Cope Sensitive Freight

Noise and Vibration Impact Assessment

Prepared for HBB Property

December 2024

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HBB Property

E230790 RP1

December 2024

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1 Introduction

1.1 Project context and overview

The COPE Sensitive Freight development application is seeking approval to construct a warehouse and distribution building on 221-227 Luddenham Road, Orchard Hills (the site), situated within the Alspec Industrial Business Park (AIBP) at 221-235 Luddenham Road, Orchard Hills.

The AIBP Planning Proposal was lodged to Penrith City Council (PCC) in December 2022 and is expected to be finalised in February 2024. The AIBP Planning Proposal amended the Penrith Local Environmental Plan (PLEP) 2010 through rezoning the central and eastern portions of the AIBP site to E4 General Industrial which permits the development and operation of warehouse and distribution uses.

The COPE project area is situated within the western portion of the AIBP site and has a direct interface with an electrical easement to the north-west, and two future basins along the northern and western boundaries of the site. The proposed development has a direct interface with the north-south internal local road, which provides access to Patons Lane and Luddenham Road.

The construction and operational noise impact assessments prepared by EMM Consulting Pty Limited for the AIBP Planning Proposal identified that further assessment and mitigation of operational and road traffic noise from individual lots was required to ensure compliance with applicable noise limits.

1.2 Purpose of this report

This NVIA report documents the existing acoustical environment; applicable noise and vibration objectives; noise modelling methodology and assumptions; and assessment of predicted noise emissions from site operations against relevant objectives.

The NVIA report has been prepared in general accordance with the following relevant guidelines and policies:

- NSW Environment Protection Authority (EPA) 2017, Noise Policy for Industry (NPfI)
- NSW Department of Environment and Climate Change (DECC) 2009, Interim Construction Noise Guideline (ICNG)
- NSW Department of Environment, Climate Change and Water (DECCW) 2011, Road Noise Policy (RNP)
- Department of Environment and Conservation NSW 2006, Assessing Vibration: a Technical Guideline.

2 Project and site description

2.1 Site location

The site is located at 221-235 Luddenham Road, Orchard Hills, NSW within the AIBP. The Masterplan for AIBP detailing the location of the Project is shown in Figure 2.1.

The proposed site and adjacent allotments are located within the Penrith City Council local government area (LGA). The site is zoned E4 General Industrial.

2.2 Previous assessments

EMM has undertaken the following assessments for the AlBP based on an indicative site masterplan:

- Masterplan operational and traffic noise impact assessment (EMM report J200388 RP1_V6) - March 2022
- Construction Noise and Vibration Impact Assessment (EMM report E230636 RP2) - July 2023.
- Masterplan operational and traffic noise impact assessment (EMM report E230918_RP2_AlspecMasterplanNIA_V3- December 2024

The assessment completed in December 2024 was an update to the operational noise impact assessment completed in March 2022 based on an updated masterplan and final ground contours from the site bulk earthworks plan.

2.3 Details of the proposed development

COPE Sensitive Freight plans to construct and operate a cross-dock and warehouse storage distribution centre. The distribution centre will operate 24 hours a day, 7 days a week. The facility will include a warehouse, hardstand area, office space and amenities. A proposed site plan is shown in Figure 2.2.

2.3.1 Onsite vehicle movements and freight handling

Noise generating activities on site are expected to include on-site vehicle movements and the handling of freight. Heavy vehicle movements have been provided by Arcadis based on information provided by COPE.

Table 2.1 provides a summary of traffic data used for the operational noise assessment. It includes total daily heavy vehicle (HV) movements, peak hour heavy vehicle movements and an assumed worst case 15-minute period used for assessment of noise impact (i.e. half of the peak hourly movements).

Table 2.1 Cope sensitive freight estimated heavy vehicle numbers

Period	Total daily HV movements per period	Peak hour	Peak hour HV movements	Worst case 15 min HV movements
Lot 4 – Cope Sensitive freight				
Morning shoulder	23	06:00 – 07:00	18	9
Day	144	07:00 – 08:00	47	24
Evening	15	18:00 – 19:00	13	7
Night	8	22:00 – 23:00	4	2

1. Average movements per site, assuming AIBP masterplan total movements are evenly distributed between 10 large warehouses. This average has been used for all large warehouses where no specific data has been provided.
2. Morning shoulder is 5am to 7am, Day 7 am to 6 pm; Evening 6 pm to 10 pm; Night 10 pm to 5 am.

Electric forklifts are expected to be the primary means of handling freight and will operate inside the warehouse and on the hardstand area. There is expected to only occasionally be the requirement for the use of a gas-powered forklift or Franna crane.

No regular maintenance activities are expected to occur on site.

2.3.2 Operational hours and hardstand usage

The site will operate 24 hours per day, 7 days a week. Site amenities will be designed to accommodate up to 221 people including drivers, warehouse staff, office staff and visitors.

The facility has up to 90 loading docks each with highly specialised usage. While the facility will operate 24 hours a day, the majority of heavy vehicle movements are expected to occur during the day period (i.e. generally 7am to 6pm) as shown in Table 2.1.

