may impact upper	— Impacts at new residences are likely to be readily mitigated through the incorporation of normal acoustic building treatments in their design.

Source	Identified impacts	Potential opportunities
	tenancies as adjacent residential buildings increase in height, particularly adjacent the Mason Park substation. — Location of sensitive receivers closer to existing industrial noise sources or at higher elevations increases the risk of levels above relevant NPfI criteria due to increased exposure. — Similar risks are present for residences adjacent the Ausgrid Homebush Depot. While separated by Underwood Road, Pomeroy Street and Powells Creek, proposed increases in height increase exposure and line of site for tenancies overlooking the site.	— Design new residential developments in accordance with the Apartment Design Guide.
Future industrial sources	Noise impacts from the future Strathfield North Metro Station is detailed as satisfying the amenity and intrusiveness noise criteria within the Sydney Metro West EIS (March 2022). Future receivers may be subject to higher noise levels than existing buildings.	— Impacts at new residences are likely to be readily mitigated through the incorporation of normal acoustic building treatments in their design. — Design new residential developments in accordance with the Apartment Design Guide.
Commercial/mixed use and retail activities	Commercial and retail activities, including deliveries, outdoor dining, and entertainment events, can generate excessive noise that can disrupt residential areas.	— Manage noise per relevant Council regulations. — Follow applicable design guidelines and standards for commercial and retail developments to address noise considerations and ensure compatibility with surrounding residential uses. — Traffic management for service entries and loading.
Open spaces / local entertainment	Public open spaces and street activation plans may affect adjacent residential areas	— Manage noise per relevant Council regulations. — Incorporate soundscape design. — Implement operational controls, such as restrictions on hours of operation, outdoor amplified music. — Establish setback requirements for new developments within the Precinct to ensure adequate distance from residential uses.
Entertainment noise	Noise emission from Sydney Olympic Park is not predicted to have a significant impact sensitive receivers within the Precinct. The infrequent	Residential buildings closest to the entertainment precinct may be affected by noise from within the precinct, however these impacts are likely to be easily

Source	Identified impacts	Potential opportunities
	nature of events means that the risk of noise impacts is considered low, and readily managed by Sydney Olympic Park Authority.	mitigated through the incorporation of normal acoustic building treatments in their design.
Residential building services noise	— Noise impacts from residential building services are predicted to generate localised impacts at nearby sensitive receivers. — The proposed increase of density and height of residential buildings could lead to an increase of building services noise within the Precinct. — While the NPfI criteria regulate noise emissions from individual residential developments, the higher housing density might potentially elevate cumulative noise levels in residential zones.	— Taller buildings can offer shielding benefits, reducing line-of-sight between noise sources and receivers. — Design residential developments per Apartment Design Guide. — Optimise the placement of building services infrastructure within residential developments. Locate mechanical services equipment away from residential receivers.
All construction activities	— Vibration impacts at vibration sensitive receivers near construction works. — Vibration impacts at sensitive underground services. — Vibration impacts at heritage structures within the Precinct. — Noise affecting sensitive residential receivers within and outside the Precinct.	— High ability to mitigate during construction planning. — Assess potential noise impacts in accordance with ICNG. — Assess potential vibration impacts on human comfort in accordance with AVaTG. — Assess potential vibration impacts on structural damage in accordance with BS7358-2:1993. — Assess potential vibration impacts on structural damage to buried services in accordance with DIN 4150-3. — Develop detailed construction management plans prior to the commencement of construction activities that incorporate noise and vibration mitigation measures and optimisation of construction schedules.

6.2 Recommendations

6.2.1 Land use planning

Land use planning processes are the most efficient mechanisms to avoid noise and vibration related land use conflicts within the Project boundary. It is noted that the Project proposes changes to some existing land use planning controls.

6.2.2 Design considerations

Following the consideration of potential noise and vibration impacts during preliminary and detailed land use planning phases of development, smaller scale noise mitigation and management measures may be implemented to further reduce any residual impacts.

These measures will typically be implemented on a project-by-project basis and considered as part of the noise and vibration assessment process during the planning phase of a development.

It is important that potential noise and vibration impacts from (or into) any development are assessed in accordance with the relevant NSW guidelines during the planning approvals stage of each project, and suitable noise management measures are implemented to control any predicted noise impacts.

