MARSHALL DAY Acoustics

WATERLOO ESTATE (SOUTH)
ACOUSTIC REPORT

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Project: **WATERLOO ESTATE (SOUTH)**

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1.0 INTRODUCTION

A Planning Proposal has been prepared by Department of Planning, Industry and Environment (DPIE) for the redevelopment of the southern part of the Waterloo Estate, referred to as "Waterloo Estate (South)".

Marshall Day Acoustics Pty Ltd (MDA) has been retained by DPIE to undertake an acoustic review of the Waterloo Estate (South) Planning Proposal (the Planning Proposal).

This report provides an overview of the Planning Proposal, relevant noise assessment criteria and a high-level assessment and guidance for the control of noise on future development within the site.

In addition to the acoustic overview of the proposal a more detailed assessment has been undertaken for two areas highlighted for review by DPIE. These two areas are:

- The eastern most block of McEvoy Street, and the effect of removing or including in the design a building separating Mead Street from McEvoy Street; and
- The proposed built form near the southern pocket park between John and McEvoy Streets, and the effect of two built form options on the noise received in the park and surrounds.

Acoustic terminology used throughout this report is contained in Appendix A.

2.0 PROJECT DESCRIPTION

This section presents:

- A general description of the development site and surrounding land uses;
- A description of the proposed development; and
- A summary of potential acoustic impacts.

2.1 Location

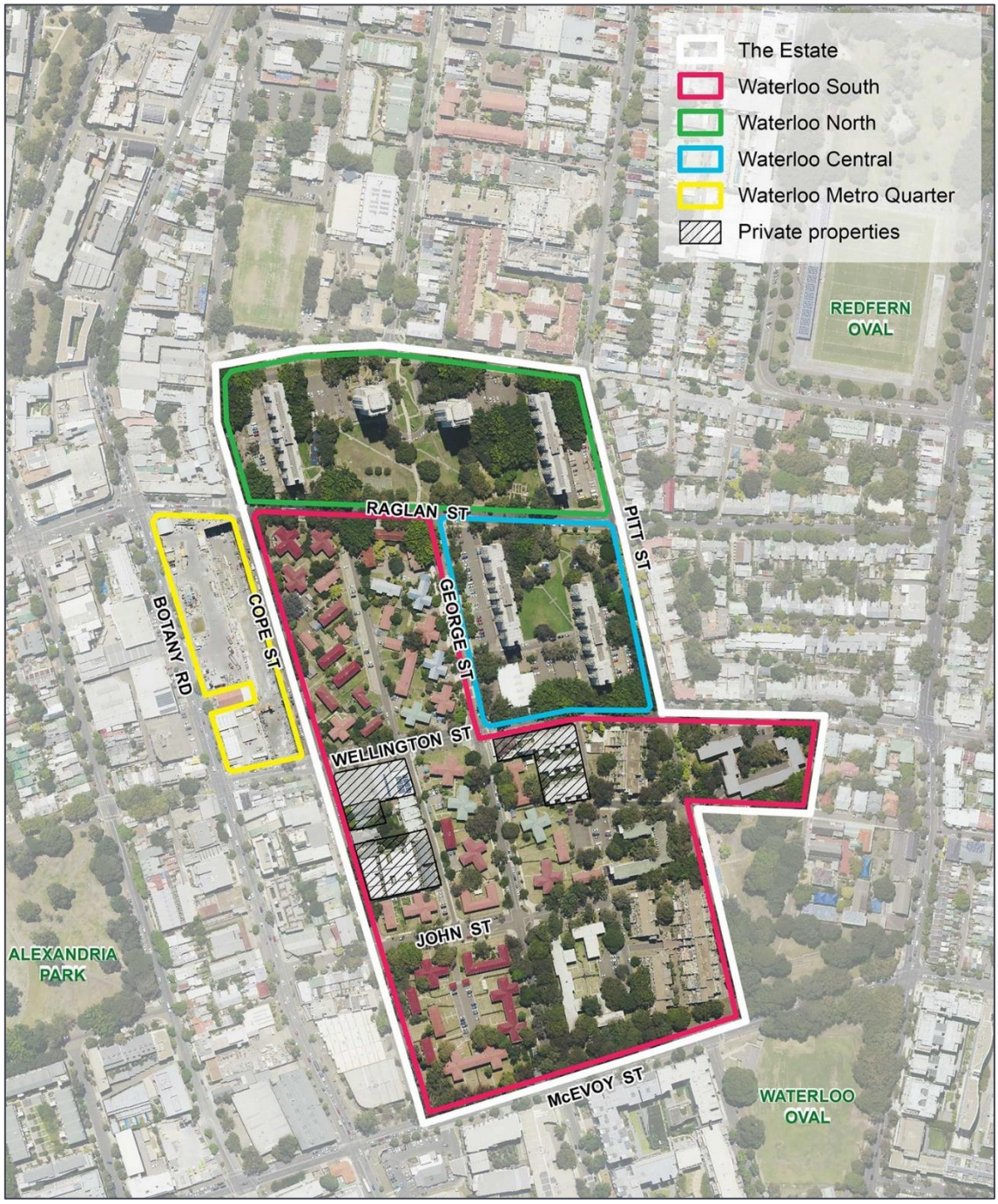
The site is south of the Sydney CBD, around 1.5 km south of Central Railway Station, in an urban area between the CBD and Sydney Airport.

The Waterloo Estate (South) development site is approximately 12.3 hectares (65 % of the total Waterloo Estate) as shown in Figure 1.

The extent of development site is bounded by the following:

- Raglan Street in the north;
- Cope Street in the west;
- McEvoy Street in the south; and
- Waterloo Park, Kellick Street, Gibson Street, Wellington Street and George Street to the east.