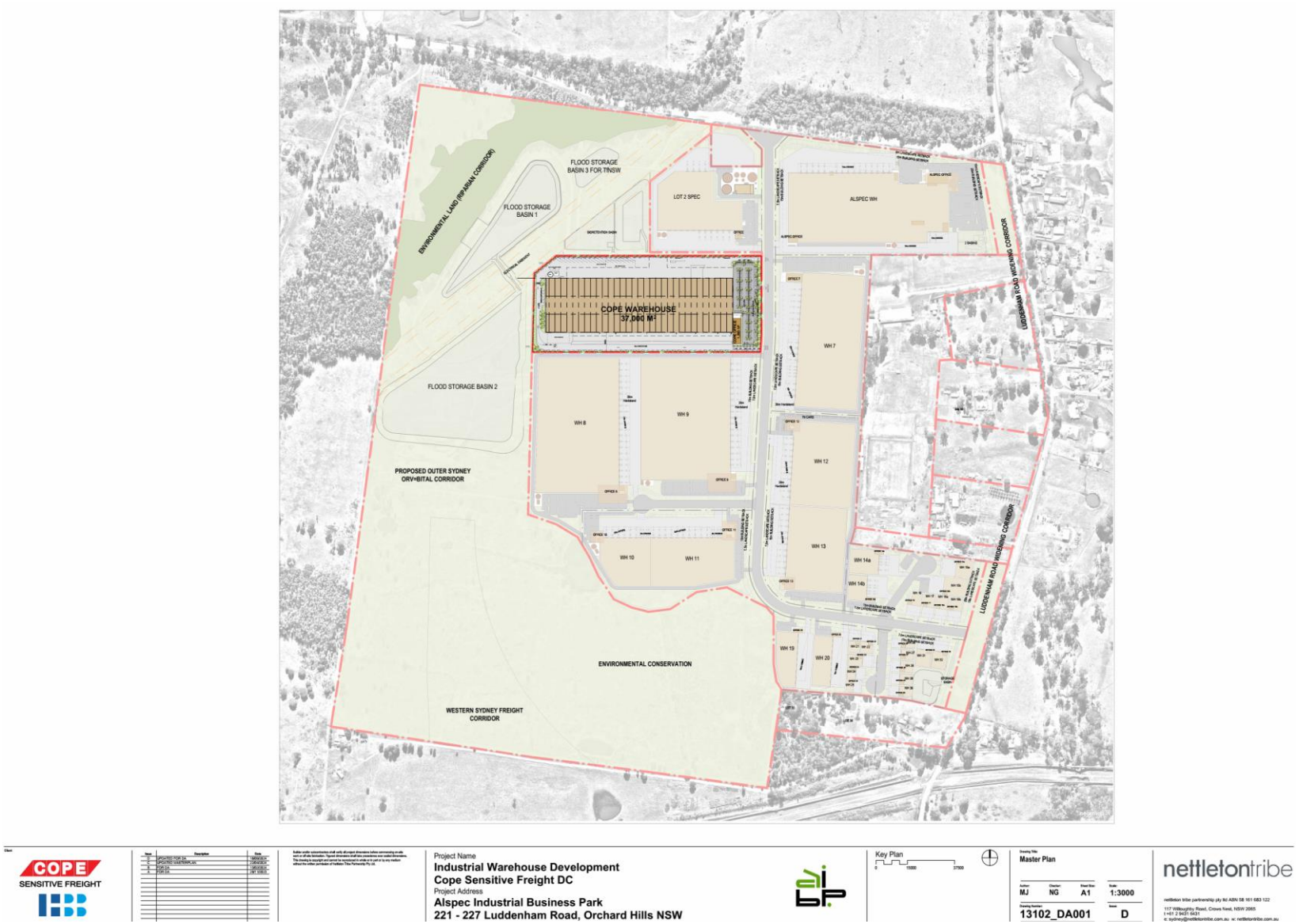


Figure 2.1 AIBC layout and site location

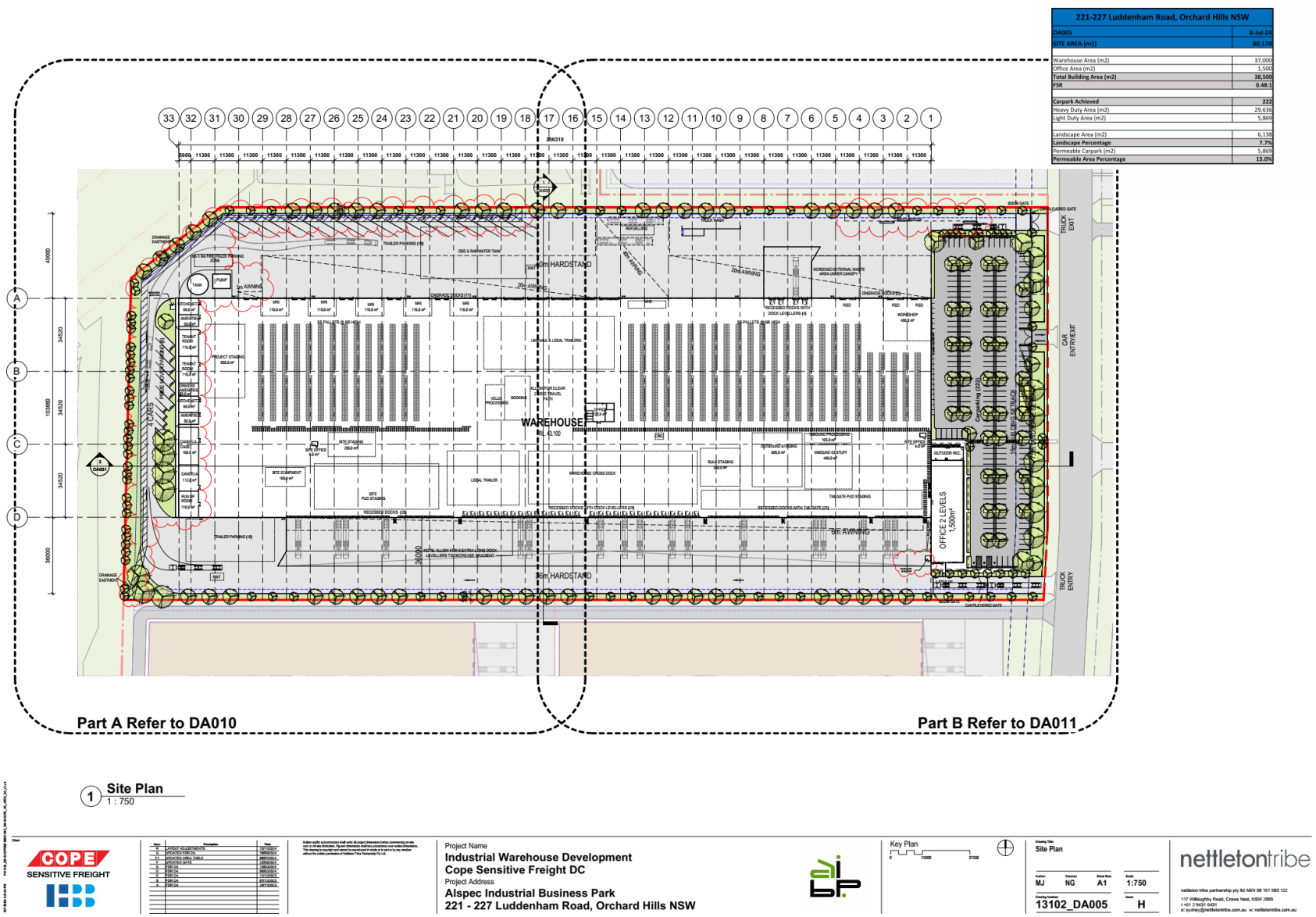


Figure 2.2 Proposed site plan

2.4 Assessment locations

Noise assessment locations were considered as part of the AIBP masterplan. These locations are considered suitable for assessment of noise impacts from this project. Off site assessment locations that could potentially experience noise from the development have been separated into three noise catchment areas (NCAs). These have been derived based on noise environments and are discussed as follows:

- NCA1 represents residential assessment locations on the eastern side of Luddenham Road. The dwelling façades face the development and Luddenham Road; they are exposed to existing road traffic noise.
- NCA2 represents residential assessment locations on the western side of Luddenham Road. These properties are all set back from Luddenham Road and would be expected to experience lower noise from existing road traffic which is consistent with noise monitoring conducted at the site. It is noted that these residential properties have been included in the precinct structure plan and rezoned to E4 General Industrial.
- NCA3 represents remote assessment locations which are well removed from Luddenham Road.

Noise sensitive uses which have been addressed in this report include the assessment locations provided in Table 2.2 and are shown in Figure 3.1.

Table 2.2 Assessment locations

Noise catchment area	Assessment location ID	Address	MGA 56 coordinate		Land use
			Easting	Northing	
NCA1	R1	182 Luddenham Road, Orchard Hills	292707	6255864	Residential
NCA1	R2	202 Luddenham Road, Orchard Hills	292718	6255742	Residential
NCA1	R3	212 Luddenham Road, Orchard Hills	292729	6255685	Residential
NCA1	R4	216 Luddenham Road, Orchard Hills	292737	6255636	Residential
NCA1	R5	222 Luddenham Road, Orchard Hills	292745	6255592	Residential
NCA1	R6	226 Luddenham Road, Orchard Hills	292752	6255550	Residential
NCA1	R7	230 Luddenham Road, Orchard Hills	292760	6255500	Residential
NCA1	R8	236 Luddenham Road, Orchard Hills	292768	6255452	Residential
NCA1	R9	240 Luddenham Road, Orchard Hills	292782	6255398	Residential
NCA1	R10	246 Luddenham Road, Orchard Hills	292786	6255352	Residential
NCA1	R11	250 Luddenham Road, Orchard Hills	292797	6255301	Residential
NCA1	R12	256 Luddenham Road, Orchard Hills	292804	6255252	Residential
NCA1	R13	262 Luddenham Road, Orchard Hills	292802	6255208	Residential
NCA1	R14	268 Luddenham Road, Orchard Hills	292750	6255017	Residential
NCA1	R21	320 Luddenham Road, Orchard Hills	292641	6254644	Residential
NCA2	R15	229 Luddenham Road, Orchard Hills	292458	6255431	Active recreation
NCA2	R16	233 Luddenham Road, Orchard Hills	292603	6255351	Residential
NCA2	R17	251 Luddenham Road, Orchard Hills	292575	6255258	Residential
NCA2	R18	275 Luddenham Road, Orchard Hills	292561	6255025	Residential
NCA2	R19	287 Luddenham Road Orchard Hills	292552	6254987	Residential
NCA2	R20	319 Luddenham Road, Orchard Hills	292377	6254700	Residential
NCA2	R22	339 Luddenham Road, Orchard Hills	292428	6254440	Residential
NCA3	R23	405 Luddenham Road, Orchard Hills	291959	6254260	Residential
NCA3	R24	327 Luddenham Road, Orchard Hills	291497	6254625	Residential

HBB Property entered into a sales agreement for the residential dwelling at R19 (287 Luddenham Road). This dwelling is the closest receiver to the project and adjoins a future driveway to the development. The dwelling is expected to be vacated prior to construction works being undertaken.