Acoustic impacts relating to road traffic depend heavily on current traffic modelling and projections. It is recommended that acoustic findings be refined and updated based on the completion of future regional traffic studies to account for regional traffic growth once significant road infrastructure projects stabilise (e.g. WestConnex, Rozelle interchange).

Potential noise and vibration impacts on sensitive developments are to be assessed in accordance with the relevant NSW guidelines during the planning approvals stage of each project.

Noise and vibration assessments must be conducted and:

- be carried out by a competent person as defined in the *Approved Methods For The Measurement And Analysis Of Environmental Noise* in NSW (EPA, 2022)
- consider cumulative noise and vibration impacts on receivers, including from proposed noise generating activities, carried out both inside and outside the proposed Project area as per the NPfI.

Noise and vibration assessments must be undertaken in accordance with (as relevant and not limited to):

- *Noise Policy for Industry* (EPA, 2017)
- *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009)
- *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP)
- *Development Near Rail Corridors and Busy Roads – Interim Guideline* (DPE, 2008)
- *NSW Road Noise Policy* (Department of Environment, Climate Change and Water, 2011)
- *Assessing Vibration: a technical guideline* (Department of Environment and Conservation, 2006)

Land use planning and building design recommendations are provided in Table 6.2 as relate to noise and vibration within the Project. It is noted that a number of the identified measures form part of existing Council documentation.

Table 6.2 Summary of noise and vibration recommendations for the Project

Reference	Recommendation
Land use planning recommendation	
1	Grouping similar land uses to avoid acoustic conflicts and reduce the risk of noise nuisance, e.g. by separating residential areas from industrial zones.
2	Locating less noise sensitive land uses along major transport routes or other noise sources.
3	Locating the rear, or less sensitive boundaries of lots towards major transport routes or other noise sources.
4	Large, non-noise sensitive buildings such as office blocks should be located to provide noise screening to more sensitive land uses such as residences or educational facilities. Where possible, these structures should be located along primary transport routes or adjacent to other major noise sources.
5	Locating less vibration sensitive land uses along rail corridors.
6	The needs of vibration sensitive land uses should be considered during planning stages. These premises may be susceptible to ground vibration generated by the existing and future Sydney Trains. Avoid vibration sensitive buildings within the transport corridor buffer zone.
7	Design green spaces to minimise event and active recreational noise at sensitive receivers
8	Include water features or other natural sounds to mask unwanted urban noise
9	Parks / urban green spaces provide open space for relaxation, recreation and socialising. They also provide relief from the noise and activity of an urban environment.
10	Soundscape design, through active (electronic) or passive (natural) means. Active soundscape could highlight the indigenous connection to the country through low volume indigenous cultural music or native birdsong.
11	Adopting Green Star, WELL or other ESD tools
Noise and vibration building design	
12	Building designs, layouts and constructions, including sound attenuation measures, are to take into account the impacts of noise between the different uses within a building and from surrounding areas.
13	Compliance with recommended internal noise levels outlined in AS/NZS2107 is necessary for proposed residential buildings to protect occupant amenity from external noise levels. This compliance requirement should be incorporated into any specific Development Control Plan.
14	The Apartment Design Guide (Department of Environment and Planning, 2015) offers guidance tools to enhance residential amenity and should be considered during the design phase of residential developments.
15	Noise / vibration impacts associated with any future development would be assessed in accordance with the relevant NSW guidelines, and suitable noise management measures would be implemented to control any predicted impacts.
16	Consider construction noise and ground vibration impacts during planning stages of demolition, remediation and construction.

Reference	Recommendation
17	Consideration may be given to the creation of a network of soundscapes to generate a coherent, acceptable noise environment. The installation of pleasant sound sources, such as water features throughout the precinct will mask less desirable noise sources such as industry, aircraft and road traffic.
18	General guidelines and 'good practice' as per the *Development Near Rail Corridors and Busy Roads – Interim Guideline* should be implemented, such as: – Using buildings as noise shields – Avoiding the use of angled buildings, as they could reflect noise into other buildings – Using podia, balconies and courtyards as noise shields
19	Buildings with concrete/brick/glazed facades and pavements are acoustically reflective. Introduction of 'green' areas/facades and soil in urban areas that scatter noise would result in less noise build up compared to high build up areas (such as the Sydney CBD).