Figure 1: Site location (source: City of Sydney)



2.2 Proposed masterplan development

The Waterloo Estate (South) development site currently includes:

- 749 social housing units owned by NSW Land and Housing Corporation;
- 120 private units and houses; and
- some commercial properties.

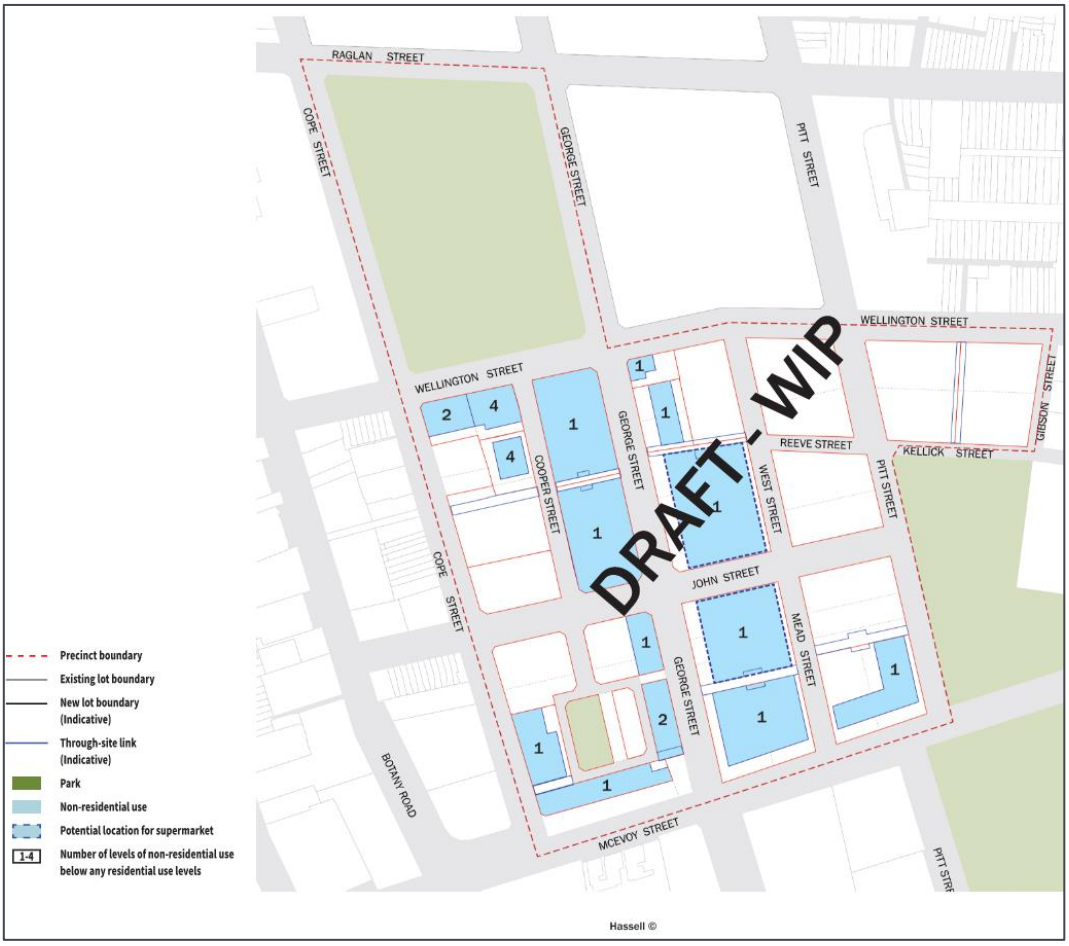
The Planning Proposal is to facilitate the redevelopment and renewal of the site into an integrated mixed-tenure community. The redevelopment involves replacing and providing social, affordable, and private market housing. The proposed mix is approximately 28 % social, 64 % market housing and 8 % affordable housing.

A copy of the masterplan is provided in Figure 2.

Figure 2: Development masterplan

The redevelopment also includes space for low impact businesses, shops and community facilities (refer blue areas in Figure 3), as well a large new park between Raglan, Cope, George and Wellington Streets, and other public spaces.

Figure 3: Development masterplan showing non-residential uses (Source: Hassell)



2.3 Acoustic impacts

The proposed development uses, being primarily residential with some low impact community/commercial facilities, are broadly similar to the current uses on the site. The overall acoustic character of the proposal and hence potential acoustic impacts on and to the site are broadly consistent with the existing uses.

Given the proximity of the site to the Sydney CBD, and urban nature of the surrounds, the site has potential impacts from a wide range of activities within the environment, summarised in the following sections.

2.3.1 Commercial and industrial existing activity

The precinct interfaces with existing industry and commercial areas, including along the interface with Cope Street and McEvoy Street. Impacts from these existing uses are discussed in a later section.

2.3.2 Commercial development within the precinct (future)

The Planning Proposal includes potential for commercial, community and other noise generating development. Such development may generate new noise, which will need to be addressed for impacts on the proposed development, as well as existing adjacent development.

2.3.3 Road traffic

The most significant impact is from the proposal's interface with McEvoy Street to the south. There are also lesser impacts from Raglan Street at the northern extent of the site. Assessment of impacts from road traffic noise are provided in later sections.

2.3.4 Aircraft

Aircraft overflights relating to Kingsford Smith Airport are audible on the site. A review of the relevant Australian Noise Exposure Forecast (ANEF) charts for Sydney-Kingsford Smith Airport indicates the site is outside areas requiring land use planning controls for aircraft noise. Accordingly, impacts from aircraft noise are expected to be limited with no specific requirements for the control of aircraft noise in accordance with Australian Standard *AS2021:2015 Acoustics Aircraft noise intrusion – Building siting and construction.*

2.3.5 Rail traffic

The north-western end of the development area is adjacent the Sydney Metro rail project, an underground rail line under construction between Chatswood and Sydenham. A review of the EIS noise paper[1] outlines a suite of management of the noise and vibration impacts associated with the rail project.