3 Existing environment

Noise monitoring was conducted to establish the existing prevailing noise environment at the proposed development site. Four unattended noise loggers were deployed on the site at locations representative of the acoustic environment at the nearest assessment locations close to Luddenham Road and at locations representative of receivers further removed from Luddenham Road.

3.1 Measurement equipment and locations

Noise monitoring was carried out using three Acoustic Research Labs (ARL) NGARA environmental noise loggers and one Svantek 979 environmental noise logger. The details of each noise monitoring location are provided in Table 3.1 and illustrated on Figure 3.1.

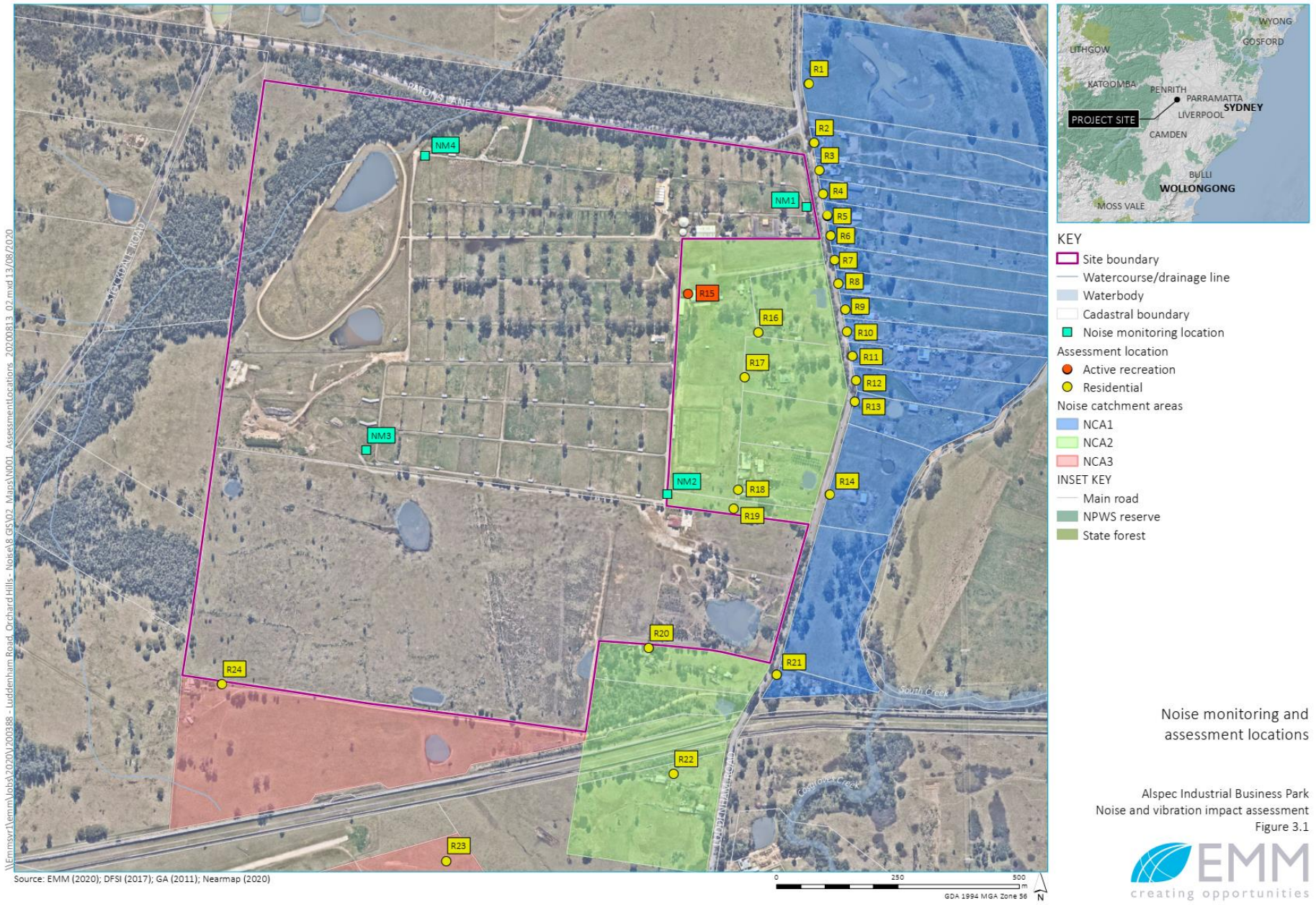
Table 3.1 Monitoring locations

Monitor ID	Equipment type and serial number	Period of measurement (2020)	Monitor location		
			Address	Easting (MGA)	Northing (MGA)
NM1	Svantek 979, 21095	24 July to 4 August	221-227 Luddenham Road, Orchard Hills	292703	6255625
NM2	ARL NGARA, 878125	1 July to 13 July	221-227 Luddenham Road, Orchard Hills	292376	6254999
NM3	ARL NGARA, 878123	1 July to 13 July	221-227 Luddenham Road, Orchard Hills	291825	6255085
NM4	ARL NGARA, 878138	1 July to 13 July	221-227 Luddenham Road, Orchard Hills	291902	6255708

Loggers were programmed to record statistical noise level indices continuously in 15 minute intervals in accordance with the requirements of the NPfI, including the L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and the L_{Aeq}. Calibration of all instrumentation was checked prior to and following measurements. All equipment had current NATA (or manufacturer) calibration status.

3.2 Weather affected noise data

Weather data for the survey period was obtained from the BOM weather station at Badgerys Creek (ID 067108). Wind speed and the rainfall data were used to exclude noise data during periods of any rainfall and/or wind speed in excess of 5 metres per second (m/s) in accordance with NPfI requirements.



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Noise monitoring and assessment locations

Alspec Industrial Business Park
Noise and vibration impact assessment
Figure 3.1

EMM
creating opportunities

3.3 Measured noise levels

A summary of the existing background and ambient noise levels is provided in Table 3.2.

Table 3.2 Summary of unattended ambient noise monitoring

Noise monitoring location	Time period[1]	Existing noise levels, dB	
		$L_{Aeq,period}$	Rating background level (RBL)
NM1	Morning shoulder	58	37
	Day	58	40
	Evening shoulder	59	44
	Evening	56	39
	Night	53	34
NM2	Morning shoulder	46	32
	Day	52	34
	Evening shoulder	52	36
	Evening	43	35
	Night	41	30
NM3	Morning shoulder	42	30
	Day	47	29
	Evening shoulder	46	31
	Evening	41	34
	Night	39	30
NM4	Morning shoulder	46	32
	Day	50	29
	Evening shoulder	43	31
	Evening	41	36
	Night	40	33

1. Morning shoulder is 5am to 7am, Day 7 am to 6 pm; evening shoulder 4pm to 6pm, evening 6 pm to 10 pm; night 10 pm to 7 am. On Sundays and Public Holidays, day is 8 am to 6 pm; night 10 pm to 8 am.

Noise levels measured at NM2, NM3 and NM4 indicate that the evening RBL is consistently higher than the day RBL. Monitoring was done during the colder winter months which would typically negate insect noise which more commonly contributes to higher evening noise levels. Monitoring locations were also far removed from each other and thus removed from a possible singular extraneous noise source which may impact the data. Further analysis of this data and additional attended measurements were undertaken at the request of regulators with results presented in (EMM letter E230918_RP3_ABP_AdditionalMonitoring_V1).