7 Conclusions

This report has provided a high-level assessment of potential noise and vibration impacts and opportunities associated with the proposed Homebush State-Led Rezoning Project. Impacts have been assessed in accordance with the *Protection of the Environment Act 1997* and *NSW Noise Policy for Industry 2017* and other relevant standards and guidelines.

This assessment has identified indicative acoustic criteria for proposed land uses. Preliminary noise modelling has been conducted to provide high-level assessments of noise impacts from industrial noise emissions from Mason Park Substation and Homebush Ausgrid Depot, and entertainment noise from Sydney Olympic Park. Risk assessment mapping has been conducted to identify zones near road and rail that are likely to be impacted by noise and vibration from these sources. Land use changes included as part of the Masterplan for the Project generally retains the existing land use avoiding significant potential land use conflicts.

A discussion of the preliminary review findings is provided in this report, along with potential opportunities to minimise, avoid or manage noise and vibration impacts onto sensitive land uses during future planning and construction stages. Recommendations have been provided to manage and minimise any potential land use impacts, however, it is noted that a number of the identified measures form part of the existing Masterplan and Council documentation.

Potential development and construction impacts will be covered under existing legislation on a project-by-project basis through the planning and approvals process.

This report will be updated as the design progresses and be supplemented with updated acoustic modelling in the subsequent revision of this report.

More detailed assessments will be conducted during the planning approvals process for each individual project.

8 References

- *Apartment Design Guide, Tools for improving the design of residential apartment development (*NSW Department of Planning and Environment, 2015)
- *Assessing Vibration: a Technical Guideline* (Department of Environment and Conservation, 2006)
- *AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors*
- *BS 7358-2: Evaluation and measurement for vibration in buildings guide to damage levels from ground-borne vibration*
- *Development Near Rail Corridors and Busy Roads – Interim Guideline* (DoP, 2008)
- *DIN 4150-3 Vibration in buildings – Part 3: Effects on structures*
- *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009)
- *Noise Policy for Industry* (EPA, 2017)
- *Road Noise Policy* (Department of Environment, Climate Change and Water, 2011)
- *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP)
- *Parramatta Road Corridor Urban Transformation Strategy 2016-2023*
- *Implementation Tool Kit: Implementation Plan 2016 – 2023, including supporting documents such as the Planning and Design Guidelines*
- *Parramatta Road Corridor Urban Transformation Strategy Implementation Update 2021 July 2021*
- *Parramatta Road Corridor Traffic and Transport Study and Action Plan Strathfield, Burwood and Canada Bay Councils 18 February 2022*
- *Strathfield Triangle – Council Initiated Planning Proposal*
- *Draft Parramatta Road Urban Design Guideline September 2015*
- *Parramatta Road Urban Amenity Improvement Plan September 2015*
- *Homebush North Precinct Master Plan Report (GroupGSA) – April 2021*
- *PRCUTS Stage 2 Homebush Precinct Master Plan Report (GroupGSA), November 2023*
- *Homebush Urban Village Masterplan scoping report (Strathfield Council), November 2023*
- *Sydney Metro West Rail infrastructure, stations, precincts and operations Environmental Impact Statement*
  - *Chapter 10 – North Strathfield Metro Station, March 2022*
  - *Technical Paper 3: Operational Noise and Vibration, March 2022*
  - *Technical Paper 4: Construction Noise and Vibration – Part 1, March 2022*
- *WestConnex M4 East Project – Construction and Operational Road Traffic Environmental Impact Statement - Noise and Vibration Technical Paper, September 2015*
- *Homebush State Led Rezoning Draft LEP Controls by COX, June 2024*
- *Homebush State Led Rezoning – Full Heritage Assessment by GML Heritage, May 2024*

Appendix A

Acoustic treatment of residences

The following section is extracted from Appendix C of 'Development near rail corridors and busy roads – interim guideline'. It presents the type of architectural treatment that would typically be required to meet the acceptable noise levels for interior spaces of residential buildings as required under AS/NZS 2107 Acoustics – Recommended design sound levels and reverberation times for building interiors.