For construction, these include:

- Implementation of the Sydney Metro Construction Noise and Vibration Strategy to manage the potential noise impacts
- Feasible mitigation measures such as the use of 3 m to 6 m high perimeter noise walls or full enclosures of the noise-producing areas of the worksites (for night-time activities)
- Limiting night-time heavy vehicle movements
- Scheduling noisy activities adjacent work/school areas outside normal working hours

For operation, the project:

- Is to be designed to meet and trigger levels from the Rail Infrastructure Noise Guidelines.
- Stations and ancillary facilities including train breakout noise from draught relief shafts are to be designed to meet the applicable noise criteria outlined in the Noise Policy for Industry

The site is also over 350 m from the nearest heavy rail line, which is well beyond the distances (60 – 80 m) specified for assessment of impacts under the Department of Planning document *Development Near Rail Corridors and Busy Roads – Interim Guideline*. Accordingly, impacts from rail noise are expected to be limited, and are not further assessed in this report.

[1] Jacobs Group (Australia) Pty Limited, 2016, *Sydney Metro Chatswood to Sydenham Technical Paper 2: Noise and Vibration*, reference 610.14718R1

3.0 NOISE ASSESSMENT CRITERIA

The following sections outline relevant noise assessment criteria applicable to the proposed development based on the identified items in Section 2.3.

3.1 NSW legislation and guidelines

3.1.1 State Environment Planning Policy (Infrastructure) 2007 and Development near Rail Corridors and Busy Roads – Interim Guidelines

The *State Environmental Planning Policy (Infrastructure) 2007* (SEPP) applies to new development sites affected by roads with daily traffic more than 20,000 vehicles. Division 17 of the SEPP applies in instances where development for sensitive uses (including residential, place of worship, hospital, educational establishment or centre-based child care facility) is on land in or adjacent such a road corridor.

For residential accommodation, the SEPP requires that appropriate measures are taken to meet the design internal noise levels detailed in Table 1.

Table 1: SEPP – design internal noise level

Type of occupancy	Noise level, dB L_{Aeq}	Applicable time-period
Bedrooms	35	Night 10 pm to 7 am
Other habitable rooms (exc. garages, kitchens, bathrooms, hallways)	40	At any time

Guidance on the application of the SEPP is provided in the Department of Planning document *Development Near Rail Corridors and Busy Roads – Interim Guideline*. The Interim Guidelines require that *"If internal noise levels with windows or doors open exceed the criteria by more than 10 dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia"*. This triggers the need for alternative ventilation to be provided to receivers in some instances.

3.1.2 NSW EPA Road Noise Policy

The NSW EPA *Road Noise Policy* (RNP) aims to identify the strategies that address the issue of road traffic noise from the following:

- existing roads
- new road projects
- road redevelopment projects
- new traffic-generating developments.

The RNP also defines criteria to be used in assessing the impact of such noise.

The development could generate additional traffic and affect existing residential or other noise-sensitive land uses. Noise generated from this additional traffic would be assessed against the RNP. In practice the high levels of existing traffic in the vicinity (Botany Road, McEvoy Street etc) mean that additional traffic from the development is unlikely to result in appreciable noise impacts in the surrounds.

While not strictly applicable, the RNP provides guidance on design noise levels in outdoor recreation areas. In the absence of a specific policy, the design noise levels in the RNP for Open Spaces are referenced in this report, i.e. 60 dB $L_{Aeq,15hr}$ and 55 dB $L_{Aeq,15hr}$ for Active and Passive uses respectively.

3.1.3 NSW EPA Noise Policy for Industry

The NSW EPA *Noise Policy for Industry* (NPfI) is the guideline for assessing noise emissions from industrial facilities scheduled by the EPA in NSW. Whilst the NPfI is intended for the assessment of large industrial premises scheduled by the EPA, it is also referred by some Councils to assess smaller commercial developments.

The NPfI balances the need for industrial activity with the community's desire to minimise intrusive sounds. It sets assessment noise levels, consistent methods, and best practice measures to manage industrial noise, and is based on the latest scientific research regarding noise's health effects

The NPfI sets out a procedure where an industrial/commercial use can be assessed against a series of objective noise levels. The NPfI sets out the procedure to determine project noise trigger levels relevant to a particular industrial development. The project noise trigger level applies to existing noise-sensitive receivers and are derived from an analysis of the background noise environment and land use zoning information.

3.2 City of Sydney planning provisions

The Sydney Development Control Plan 2012 (DCP) applies to development where the City of Sydney Council and Central Sydney Planning Committee is the consent authority. DPIE have indicated this is not likely to be the case for the Waterloo Estate (South) and the DCP would therefore not apply. A specific Design Guide is to be developed for the site.

To provide acoustic design outcomes for the development consistent with surrounding areas, it is recommended that the acoustic provisions of the DCP (2012) be adopted into the Design Guide.

Section 4 of the DCP outlines a suite of development provisions and controls for future noise sensitive development. Residential development is to include acoustic measures to reduce the impact of noise from existing or planned external sources. Such sources include but are not limited to, busy roads, adjoining industry and live music venues.

The DCP development provisions and controls are detailed in Appendix C.

Where the City of Sydney Council is the relevant authority, it is common that standard consent conditions are applied to commercial development. In general, these require noise from commercial plant and industrial development to be consistent with the requirements of the NSW EPA Noise Policy for Industry but may also include Council specific requirements.

3.3 Summary of acoustic design goals for future development

The acoustic design requirements for future uses within the Waterloo Estate (South) site will be dependent on the type of development.