Analysis of data for NM1 and NM2 show noise levels typical of regular morning and afternoon peak traffic flows. Given their proximity to Luddenham Road it is clear this is the source of elevated evening background noise. As

the source of elevated evening background noise levels at location NM3 and NM4 is less clear minimum background levels will be used for the evening at these locations.

Section 2.3 of the NPfI provides guidance where the recorded RBL is below the minimum assumed background noise level and is reproduced in Table 3.3. In these cases, the minimum background noise level is adopted for assessment purposes in accordance with the NPfI.

Table 3.3 Minimum RBLs

Time of day	Minimum rating background noise level, dBA
Day	35
Evening	30
Night	30

3.4 Attended noise monitoring

To further understand and demonstrate the noise environment present in the study area, EMM conducted additional attended noise monitoring at a selection of residential assessment locations to the east of the AIBP. The measurements were conducted during the morning shoulder period of 8 November 2024 and the evening and night periods of 14 November 2024. Further details of the assessment and methodology can be found in (EMM letter E230918_RP3_ABP_AdditionalMonitoring_V1).

Attended noise measurements were taken to delineate the impact of current industrial operations. EMM conducted measurements during the following periods:

- Morning shoulder: where industry is expected to be most significant,
- Evening: where traffic was believed to dominate the noise environment
- Night: where noise from existing traffic is expected to be lowest.

Industrial noise was audible at low levels (up to L_{Aeq} 28 dB) on Luddenham Road during the evening and night periods and Mandalong Close (up to L_{Aeq} 26 dB) during the night period only. Measured industrial noise levels were more than 10 dB below amenity criteria at each location and would be considered insignificant in the context of existing road traffic noise.

Given the proximity of the AIBP to Luddenham Road and the relatively low noise contribution from existing industrial activity during the evening and night, the Alspec Warehouse would likely be the only significant industrial noise contribution at residences in this area.

3.5 Morning shoulder period

Fact Sheet A, Section 3A, of the NPfI provides guidance on determining noise criteria for shoulder periods. The NPfI states that "*where early morning (5 am to 7 am) operations are proposed, it may be unreasonable to expect such operations to be assessed against the night-time project noise trigger levels – especially if existing background noise levels are steadily rising in these early morning hours*".

Attended monitoring and further analysis of background monitoring data from NM1 shows that noise levels from traffic on Luddenham Road steadily increases in the morning shoulder period from 5am. Average $L_{Aeq,period}$ noise levels at NM1 in the morning shoulder period are 58 dB, the same as during the day period.

Since noise levels increase from 5am, and given road traffic noise has been noted as the primary source of existing noise levels during the morning shoulder period, it is reasonable to assess operational noise generated between 5 am and 7am (which is expected to be primarily from vehicle movements), against a separate morning-shoulder period criteria.

4 Assessment criteria

4.1 Construction noise

The Interim Construction Noise Guideline (ICNG) (DECC 2009) promotes a clear understanding of ways to identify and minimise noise from construction and to identify 'feasible' and 'reasonable' work practices. The ICNG recommends standard construction hours where noise from construction activities is audible at residential premises (i.e. assessment locations), as follows:

- Monday to Friday - 7 am to 6 pm
- Saturday - 8 am to 1 pm
- Sundays or public holidays - no construction work.

The ICNG acknowledges that works outside standard hours may be necessary, with justification provided to the relevant authorities.

The ICNG provides two methodologies to assess construction noise emissions. The first is a quantitative approach that is suited to major construction projects with typical durations of more than three weeks. This method requires noise emission predictions from construction activities at the nearest assessment locations and assessment against ICNG recommended noise levels.

The second is a qualitative approach, which is a simplified assessment process that relies more on noise management strategies. This method is suited to short-term infrastructure and maintenance projects of less than three weeks.

This assessment has adopted a quantitative approach. The qualitative aspects of the assessment include identification of assessment locations, description of works involved, including predicted noise levels and proposed management measures that include a complaints handling procedure.

4.1.1 Construction noise management levels

Table 4.1 provides ICNG noise management levels (NML) which apply to residential assessment locations.

Table 4.1 ICNG construction noise management levels for residences

Time of day	NML $L_{Aeq,15min}$	Application
Recommended standard hours: Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm, no work on Sundays or public holidays	Noise-affected rated background level (RBL) RBL + 10 dB	The noise-affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured Leq(15-min) is greater than the noise-affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise-affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:

Table 4.1 ICNG construction noise management levels for residences

Time of day	NML $L_{Aeq,15min}$	Application
		• times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences), and • if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise-affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise-affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

Source: ICNG (EPA, 2009).

The only non-residential use in the vicinity of the Site is the Bosna Croatian Club (soccer oval) at 229 Luddenham Road (Receiver 15). The noise management level for construction impact on active recreation (sports) is $L_{Aeq,15min}$ 65 dB.

Table 4.2 Construction noise management levels – all assessment locations

Assessment location	Adopted RBL[1]	NML, $L_{Aeq,15minute}$ dB	HNML, $L_{Aeq,15minute}$ dB
R1-R14 & R21 (NM1)	40	50	75
R15	n/a	65	n/a
R16-R20 & R22 (NM2)	35	45	75
R23, R24 (NM3)	35	45	75

Notes: 1. Based on the day period RBL established shown in Table 3.3

2. NML – Noise management Level, HNML – highly noise affected management level

4.2 Construction vibration

4.2.1 Human perception of vibration

Humans can detect vibration levels that are well below those causing any risk of damage to a building or its contents.

The actual perception of motion or vibration may not in itself be disturbing or annoying. An individual's response to that perception, and whether the vibration is "normal" or "abnormal", depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as "normal" in a car, bus or train is considerably higher than what is perceived as "normal" in a shop, office or dwelling.

Human tactile perception of random motion, as distinct from human comfort considerations, was investigated by Diekmann and subsequently updated in German Standard DIN 4150 Part 2 1999. On this basis, the resulting degrees of perception for humans are suggested by the vibration level categories given in Table 4.3.

Table 4.3 suggests that people will just be able to feel floor vibration at levels of approximately 0.15 millimetres per second (mm/s) and that the motion becomes "noticeable" at a level of approximately 1 mm/s.

Table 4.3 Peak vibration levels and human perception of motion

Approximate vibration level	Degree of perception
0.10 mm/s	Not felt
0.15 mm/s	Threshold of perception
0.35 mm/s	Barely noticeable
1 mm/s	Noticeable
2.2 mm/s	Easily noticeable
6 mm/s	Strongly noticeable
14 mm/s	Very strongly noticeable

Note: These approximate vibration levels (in floors of building) are for vibration having a frequency content in the range of 8 Hertz (Hz) to 80 Hz.

4.2.2 Assessing vibration - a technical guideline

Environmental Noise Management – Assessing Vibration: a technical guideline (DEC 2006) (the guideline) is based on BS 6472 – 2008, Evaluation of human exposure to vibration in buildings (1–80 Hz) (British Standards Institution 2008).

The guideline presents preferred and maximum vibration values for the use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. At vibration values below the preferred values, there is a low probability of adverse comment or disturbance to building occupants. Where all feasible and reasonable mitigation measures have been applied and vibration values are still beyond the maximum value, it is recommended that the operator negotiate directly with the affected community.

The guideline defines three vibration types and provides direction for assessing and evaluating the applicable criteria. Table 2.2 of the guideline provides examples of the three vibration types and has been reproduced in Table 4.4.

Table 4.4 Examples of types of vibration

Continuous vibration	Impulsive vibration	Intermittent vibration
Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).	Infrequent: Activities that create up to three distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading. Blasting is assessed using ANZEC (1990).	Trains, intermittent nearby construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer these would be assessed against impulsive vibration criteria.

Source: DEC (2006).

Continuous vibration associated with compaction of road base for new site access road and hard stand areas is most relevant to the construction of the BESS and substation.