The risk levels presented on the noise impact maps for each scenario broadly align with the following categories:

Low impact	*Categories 1 and 2*
Medium impact	*Categories 2 and 4*
High impact	*Categories 5 and 6*

Appendix A – Acoustic Treatment of Residences

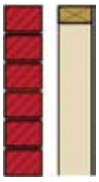
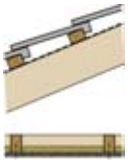
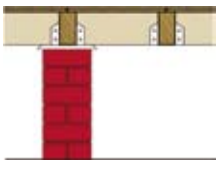
The following table sets out standard (or deemed-to-satisfy) constructions for each category of noise control treatment for the sleeping areas and other habitable areas of single / dual occupancy residential developments only. The assumptions made in the noise modelling are as follows:

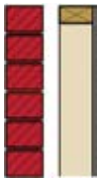
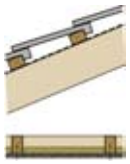
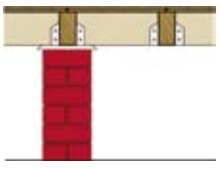
- Typical layout of a modern dwelling taken from a recent large residential development in an outer Sydney suburb
- Bedrooms and other habitable rooms are exposed to road noise

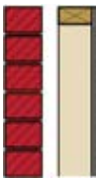
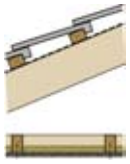
ACOUSTIC PERFORMANCE OF BUILDING ELEMENTS

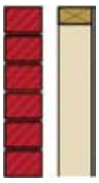
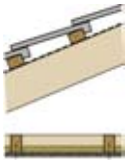
The acoustic performances assumed of each building element in deriving the Standard Constructions for each category of noise control treatment presented in the preceding Table, are presented below in terms of Weighted Sound Reduction Index (Rw) values, which can be used to find alternatives to the standard constructions presented in this Appendix:

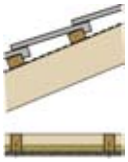
Category of Noise Control Treatment	R_w of Building Elements (minimum assumed)				
	Windows/Sliding Doors	Frontage Facade	Roof	Entry Door	Floor
Category 1	24	38	40	28	29
Category 2	27	45	43	30	29
Category 3	32	52	48	33	50
Category 4	35	55	52	33	50
Category 5	43	55	55	40	50

Category No.	Building Element	Standard Constructions	sample
1	**Windows/Sliding Doors**	Openable with minimum 4mm monolithic glass and standard weather seals	
	Frontage Facade	**Timber Frame or Cladding:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally	
		Brick Veneer: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally	
		Double Brick Cavity: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R1.5 insulation batts in roof cavity.	
	Entry Door	35mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
2	**Windows/Sliding Doors**	Openable with minimum 6mm monolithic glass and full perimeter acoustic seals	
	Frontage Facade	**Timber Frame or Cladding Construction:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally with R2 insulation in wall cavity.	
		Brick Veneer Construction: 110mm brick, 90mm timber stud frame or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	40mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
3	**Windows/Sliding Doors**	Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	**Brick Veneer Construction:** 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 1 layer of 13mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
4	**Windows/Sliding Doors**	Openable with minimum 10.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	**Brick Veneer Construction:** 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 2 layers of 10mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
5	**Windows/Sliding Doors**	Openable Double Glazing with separate panes: 5mm monolithic glass, 100mm air gap, 5mm monolithic glass with full perimeter acoustic seals.	
	Frontage Facade	**Double Brick Cavity Construction:** 2 leaves of 110mm brickwork separated by 50mm gap with cement render to the external face of the wall and cement render or 13mm plasterboard direct fixed to internal faces of the wall.	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 2 layers of 10mm sound-rated plasterboard fixed to ceiling joist using resilient mounts, R2 insulation batts in roof cavity	
	Entry Door	Special high performance acoustic door required - Consult an Acoustic Engineer	*Door to acoustic consultant's specifications*
	Floor	Concrete slab floor on ground	
6	**All**	Consult an Acoustic Engineer	