- Commercial development is to be designed to achieve the requirements of any standard consent condition applied by City of Sydney. This is likely to also include a requirement for compliance with the *Noise Policy for Industry* at existing and future noise sensitive uses
- Residential development on the site is to include acoustic measures to reduce the impact of noise from road traffic and adjoining commercial/industry. Development should be designed to achieve the City of Sydney DCP design levels, summarised in Table 2:

Table 2: Residential development design internal noise levels – general site

Type of occupancy	Closed windows and doors, dB $L_{Aeq,1hr}$	Open windows and doors, dB $L_{Aeq,1hr}$	Applicable time-period
Bedrooms	35	45	Night 10 pm to 7 am
Main living areas	45	55	At any time

- As the SEPP takes precedence over the DCP where impacts are from a road having an Average Annual Daily Traffic (AADT) more than 20,000 vehicles per day, then residential development adjoining must also include acoustic measures to reduce the impact of road noise, e.g. McEvoy Street. This is on the assumption that the AADT is greater than 20,000 on McEvoy Street at the time of development, which should be confirmed by a traffic engineer. Development is recommended to be designed to achieve the SEPP/Department of Planning Interim Guideline criteria, per the design levels in Table 3:

Table 3: Residential development design internal noise levels – McEvoy Road traffic impact only

Type of occupancy	Closed windows and doors, dB	Descriptor	Applicable time-period
Bedrooms	35	$L_{Aeq,9hr\ Night}$	Night 10 pm to 7 am
Main living areas	40	$L_{Aeq,15hr\ Day}$ or $L_{Aeq,9hr\ Night}$	At any time

If internal noise levels with windows or doors open exceed the criteria by more than 10 dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and to meet the ventilation requirements of the National Construction Code/Building Code of Australia.

- For outdoor recreation/open space areas the reference design noise levels are 60 dB $L_{Aeq,15hr}$ and 55 dB $L_{Aeq,15hr}$ for Active and Passive uses respectively.

4.0 ASSESSMENT OF PROPOSAL

4.1 Approach

A high level review of the proposed design has been undertaken, to assess the extent of potential acoustic impacts. A noise model of the site and surrounds has been prepared to guide this assessment and evaluation; the noise model is however not intended as a numerically detailed calculation and should not form the basis for future developers to design noise controls, but provides an indication of extent of impacts from local road traffic noise.

In addition to the acoustic overview of the Planning Proposal, a more detailed assessment has been undertaken for two areas highlighted for review by DPIE. These two areas are:

- The eastern most block of McEvoy Street, and the effect of removing or including in the design a building separating Mead Street from McEvoy Street; and
- The proposed built form near the southern pocket park between John and McEvoy Streets, and the effect of two built form options on the noise received in the park and surrounds.

4.2 Assumptions and modelling basis

Modelling of road traffic noise was undertaken in accordance with the Calculation of Road Traffic Noise (CoRTN) method, as recommended for use by the NSW RNP. The modelling was undertaken in SoundPLAN v8.2 environmental noise modelling software.

The noise model includes the following parameters:

- 50 % soft ground was assumed for ground effect attenuation;
- The traffic speed for the modelled carriageways was set to 50 km/h to reflect the signed speed limits;
- Terrain and building data for the site of interest was supplied by The Department of Planning, Industry and Environment;
- Terrain and building data for the surrounding area obtained from public available sources, Google Maps;

The traffic volumes used in this assessment are shown in Table 4, based on volumes contained in the traffic report (Jacobs, 2020) and traffic counts from the NSW Roads and Maritime Services. The 24-hour AADT has been derived based on the data in the traffic report, which provided peak 1-hour volumes only. It is recommended the validity of the assumed traffic volumes be confirmed by a traffic engineer.

Table 4: Traffic volumes and composition

Carriageway	Peak 1 hour	24-hour AADT	% Heavy vehicle
Botany Road	1,860	25,128	7
Wyndham Street	610	8,241	10
McEvoy Street	1,710	19,627	8
Elizabeth Street	1,970	32,492	8
Raglan Street	580	7,836	4

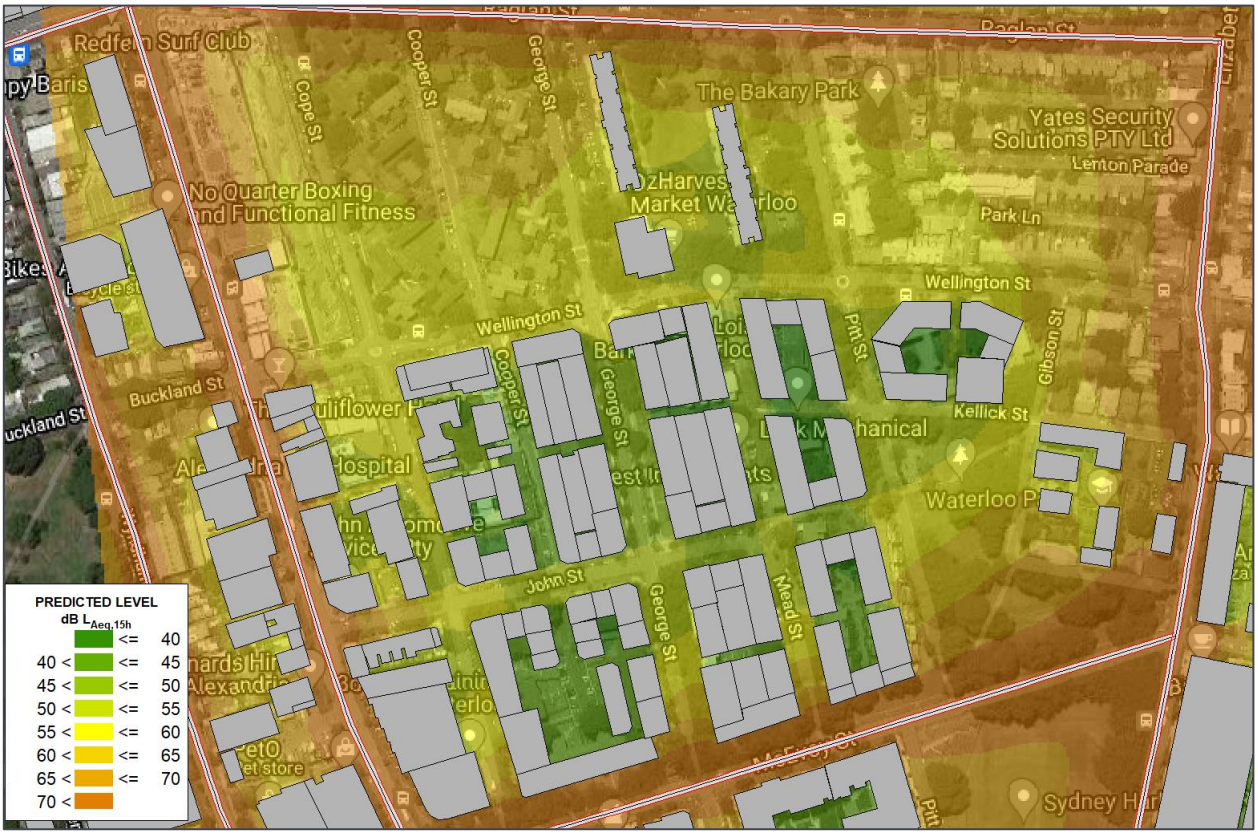
4.3 High-level site wide acoustic assessment