Intermittent vibration (as defined in Section 2.1 of the guideline) is assessed using the vibration dose concept which relates to vibration magnitude and exposure time. Intermittent vibration is representative of heavy vehicle pass-bys and construction activities such as impact hammering, rolling or general excavation work.

Section 2.4 of the guideline provides acceptable values for intermittent vibration in terms of vibration dose values (VDV) which requires the measurement of the overall weighted rms (root mean square) acceleration levels over the frequency range 1 Hz to 80 Hz.

To calculate VDV the following formula is used (refer to Section 2.4.1 of the guideline):

$$VDV = \left[\int_0^T a^4(t)dt\right]^{0.25}$$

Where VDV is the vibration dose value in $m/s^{1.75}$, *a (t)* is the frequency-weighted rms of acceleration in m/s^2 and *T* is the total period of the day (in seconds) during which vibration may occur.

The acceptable VDV for intermittent vibration are reproduced in Table 4.5.

Table 4.5 Acceptable vibration dose values for intermittent vibration

Location	Daytime		Night-time	
	Preferred value, $m/s^{1.75}$	Maximum value, $m/s^{1.75}$	Preferred value, $m/s^{1.75}$	Maximum value, $m/s^{1.75}$
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes: Day time is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.

These criteria are indicative only, and there may be a need to assess intermittent values against continuous or impulsive criteria for critical areas.

There is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values. Adverse comment or complaints may be expected if vibration values approach the maximum values. The guideline recommends that activities should be designed to meet the preferred values where an area is not already exposed to vibration.

4.2.3 Structural vibration

i Australian Standard AS 2187.2 – 2006

In terms of the most recent relevant vibration damage criteria, Australian Standard AS 2187.2 - 2006 *Explosives - Storage and Use - Use of Explosives* recommends that the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2* be used as they are "applicable to Australian conditions".

The standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration that are considered in the standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (e.g. compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to manage minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 4.6 and graphically in Figure 4.1.

Table 4.6 Transient vibration guide values - minimal risk of cosmetic damage

Line[1]	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s	50 mm/s
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Notes: 1. Refers to the "Line" in Figure 4.1.

The standard notes that the guide values in Table 4.6 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 4.6 may need to be reduced by up to 50%.

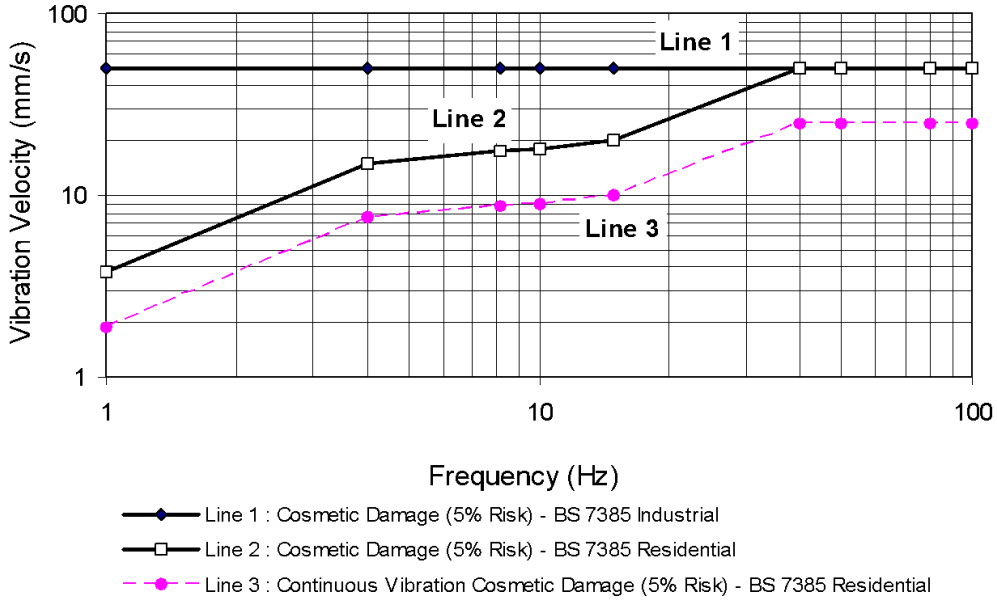


Figure 4.1 Graph of transient vibration guide values for cosmetic damage

In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the guide values for building types corresponding to Line 2 are reduced. Below a frequency of 4 Hz where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz (as shown in Figure 4.1).

Fatigue considerations are also addressed in the standard, and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the guide values in Table 4.6 should not be reduced for fatigue considerations.

In order to assess the likelihood of cosmetic damage due to vibration, AS2187 specifies that vibration measurements should be made at the base of the building and the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) should be compared with the criteria curves presented in Table 4.6.

It is noteworthy that in addition to the guide values nominated in Table 4.6 the standard states that:

> Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK.

4.3 Operational noise

Noise from development in NSW is regulated by the local council, DPE and/or the EPA, and sites generally have environmental protection licence and/or development consent conditions stipulating noise limits. These limits are typically derived from project specific trigger or operational noise levels predicted at assessment locations. They are based on EPA guidelines (e.g. NPfI) or noise levels that can be achieved by a specific site following the application of all feasible and reasonable noise mitigation.

The objectives of noise trigger levels for industry, established in accordance with the NPfI, are to protect the community from excessive intrusive noise and preserve amenity for specific land uses. It should be noted that the audibility of a noise source does not necessarily equate to non-compliance at an assessment location.

In consultation with regulators a whole of precinct approach has been adopted. To ensure that industrial noise levels (existing plus new) remain within recommended amenity noise levels for an area, a masterplan noise study for the whole of the AIBP has been completed (refer to EMM report *E230918_RP2_AlspecMasterplanNIA_V3*) which established relevant cumulative noise targets.

Noise predictions for individual lots within the AIBP, such as this project, will be assessed against project intrusive noise criteria. Compliance with amenity noise limits will be demonstrated by comparing results in this report against the estimated impact from Lot 4 (which coincides with the COPE project area) from the masterplan assessment.

4.3.1 Intrusiveness noise levels

The intrusiveness noise level is expressed as:

$L_{Aeq,15minute}$ = Rating Background Level + 5 dB

Where:

- $L_{Aeq,15minute}$ represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes
- RBL represents the background level to be used for assessment purposes.

Intrusive noise levels are only applied to residential receptors (residences). For other receptor categories, recommended amenity noise levels apply.

Table 4.7 presents the site intrusiveness noise levels based on adopted RBLs.

Table 4.7 Project intrusiveness noise levels (dB)

Assessment location	Representative NM[1]	RBL				Project Intrusiveness noise level, $L_{Aeq,15min}$			
		Morning shoulder	Day	Evening	Night	Morning shoulder	Day	Evening	Night
NCA1	NM1	37	40	39	34	42	45	44	39
NCA2	NM2	32	35[1]	35	30	37	40	40	35
NCA3	NM3	30[1]	35[1]	30[1]	30	35	40	35	35

Notes: 1. Minimum RBL for this period from the NPfI has been adopted.

4.3.2 Amenity noise levels

In consultation with regulators a whole of precinct approach has been adopted. To ensure that industrial noise levels (existing plus new) remain within recommended amenity noise levels for an area, a masterplan noise study for the whole of the AIBP has been completed (refer to EMM report *E230918_RP2_AlspecMasterplanNIA_V3*) which established relevant cumulative noise targets.

Noise predictions for individual lots within the AIBP, such as this project, will be assessed against project intrusive noise criteria. Compliance with amenity noise limits will be demonstrated by comparing results in this report against the estimated impact from Lot 1 (which coincides with the COPE project area) from the masterplan assessment.

The only non-residential use near the site is the Bosna Croatian Club at 229 Luddenham Road (Receiver 15). This receiver is considered both active recreation (soccer oval) and commercial premises (club) in accordance with the NPfI. For this assessment operational noise will be assessed against the more conservative project amenity noise level for active recreation areas of $L_{Aeq,15minute}$ 53 dB.