Appendix B

Road traffic numbers

Road traffic numbers – Existing roads

Road / Section	AADT
M4 Motorway – Eastbound	
M4 Eastbound	58,180
Btwn Homebush Bay Drive ON Ramp and Sydney St OFF Ramp	12,525
Btwn Sydney St and Parramatta Rd	6,027
M4 Motorway – Westbound	
M4 Westbound (Parramatta Rd Interchange)	8,266
Btwn Concord Rd ON Ramp and Homebush Bay OFF Ramp	10,831
Btwn Homebush Bay ON Ramp and Birnie Ave	54,963
M4 Motorway Ramps – Eastbound	
M4 EB OFF Ramp to Homebush Bay Drive	26,200
M4 EB ON Ramp from Homebush Bay Drive	4,978
M4 EB OFF Ramp to Sydney St	6,498
M4 Motorway Ramps – Westbound	
M4 WB ON Ramp from Concord Rd	2,563
M4 WB OFF Ramp to Homebush Bay Drive	8,088
M4 WB ON Ramp from Homebush Bay Drive	16,340
Parramatta Road – Eastbound & Westbound	
Btwn Birnie Ave and Centenary Drive	69,510
Btwn Centenary Drive Flemington Rd	39,581
Btwn Flemington Rd and Potts St	39,581
Btwn Potts St and Bridge Rd	39,581
Btwn Bridge Rd and Knight St	34,019
Btwn Knight St and George St	37,954
Btwn George St and Concord Rd	43,966
Btwn Concord Rd and M4 Interchange	27,881
Btwn M4 and Wentworth Rd	44,145
Btwn Wentworth Rd and Broughton St	45,732
Btwn Broughton St and Burwood Rd	44,224
Homebush Bay Drive – Northbound & Southbound	
Btwn Arthur St and M4 WB ON / OFF Ramps	12,0587
Btwn M4 WB ON / OFF Ramps and M4 EB OFF	73,035

Road / Section	AADT
Btwn M4 EB OFF and M4 EB ON	69,002
Btwn M4 EB ON and Underwood Rd	80,576
Concord Road / Leicester Ave – Northbound & Southbound	
South of Parramatta Rd	39,846
Concord Road – Northbound & Southbound	
Btwn Parramatta Rd and M4 WB ON Ramp	38,815
Btwn M4 WB ON Ramp and Sydney St	39,636
Btwn Sydney St and Patterson St	45,513
North of Patterson St	44,639
Sydney Street – Eastbound & Westbound	
West of Concord Rd	6,498

Appendix C

Noise and vibration impact maps

Figure C1	Author: RV/GH	1:12,000 at A3
Date: 04/07/2024	Approved by: RW	

To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

- Homebush Precinct
- Sensitive developments

Noise level (Leq dBA)

- 40
- 45
- 50
- 55
- 60

Homebush State-led Rezoning Project

Industrial noise impact predictions from Mason Park Substation and Ausgrid Homebush Depot

Figure C2	Author: RV/GH	0 150 300 450 600 m	
Date: 04/07/2024	Approved by: RW	1:12,000 at A3	
To be read in conjunction with WSP document:		PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report	

Legend

- Homebush Precinct
- Sensitive developments

Noise level (Leq dBA)

- 40
- 45
- 50
- 55

Homebush State-led Rezoning Project

Building services noise impact predictions

Figure C3	Author: RV/GH	0 150 300 450 600 m	
Date: 04/07/2024	Approved by: RW	1:12,000 at A3	

To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

- Homebush Precinct
- Sensitive developments

Noise level (Leq dBA)

- 40
- 45
- 50
- 55
- 60

Homebush State-led Rezoning Project

Entertainment noise impact predictions

Figure C4	Author: RV/GH	0 150 300 450 600 m	
Date: 04/07/2024	Approved by: RW	1:12,000 at A3	