4.3.1 Road traffic

The site is bounded and in the vicinity of roads carrying significant volumes of road traffic. The most significant impact is from the proposal's interface with McEvoy Street to the south. There are also lesser impacts from Raglan Street at the northern extent of the site.

An overview of potential site road traffic noise levels is shown in Figure 4. As noted above, the model is not intended as a detailed exact representation of actual road traffic noise levels, but provides an indication of extent of impacts from local road traffic noise.

Figure 4: Daytime traffic noise levels across site (indicative only), dB $L_{Aeq,15hr}$



Road traffic noise levels from McEvoy Street are in the order of 65-70 dB $L_{Aeq,15hr}$ at the building facade closest to the road. These levels will trigger the need for acoustic upgrades to these façades. The noise impacts reduce as the receiver location moves further into the site. Dwellings within 80 m of McEvoy Street will need to be assessed at development stage to determine required facade acoustic performance and the need for alternative ventilation.

Road traffic noise from Pitt Street, Cope Street and other internal roads are anticipated to be minimal given the low levels of observed traffic. Impacts from busier but further removed roads including Botany Road, Wyndham Street and Elizabeth Street are also expected to be low due to the distance from the site and intervening shielding from buildings.

Traffic noise impacts have been considered on the proposed Village Green area in the north of the precinct, bounded by Raglan, George, Cope and Wellington Streets. The indicative noise modelling shows noise impacts on the western side of the Village Green from Botany Road, as there are no buildings screening Botany Road noise during the construction of the Waterloo Metro Station and Waterloo Metro Quarter. Upon completion of the Metro Station precinct, noise impacts from Botany Road are expected to be reduced.

Ultimately, noise levels on areas adjacent the George, Cope and Wellington Street frontages will generally be low, due to the low expected traffic volumes, and suitable for either active or passive recreation designation. Road traffic noise on the northern edge of the Village Green, adjacent Raglan Street may be higher, in the order of 65 dB $L_{Aeq,15hr}$ at 20 m from Raglan Street.

The NSW EPA RNP reference assessment levels of 60 dB $L_{Aeq,15hr}$ and 55 dB $L_{Aeq,15hr}$ for active and passive use (respectively) open space. On this basis the planning of utilisation within the park should prioritise the southern areas of the Village Green for more passive uses, including contemplative activities, and the northern end for more active uses which are less sensitive to ambient noise.

4.3.2 Existing industrial and commercial development

The precinct interfaces with existing industry and commercial areas. These include:

- Cope Street interface: commercial buffer to Botany Road. With a mix of residential and commercial developments. There may be existing mechanical plant impacts and commercial noise breakout etc.
- McEvoy Street between Botany Road & George Street: includes 24-hour fast-food restaurant and licensed premises and other commercial buildings.

There are potential noise impacts from existing commercial premises. However, given the existing residential uses on the development site the commercial premises should have been designed to comply with environmental noise requirements at these boundaries already. Potential impacts should be confirmed at development stage, but they are expected to generally be minor.

4.4 Assessment of easternmost block of McEvoy Street

This section assesses the easternmost block of McEvoy Street (i.e. between George and Pitt Streets), including potential acoustic impacts that may result from the removal of built form at the end of Mead Street. Specifically, the proposal seeks to remove sections of the lower portion of buildings on McEvoy Street, and fill or partially fill sections, refer Figure 5.