4.3.3 Mitigating noise

Where noise levels above the relevant goals are predicted, all feasible and reasonable mitigation are to be considered for the project to reduce noise levels towards the goals, before any residual impacts are determined and addressed.

The significance of the residual noise impacts is generally based around the human perception to changes in noise levels as explained in the glossary of the acoustic terms. For example, a change in noise level of 1 to 2 dB is typically indiscernible to the human ear. The characterisation of a residual noise impact of 0 to 2 dB above the noise goal is therefore considered negligible. Table 4.1 of the NPfI provides a characterisation of residual noise impact as outlined in Table 4.8.

Table 4.8 Significance of residual noise impacts

If the predicted noise level minus the goal is:	And the total cumulative industrial noise level is:	Then the significance of the residual noise level is:
≤2 dB	Not applicable	Negligible
≥3 but ≤5 dB	Less than recommended amenity noise level, or Greater than recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from development is ≤1 dB.	Marginal
≥ 3 but ≤5 dB	Greater than recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is >1 dB.	Moderate
>5 dB	Less than or equal to recommended amenity noise level.	Moderate
>5 dB	Greater than recommended amenity noise level.	Significant

4.4 Sleep disturbance

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where operation or construction night period noise at a residential location exceed screening levels of:

- $L_{Aeq,15minute}$ 40 dB or the prevailing RBL plus 5 dB (whichever is the greater), and/or
- L_{Amax} 52 dB or the prevailing RBL plus 15 dB (whichever is the greater).

Guidance regarding potential for sleep disturbance is also provided in the RNP. The RNP calls upon numerous studies that have been conducted into the effect of maximum noise levels on sleep. The RNP acknowledges that, at the current (2011) level of understanding, it is not possible to establish absolute noise level criteria that will correlate to an acceptable level of sleep disturbance.

Additional information is outlined in *WHO* [World Health Organization] *Night Noise Guidelines for Europe* (WHO 2009) and the *Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep* (Basner and McGuire 2018). Further guidance is also provided in the NSW RNP with reference to enHealth "as a rule for planning for short-term or transient noise events, for good sleep over 8 hours the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45 dB(A) L_{Amax} more than 10 or 15 times per night". It is commonly accepted by acoustic practitioners and regulatory bodies (i.e. EPA) that a facade including a partially open window will reduce external noise levels by 10 dB. Therefore, external noise levels in the order of 55 dB calculated at the facade of a residence is unlikely to impact sleep according to the RNP.

If noise levels over the screening criteria are identified, then additional analysis will consider factors such as:

- how often the events will occur
- the time the events will occur
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods)
- current scientific literature available regarding the impact of maximum noise level events at night.

Considering the current research and NSW guidelines and existing traffic noise on Luddenham, we believe that an appropriate noise limit for the assessment of sleep disturbance is a façade level of L_{Amax} 55 dB.

4.5 Road traffic noise

Construction and operational traffic require consideration for potential noise impacts. The principal guidance to assess the impact of road traffic noise on assessment locations is in the RNP. Table 4.9 presents the road noise assessment criteria for residential land uses (i.e. assessment locations), reproduced from Table 3 of the RNP for road categories relevant to construction and operation of the Project site.

Table 4.9 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria – dB	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hour}$ 60 (external)	$L_{Aeq,9hour}$ 55 (external)
Local roads	Existing residences affected by additional traffic on local roads generated by land use developments.	$L_{Aeq,1hour}$ 55 (external)	$L_{Aeq,1hourr}$ 50 (external)

Additionally, the RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to an increase of up to 2 dB.

In addition to meeting the assessment criteria in Table 4.9, any significant increase in total traffic noise at the relevant residential assessment locations must be considered. Residential assessment locations experiencing increases in total traffic noise levels above those presented in Table 4.10 should be considered for mitigation. Relative increase criteria are not applicable for local roads.

Table 4.10 Road traffic relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase – dB	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/ sub-arterial roads and transit ways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{Aeq,15hour}$ +12 dB (external)	Existing traffic $L_{Aeq,9hour}$ + 12 dB (external)

Appendix B of the RNP, states that noise levels shall be rounded to the nearest integer, whilst difference between two noise levels are to be rounded to a single decimal place.

4.6 Cumulative operational noise

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise level (RANL) for an area, a whole of precinct assessment formed part of the masterplan study to ensure amenity targets are satisfied (refer to EMM report *E230918_RP2_AlspecMasterplanNIA_V3*). Cumulative impact from the AIBP as well as other industrial sources has been assessed against RANL. Noise predictions in this assessment will be compared against the estimated impact from Lot 4 from the masterplan assessment.

5 Assessment

5.1 Noise modelling methodology

Road traffic noise levels were predicted using DataKustik CadnA noise prediction software implementing the US EPA Federal Highways (FHWA) Traffic Noise Model (TNM).

Operational and construction noise levels were predicted using DGMR Software proprietary modelling software, iNoise, implementing international standard ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors' algorithms. As per Section 1 of the Standard:

> The method predicts the equivalent continuous A-weighted sound pressure level (as described in parts 1 to 3 of ISO 1996) under meteorological conditions favourable to propagation from sources of known sound emission.
>
> These conditions are for downwind propagation, as specified in 5.4.3.3 of ISO 1996-2:1987 or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

The model calculates total noise levels at assessment locations from concurrent operation of multiple noise sources. It considers factors that influence noise propagation such as the lateral and vertical location of plant, source-to-receptor distances, ground effects, atmospheric absorption, topography of the site and surrounding area and applicable meteorological conditions.

The model was populated with 3-D topography of the project and surrounding area, extending out past all assessment locations. Plant and equipment representing the range of proposed construction and operation scenarios were placed at locations that would represent typical worst case noise levels throughout the construction and operational scenarios.

Table 5.1 Modelling Standard Parameters

Modelling Parameter	Input
Model	ISO 9613-2:1996
Environmental conditions	Humidity 70% Temperature 10°C Air pressure [mbar] 1013.3
Elevation contours	Contours adopted from NSW Elevation Data Services
Receiver height	1.5m above ground
Ground absorption factor	0.7 over open grass 0.0 for concrete and paved industrial area
Warehouse height	14.6m for larger warehouses 10m for small and medium warehouses

5.2 Construction noise

Construction equipment sound power levels (SWL) have been sourced from an EMM database of similar equipment based on measurements at other construction sites. Earthworks and site-preparation are expected to be the most significant noise impact.

The model included the cumulative operation of all construction plant and equipment as an area source across the project site providing a potential worst-case scenario.

Table 5.2 Construction equipment sound power levels dB

Equipment/activity	Number of items (per 15 minutes)	SWL per item, L_{Aeq}	Total SWL, L_{Aeq}	Cumulative SWL, L_{Aeq}
Initial site preparation works/bulk earthworks				
Excavator	1	104	104	118
Dozer	1	112	112	
Dump truck	1	108	108	
Light vehicle	4	75	81	
FEL	1	105	105	
Road truck (deliveries)	1	104	104	
Grader	1	108	108	
Roller	1	114	114	
Crane	1	106	106	
Generator	1	97	97	

Works associated with commissioning and landscaping will generate significantly lower noise levels than the site preparation works identified in Table 5.2 and have not been considered further in the assessment. Worst case predictions for construction noise impact are shown in Table 5.3.

Table 5.3 Predicted construction noise levels, $L_{Aeq,15min}$ (dB)

Noise catchment area	Predicted noise level	Construction NML	Highly noise affected level	Exceedance of construction NML	Exceedance of highly noise affected level
NCA1	39-47	50	75	Nil	Nil
NCA2	38-47	45	75	Up to 2dB	Nil
NCA3	38-45	45	75	Nil	Nil
Receiver R15 (non-residential)	57	65	N/A	Nil	N/A

Construction noise levels are predicted to comply with the construction NML at NCA1, NCA3 and R15. Marginal exceedances of up to 2 dB of the NML are predicted for NCA2. No exceedances of the highly noise affected level are predicted.