To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

- Homebush Precinct
- Sensitive developments

Road Noise Impact Zones

- Low - Category 1 and 2
- Medium - Category 3 and 4
- High - Category 5 and 6

Homebush State-led Rezoning Project

Road noise impact zones

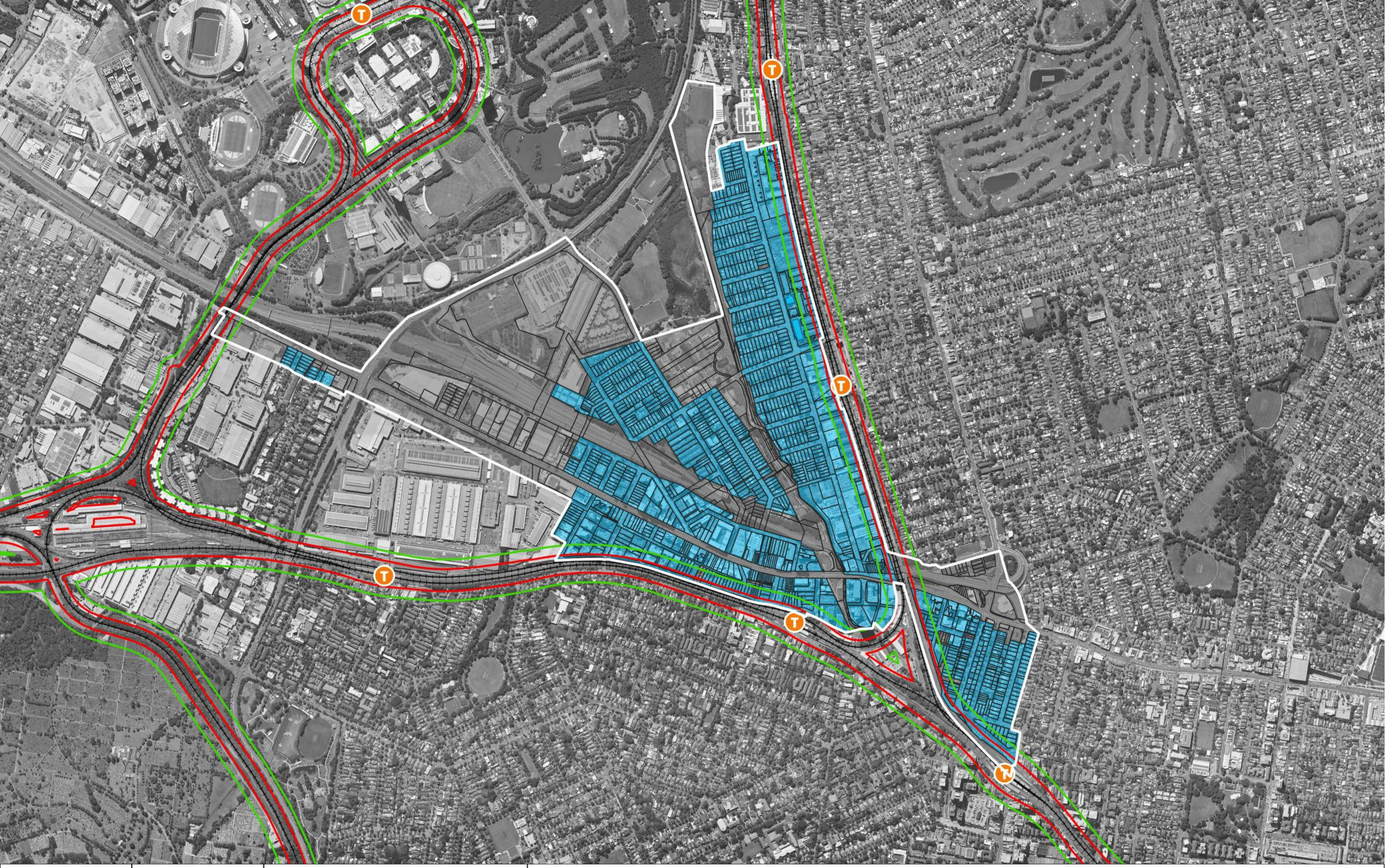


Figure C5	Author: RV/GH	0 150 300 450 600 m
Date: 04/07/2024	Approved by: RW	1:12,000 at A3

To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

- Homebush Precinct
- Sensitive developments
- Railway lines
- Railway station

Rail Noise Zones

- High - Zone A (25m)
- Low - Zone B (60m)

Homebush State-led Rezoning Project

Rail noise impact zones

Figure C6	Author: RV/GH	0 150 300 450 600 m	
Date: 04/07/2024	Approved by: RW	1:12,000 at A3	

To be read in conjunction with WSP document: PS210769-RW-NSW-ACO-REP- Final Acoustics Study Report

Legend

- Homebush Precinct
- Sensitive developments
- Railway lines
- Railway station

Rail Vibration Impact Zones

- High - For single residential dwe on hard ground (25m)
- High - For other sensitive buildir

Homebush State-led Rezoning Project

Rail vibration impact zones

wsp

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