Figure 5: Proposed changes to easternmost block of McEvoy Street

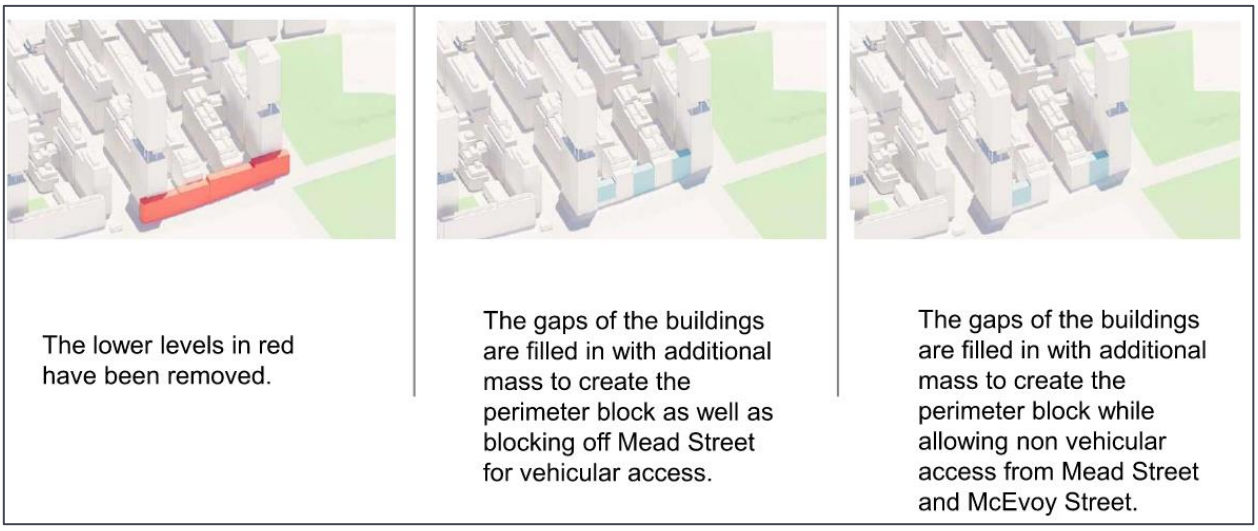


Figure 6 shows the indicative road traffic noise levels for the proposal, and the impact associated with the two (2) schemes. The result shows for the partial fill scheme, i.e. 'opening' Mead Street at the McEvoy Street end, an increase in road traffic noise levels on Mead Street

Figure 6: Indicative road traffic noise levels - easternmost block of McEvoy Street, dB $L_{Aeq,9hr\ Night}$

Filled sections	Partially filled sections
	

Figure 7 shows the relative change in road traffic noise levels for the two (2) schemes. With the partially filled arrangement, road traffic noise levels are expected to be more than 10 dB higher at the respective facades of buildings (east/west) fronting Mead Street.

Figure 7: Relative change in noise levels - easternmost block of McEvoy Street

Noise levels external the buildings (east/west facades) fronting Mead Street may therefore be at a level where windows to bedrooms would need to be closed to achieve relevant internal noise levels and/or additional sound insulation treatment would likely be required. With a requirement for windows to be closed, there is likely the need to provide mechanical ventilation.

Noise levels at ground level within the confines of Mead Street itself, for example if the road reserve were to be used as a park/green space, would also be affected.

With the partially filled scheme, levels in this space would be above 55 dB $L_{Aeq,15hr}$ for the first section of the block, to around 80 m from McEvoy Street.

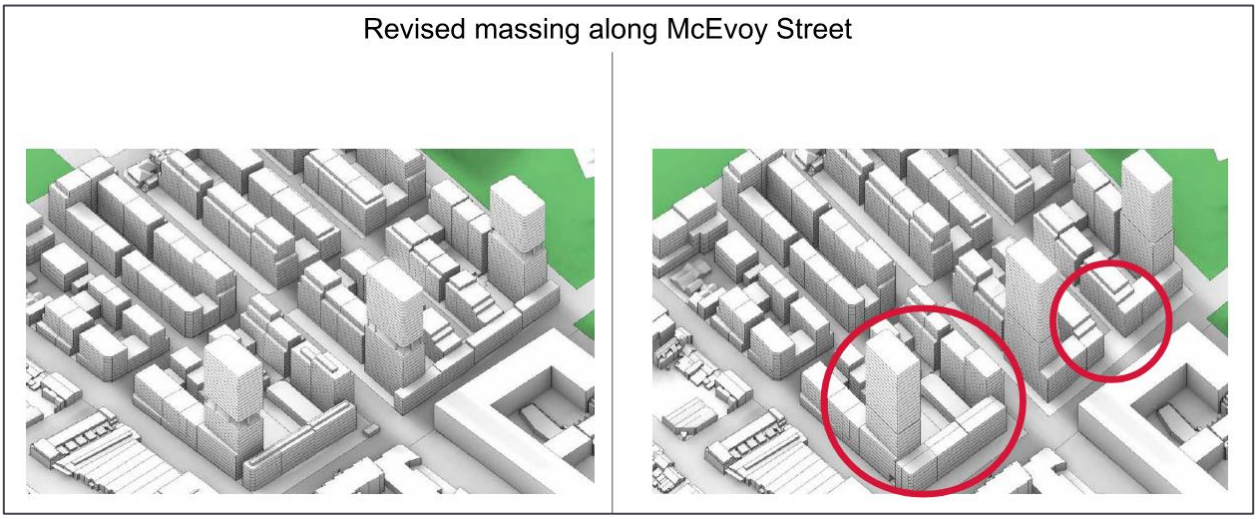
With the filled section scenario, noise levels in the Mead Street reserve would be below the 55 dB $L_{Aeq,15hr}$ design level for passive use open space.

Although the proposed change indicates a relative increase in noise, the road traffic noise levels are such that for either option, the buildings can be designed to achieve the design internal noise requirements discussed earlier. This is expected to need to occur at the detailed design stage of the development regardless of the option pursued.

4.5 Assessment of built form on southern pocket park

This section assesses the potential impacts resulting from the proposed built form changes on the southern pocket part (i.e. between John and McEvoy Streets). Specifically, the proposal seeks to increase built form in the southern building fronting McEvoy Street, refer Figure 8.

Figure 8: Proposed changes to built form on the southern pocket part (between John and McEvoy Streets)



There is negligible difference from an acoustic impact point of view for the two (2) options.

It is noted that any additional sensitive uses on the facades fronting Cope Street and George Street (corner McEvoy Street) as a result of the change, would need to incorporate a similar level of acoustic treatment to that provided to other sensitive uses.