5.3 Construction vibration

Safe working distances for typical items of vibration intensive plant are listed in Table 5.4. The safe working distances are quoted for both "Cosmetic Damage" (refer British Standard BS 7385) and "Human Comfort" (refer British Standard BS 6472-1).

Table 5.4 Recommended safe working distances for vibration intensive plant

Plant Item	Rating / Description	Safe working distance	
		Cosmetic damage (BS 7385)	Human response (BS 6472)
Tunnel Boring Machine[1]	6-8m diameter	2-5 m	7m
Small hydraulic hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium hydraulic hammer	(900 kg - 12 to 18t excavator)	7 m	23 m
Large hydraulic hammer	(1600 kg - 18 to 34t excavator)	22 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	20 m
Pile boring	≤ 800 mm	2 m (nominal)	N/A
Jackhammer	Hand-held	1 m (nominal)	Avoid contact with structure
Vibratory Rollers	<50kN (Typically 1-2 tonnes)	5 m	15 to 20 m
	<100kN (Typically 2-4 tonnes)	6 m	20 m
	<200kN (Typically 4-6 tonnes)	12 m	40 m
	<300kN (Typically 7-13 tonnes)	15 m	100 m
	>300kN (Typically 13-18 tonnes)	20 m	100 m
	>300kN (>18 tonnes)	25 m	100 m

Source: From Transport Infrastructure Development Corporation Construction's Construction Noise Strategy (Rail Projects), November 2007 – based on residential building.

Safe work distances relate to continuous vibration. For most construction activity, vibration emissions are intermittent in nature. The safe working distances are therefore conservative.

TBM level adopted based on road header data as reported in SLR Environment Effect Statement –North East Link Project. North East Link. Surface noise and vibration impact assessment – 640.11671-R01-FINAL.

The safe working distances presented in Table 5.4 are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions.

The nearest assessment location to the project is 225m. Due to the distance between the project site and the nearest assessment location no significant vibration impacts are predicted.

5.4 Operational noise

5.4.1 Shielding from buildings

Operational noise impact from the development has been modelled using the site plans provided. All warehouse and office buildings included in the AIBP masterplan shown in Figure 2.1 have been included in modelling.

5.4.2 Traffic movements

On-site traffic movements have been assessed based on information provided by the client. No acoustically significant operational activities, besides traffic movements and freight handling, are expected.

Estimated traffic movements for the development are detailed in Table 2.1.

Each truck has been modelled as arriving at or departing from site and idling for 10 minutes. Sound power of L_{Aeq} 95 dB has been used for an idling truck and L_{Aeq} 105 dB has been used to represent trucks traveling approximately 10km/hr, manoeuvring and reversing while on site.

5.4.3 Material handling

Electric forklifts are expected to be the primary means of freight handling on site. A forklift operating for 15 minutes for each heavy vehicle was assumed to represent a typical worst case scenario. A sound power level of 90 dBA has been used for each forklift to represent a typical operational effort over a 15 minute period. This sound power represents general operation of the forklift including manoeuvring and impact noise associated with material handling.

5.4.4 Mechanical plant

Plans for the COPE development show a plant room adjacent to the office space. A sound power of 95 dB has been used to represent condensers in the plantroom and is considered conservative for mechanical plant servicing office components of buildings and commercial enterprises. A sound power of 95 dB has also been conservatively adopted to represent rooftop ventilation.

5.4.5 Plant and equipment summary

The operational noise model represents a snapshot of typical operations, with equipment placed at various locations and heights, representing a realistic operational scenario, based on information provided by the client. A typical worst case 15-minute assessment for the day and evening/night period has been developed.

Equipment sound power levels have been based on data obtained from an EMM measurement database of similar equipment. Indicative plant and equipment of acoustic significance and associated sound power levels for the proposed development are presented in Table 5.5.

Table 5.5 Equipment sound power levels $L_{Aeq,15minute}$ dB

Plant Item	Quantity	L_{WA}	Note
Warehouse noise sources			
Heavy vehicle	each	105	Travelling at 10km/hr
Heavy vehicle	each	95	Idling for 10 minutes
Light vehicle	each	85	Travelling at 10km/hr

Plant Item	Quantity	L_{WA}	Note
Forklift	each	90	15 minutes operation per heavy vehicle on hardstand
Mechanical plant	each	95	Continuous operation, external to warehouse
Rooftop ventilation	each	95	Continuous operation

5.4.6 Operational scenarios

Operational scenarios have been developed to assess a typical worst-case 15 minutes for the morning shoulder, day, evening and night periods.

i Morning shoulder period

- 13 heavy vehicle movements to or from the hardstand areas
- 13 forklifts in operation
- 100 light vehicle movements to or from the carpark to represent the morning peak period.
- Mechanical plant operating continuously.

ii Day period

This scenario includes:

- 19 heavy vehicle movements to or from the hardstand areas
- 19 forklifts in operation
- 100 light vehicle movements to or from the carpark to represent the afternoon peak period.
- Mechanical plant operating continuously.

iii Evening period

This scenario includes:

- 5 heavy vehicle movements to or from the hardstand areas
- 5 forklifts in operation
- Mechanical plant operating continuously.

iv Night period

This scenario includes:

- 6 heavy vehicle movements to or from the hardstand areas
- 6 forklifts in operation

- 50 light vehicle movements to or from the carpark to represent the night period.
- 6 heavy vehicle movements to or from the hardstand areas
- Mechanical plant operating continuously.

5.4.7 Sleep disturbance

An L_{Amax} sound power of 115 dB has been used to represent an airbrake discharge or pallet drop event for assessment of sleep disturbance. The assessment undertaken assumes airbrake discharge and pallet drop occur simultaneously at the nearest end of the hardstand area to assessment locations, whilst all other operational noise sources are in operation.

5.4.8 Predicted operational noise impacts

Predicted operational and sleep disturbance impacts are provided in Table 5.6 and Table 5.7. Results for each assessment location are provided for morning shoulder, day, evening and night periods. The highest result for a receiver within each noise catchment area has been provided.

Table 5.6 Predicted operational noise levels, $L_{Aeq,15min}$ dB

Assessment location	Noise catchment area	Project intrusiveness noise level (PINL)	Predicted noise level				Exceedance of PINL?
			Morning shoulder	Day	Evening	Night	
R1	NCA1	42/45/44/39	29	34	28	27	No
R2	NCA1	42/45/44/39	25	29	<25	<25	No
R3	NCA1	42/45/44/39	27	31	25	<25	No
R4	NCA1	42/45/44/39	27	31	25	25	No
R5	NCA1	42/45/44/39	33	37	31	30	No
R6	NCA1	42/45/44/39	32	36	30	29	No
R7	NCA1	42/45/44/39	29	33	27	26	No
R8	NCA1	42/45/44/39	27	31	26	25	No
R9	NCA1	42/45/44/39	28	32	27	25	No
R10	NCA1	42/45/44/39	29	33	27	26	No
R11	NCA1	42/45/44/39	29	33	27	26	No
R12	NCA1	42/45/44/39	29	32	27	26	No
R13	NCA1	42/45/44/39	27	31	25	<25	No
R14	NCA1	42/45/44/39	28	31	26	25	No
R15	NCA2	53/53/53/53	26	30	<25	<25	No
R16	NCA2	37/40/40/35	30	34	28	27	No

Assessment location	Noise catchment area	Project intrusiveness noise level (PINL)	Predicted noise level				Exceedance of PINL?
			Morning shoulder	Day	Evening	Night	
R17	NCA2	37/40/40/35	29	32	27	26	No
R18	NCA2	37/40/40/35	28	32	27	26	No
R19	NCA2	37/40/40/35	29	32	27	26	No
R20	NCA2	37/40/40/35	<25	26	<25	<25	No
R21	NCA1	42/45/44/39	<25	26	<25	<25	No
R22	NCA2	37/40/40/35	<25	27	<25	<25	No
R23	NCA3	35/40/35/35	<25	28	<25	<25	No
R24	NCA3	35/40/35/35	27	31	25	<25	No

Notes: 1. Project intrusive noise level for morning shoulder/day/evening/night period.