5.0 FURTHER RECOMMENDATIONS

The following sections describe recommendations for the control of noise associated with the proposal, specifically options for mitigating road traffic noise and considerations for the control of commercial/industrial noise.

The extent of and design of any acoustic treatment should be undertaken by an appropriately qualified acoustic consultant, with consideration of any specific detailed requirements.

5.1 Road traffic noise mitigation

5.1.1 Design and layout

Locating noise-sensitive rooms such as bedrooms as far as practical or shielded from the road corridor can assist in reducing the requirement for providing increased sound insulation of the facade. Some other design and layout examples to reduce road traffic noise include the following:

- Use the built form to shield outdoor living areas such as courtyards
- Heavy, non-porous facade materials such as brick provide better noise insulation relative to lightweight materials
- Minimise the number of doors and windows on the side(s) of the noise-sensitive rooms exposed to noise
  - Provide solid core doors with noise seals
  - Provide thick laminated glass or double glazing for windows or glass doors exposed to the road
  - As glazing is typically the acoustically-weakest element of the facade, reducing glazed areas for noise-sensitive rooms facades that face the road can also assist in reducing the extent of upgraded glazing required

5.1.2 Built form

Other mitigation includes provision or requirement to include upgraded building facade and roof-ceiling constructions that incorporate sufficient sound insulation to achieve the relevant internal design levels.

Sensitive uses in areas fronting McEvoy Street are likely to require windows to be closed to achieve relevant internal design noise levels, and hence alternative ventilation. In addition, treatment such as thicker, laminate or double glazed window systems and increased thickness plasterboard ceiling linings may be required.

It is noted that this is a very high level assessment of the indicative sound insulation that may be required. Developers would need to carry out their own detailed design and assessments to confirm the extent of upgraded building facade and roof-ceiling constructions.

5.1.3 Local road traffic

Strategies to minimise noise from traffic associated with the development should be considered and implemented where appropriate.

Mitigation that is implemented should be applied to the location along the public road from the development to the location where road traffic noise levels from the development are contained within the existing road traffic noise levels.

Examples include the appropriate location of private access roads, regulating times of use/clustering vehicle movements from commercial uses, and using barriers and acoustic treatments.

5.2 Commercial development

5.2.1 Interface with existing commercial

Existing residential uses on the site already interface with commercial uses. it is therefore expected that controls are already in place on the noise emitter (i.e. commercial). It is however recommended that commercial noise is still assessed in detail, primarily in instances where building footprints/heights etc. may change, thus bringing sensitive uses closer to the interface.

There is a section bounded by Cope, John, Cooper and Wellington Streets that currently has some commercial development that may be for residential use under the planning proposal. Where this is the case this new interface may require specific assessment at development stage. This is to address any existing commercial noise impacts that would have been designed for the exiting commercial receivers, with a less stringent criteria than would apply for the new residential receivers.

5.2.2 Future commercial/community uses

The extent of non-residential uses associated with the proposal are limited and the final design yet to be confirmed. Noise impacts from such uses and the extent of any treatment would need to be considered on a case by case. However, noise from future development is recommended to comply with policies and guidelines set out earlier in this report, noting that the requirements may vary depending on the planning pathway. An example planning condition that may apply to commercial development is provided below for information.

Example planning conditions

> *Noise from commercial plant and industrial development must not exceed a project amenity/intrusiveness noise level or maximum noise level in accordance with relevant requirements of the NSW EPA Noise Policy for Industry 2017 (NPfI). Further:*
>
> > *(i) Background noise monitoring must be carried out in accordance with the long-term methodology in Fact Sheet B of the NPfI unless otherwise agreed by the City's Area Planning Manager.*
> >
> > *(ii) Commercial plant is limited to heating, ventilation, air conditioning, refrigeration and energy generation equipment*
>
> *If further controls or more stringent requirements on control of environmental noise are deemed appropriate, then the following additional condition can be considered:*
>
> *The noise level (LAeq,15 minute) emitted from the development must not exceed the background noise level (LA90, 15 minute) by more than 3dB when assessed inside any habitable room of any affected residence or noise sensitive commercial premises at any time. Further:*
>
> > *(i) The noise level and the background noise level shall both be measured with all external doors and windows of the affected residence closed.*
> >
> > *(ii) Background noise measurements must not include noise from the development but may include noise from necessary ventilation at the affected premise.*

APPENDIX A GLOSSARY OF TERMINOLOGY

Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
dB	Decibel. The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 μPa i.e. dB = 20 x log(P/Pr)
L_{A90}	The A-weighted noise level exceeded for 90% of the measurement period, measured in dB. This is commonly referred to as the background noise level.
$L_{Aeq\,(t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 hr) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.

APPENDIX B LAND ZONING

APPENDIX C SYDNEY DEVELOPMENT CONTROL PLAN 2012 - SECTION 4

C1 4.2.3.11 Acoustic privacy

(1) A Noise Impact Assessment prepared by a suitably qualified acoustic consultant may be required when submitting a development application for commercial and retail uses which may affect the acoustic privacy of the adjacent residential use.

(2) Where necessary, a residential development is to include acoustic measures to reduce the impact of noise from existing or planned external sources (for example busy roads, adjoining industries, live music venues and public parks and plazas in which people may congregate or host live music or events).

(3) Development is to incorporate measures that reduce the entry of noise from external sources into dwellings.

(4) Where possible, the attenuation of noise at its source is preferred. Where this option is adopted, the applicant will need to demonstrate that the measures to be undertaken:

(a) have the consent of relevant parties associated with that noise source; and

(b) last for the life of the development proposal.

(7) The repeatable maximum LAeq (1 hour) for residential buildings and serviced apartments must not exceed the following levels:

(a) for closed windows and doors:

(i) 35dB for bedrooms (10pm-7am); and

(ii) 45dB for main living areas (24 hours).

(b) for open windows and doors:

(i) 45dB for bedrooms (10pm-7am); and

(ii) 55dB for main living areas (24 hours).

(8) Where natural ventilation of a room cannot be achieved, the repeatable maximum LAeq (1hour) level in a dwelling when doors and windows are shut and air conditioning is operating must not exceed:

(a) 38dB for bedrooms (10pm-7am); and

(b) 48dB for main living areas (24 hours).

(9) These levels are to include the combined measured level of noise from both external sources and the ventilation system operating normally.

(10) To limit the transmission of noise to and between dwellings, all floors are to have a weighted standardised impact sound level (L'nT,w) less than or equal to 55 where the floor separates a habitable room and another habitable room, bathroom, toilet, laundry, kitchen, plant room, stairway, public corridor, hallway and the like.

(11) The overall design and layout of dwellings, where appropriate, is to include:

(a) a limit on window size and number where oriented towards an intrusive noise source;

(b) seals at entry doors to reduce noise transmission from common corridors or outside the building;

(c) minimisation of the number of shared walls with other dwelling units;

(d) storage, circulation areas, and non habitable rooms to buffer noise from external sources;

(e) double or acoustic glazing; and

(f) operable acoustic screens to balconies.

(12) Mixed-use development which includes two or more dwellings is to provide separate lift access and a separate entrance for use exclusively for the dwellings.

C2 4.2.5.3 Development on busy roads and active frontages

The following provisions apply to, sensitive uses on sites that are to have an active frontage as shown on the Active frontages map, or sites with a frontage to a busy road that carries more than 20,000 vehicles a day. Sensitive uses include:

- *buildings for residential use (including mixed use buildings);*
- *places of public worship;*
- *hospitals; and*
- *educational establishments or childcare centres*

Noise and air quality mitigation measures are required for new developments along road corridors carrying more than 20,000 Annual Average Daily Traffic.

…

These provisions also provide a design solution to achieve acceptable amenity for residential uses that may be affected by noise from busy roads and active uses.

Applicants proposing development on busy roads should also refer to State Environment Planning Policy (Infrastructure) 2007 and the NSW Government's Development near Rail Corridors and Busy Roads – Interim Guidelines which includes design guidelines and requirements to manage the impacts from road and rail noise and vibration.

Objectives

(a) Mitigate the impacts of noise for sensitive uses located along busy road corridors.

(b) Ensure visual privacy for residential dwellings when viewed from the adjacent public domain.

(c) Ensure acoustic amenity for sensitive uses by attenuating noise from external sources.

(d) Ensure reasonable internal daylight levels within sensitive uses.

Provisions

(1) Where sensitive uses are proposed, council may require an Acoustic Assessment prepared with reference to NSW Government's Development near Rail Corridors and Busy Roads – Interim Guidelines.

(2) Where sensitive uses are proposed, development is to be appropriately designed to minimise the impact of road noise and vibration.

APPENDIX D RECOMMENDATIONS FOR INCLUSION IN DESIGN GUIDE

D1 Residential development

Designed to meet relevant standards, including but not limited to:

- *State Environmental Planning Policy (Infrastructure) 2007* for development adjacent a road having an Average Annual Daily Traffic (AADT) more than 20,000 vehicles per day
- NSW *Development near Rail Corridors and Busy Roads – Interim Guidelines*
- City of Sydney development provisions (where applicable)

Residential development on the site, except where adjacent a road having an Average Annual Daily Traffic (AADT) more than 20,000 vehicles per day (e.g. McEvoy Street), should be designed to achieve the design levels in Table D1:

Table D1: Residential development design internal noise levels – general site

Type of occupancy	Closed windows and doors, dB $L_{Aeq,1hr}$	Open windows and doors, dB $L_{Aeq,1hr}$	Applicable time-period
Bedrooms	35	45	Night 10 pm to 7 am
Main living areas	45	55	At any time

Residential development adjacent a road having an Average Annual Daily Traffic (AADT) more than 20,000 vehicles per day (e.g. McEvoy Street) is to be designed to achieve the *State Environmental Planning Policy (Infrastructure) 2007*/Department of Planning Interim Guideline criteria, per the design levels in Table D2:

Table D2: Residential development design internal noise levels – development adjacent roads with Average Annual Daily Traffic (AADT) more than 20,000 vehicles

Type of occupancy	Closed windows and doors, dB	Descriptor	Applicable time-period
Bedrooms	35	$L_{Aeq,9hr\ Night}$	Night 10 pm to 7 am
Main living areas	40	$L_{Aeq,15hr\ Day}$ or $L_{Aeq,9hr\ Night}$	At any time

For these dwellings, if internal noise levels with windows or doors open exceed the criteria by more than 10 dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and to meet the ventilation requirements of the National Construction Code/Building Code of Australia.

For development adjacent high traffic volume roads, general principles apply:

- Where possible locate noise-sensitive rooms such as bedrooms at the rear or as far as possible from the road
- Heavy, non-porous facade materials provide better sound insulation relative to lightweight materials
- Minimise the number of doors and windows on the side(s) of the noise-sensitive rooms exposed to noise
- Windows are likely required to be closed to achieve relevant internal design noise levels, and hence alternative ventilation will be required

Other general principles apply

- Residential development is to include acoustic measures to reduce the impact of noise from existing or planned external sources, including but not limited to busy roads, adjoining industries, live music venues and public parks and plazas in which people may congregate or host live music or events

D2 Commercial development

Noise associated with new commercial development, will need to be designed to meet relevant environmental standards, including but not limited to:

- NSW EPA *Noise Policy for Industry*
- NSW EPA *Road Noise Policy*
- City of Sydney development provisions (where applicable)