No exceedances of the PINL are predicted for any assessment location.

Predicted sleep disturbance impacts are provided in Table 5.7.

Table 5.7 Predicted maximum noise levels at residential assessment locations, L_{Amax} dB

Assessment location	Sleep disturbance criteria	Predicted noise level	Exceedance
R1	55	38	No
R2	55	32	No
R3	55	35	No
R4	55	36	No
R5	55	44	No
R6	55	43	No
R7	55	36	No
R8	55	36	No
R9	55	38	No
R10	55	36	No
R11	55	36	No
R12	55	36	No
R13	55	36	No
R14	55	39	No

Assessment location	Sleep disturbance criteria	Predicted noise level	Exceedance
R16	55	34	No
R17	55	37	No
R18	55	36	No
R19	55	40	No
R20	55	40	No
R21	55	31	No
R22	55	34	No
R23	55	31	No
R24	55	33	No

No exceedance of the sleep disturbance screening criteria at any assessment location is predicted.

5.4.9 Cumulative operational noise impact

Cumulative noise from the AIBP has been assessed in the masterplan noise impact assessment (EMM December 2024). Cumulative impact has been assessed in this COPE report by comparing noise predictions from the COPE with Lot 4 predictions from the masterplan. The results provided in Table 5.8 represent the highest impact for an assessment location within each noise catchment area. Where predicted noise levels from COPE sensitive freight are the same as (or less than) those for Lot 4 from the masterplan assessment, then cumulative impact findings from the masterplan assessment are maintained and noise from the COPE site is not predicted to contribute to unacceptable amenity noise levels at the assessment locations.

Table 5.8 Predicted operational noise levels, $L_{Aeq,15minute}$ dB

Assessment period	Noise catchment area	Predicted noise level		Difference
		COPE sensitive freight	Masterplan – Lot 4 (COPE)	
Morning shoulder	NCA1	33	33	Nil
	NCA2	30	30	Nil
	NCA3	27	27	Nil
	R15	26	26	Nil
Day	NCA1	37	37	Nil
	NCA2	34	34	Nil
	NCA3	31	31	Nil
	R15	30	30	Nil
Evening	NCA1	31	31	Nil
	NCA2	28	28	Nil

Assessment period	Noise catchment area	Predicted noise level		Difference
		COPE sensitive freight	Masterplan – Lot 4 (COPE)	
	NCA3	25	25	Nil
	R15	<25	<25	Nil
Night	NCA1	30	30	Nil
	NCA2	27	27	Nil
	NCA3	<25	<25	Nil
	R15	<25	<25	Nil

5.5 Road traffic noise generation

Road traffic noise generated by additional traffic movements from the site has been addressed for assessment locations along Luddenham Road. Road noise modelling has been done to quantify potential increases in road traffic noise due to site generated traffic when compared against the natural growth of traffic volumes in the absence of the development.

For COPE the following project traffic movement data was supplied to EMM by Arcadis:

- daily light vehicle movements of 451 with 113 of those to occur during the night period
- daily HV movements of up to 190 per day with 31 of those to occur during the night period.

Traffic generated by this development would result in an increase of less than 0.5 dB to existing traffic noise. Cumulative road traffic noise generated by the AIBP has been assessed in the masterplan noise impact assessment (EMM December2024). The Masterplan assessment demonstrates that existing traffic noise levels exceed the RNP planning levels for assessment locations on Luddenham Road. An exceedance of the 2 dB relative increase criteria is predicted for traffic on Luddenham Road north of Patons Lane at assessment location R1.

6 Noise mitigation and management

6.1 General

Construction noise levels are predicted to exceed NML at some assessment locations during worst case construction activities. The ICNG requires that where construction noise is predicted to exceed NMLs, feasible and reasonable noise mitigation strategies should be adopted to minimise noise and vibration impacts as practicable.

The following section details feasible and reasonable noise mitigation strategies suitable for reducing construction noise impact. While there are no predicted exceedances of operational noise criteria, the following work practices will also reduce potential noise impacts from operations from COPE.

6.2 General mitigation and management

6.2.1 Work practices

Work practice methods include:

- regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration
- regular identification of noisy activities and adoption of improvement techniques
- avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby residents
- develop routes for the delivery of materials and parking of vehicles to minimise noise
- where possible, avoid the use of equipment that generates impulsive noise
- minimise the movement of materials and plant and unnecessary metal-on-metal contact
- minimise truck movements
- schedule respite periods for intensive works as determined through consultation with potentially affected neighbours (e.g. a daily respite period for a minimum of one hour at midday).

6.2.2 Plant and equipment

Additional measures for plant and equipment include:

- where possible, choose quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks
- movement alarms and beepers to be replaced with non-tonal level varying quackers or equivalent
- operate plant and equipment in the quietest and most efficient manner
- regularly inspect and maintain plant and equipment to minimise noise and vibration level increases, to ensure that all noise and vibration reduction devices are operating effectively.

6.2.3 Quantifying noise reductions

Approximate noise reductions provided by some of these measures are provided in Table 6.1.

Table 6.1 Relative effectiveness of various forms of noise control

Noise control	Nominal noise reduction possible, in total A-weighted sound pressure level, dB
Increase source to receiver distance[1]	approximately 6 dB for each doubling of distance
Reduce equipment operating times or turn off idling machinery[2]	approximately 3 dB per halving of operating time
Operating training on quiet operation[2]	up to 3 to 5 dB
Screening (e.g. noise barrier)[1]	normally 5dB to 10 dB, maximum 15 dB
Enclosure (e.g. shed/building)[1]	normally 15 dB to 25 dB, maximum 50 dB
Silencing (e.g. exhaust mufflers)[1]	normally 5 dB to 10 dB, maximum 20 dB

1. Sourced from AS2436-2010.
2. Based on EMM's measurement experience at construction and mining sites.

7 Conclusion

EMM has completed an assessment of potential noise impacts associated with the proposed Cope Sensitive freight distribution centre building on 221-227 Luddenham Road, Orchard Hills (the site), situated within the Alspec Industrial Business Park (AIBP) at 221-235 Luddenham Road, Orchard Hills. The assessment considered the potential for operational, construction and road traffic noise and vibration impacts of the project and has been prepared in accordance with the methodologies outlined in the ICNG, NPfI and RNP, as well as other relevant guidelines and standards.

Construction noise management levels, project intrusiveness noise levels and amenity noise goals for the Project have been established based on the results of ambient noise monitoring and methodology provided in the ICNG and NPfI.

Noise modelling has been undertaken based on likely levels of noise generated by the development during the site establishment construction period and typical worst-case operational activity. Findings of the assessment are summarised as follows:

- Construction noise predictions indicate some minor exceedances, up to 2 dB, of NMLs for some receivers in close proximity to the development boundary. No exceedances of the highly noise affected management level are predicted.
- Operational noise levels are predicted to comply with project intrusiveness noise levels and cumulative impact assessment criteria.
- The sleep disturbance assessment demonstrated that no exceedances of the NPfI night-time maximum screening noise level is predicted.
- Additional road traffic movements on Luddenham Road will be generated by the development. Increases in road traffic noise along Luddenham Road due to site generated traffic is not expected to exceed the 2dB requirement of the RNP.

References

NSW Environment Protection Authority (EPA) 2017, *NSW Noise Policy for Industry* (NPfI).

NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP).

NSW Environmental Protection Authority (EPA) 2009, *The Interim Construction Noise Guideline* (ICNG).

Glossary

Project and technical terms

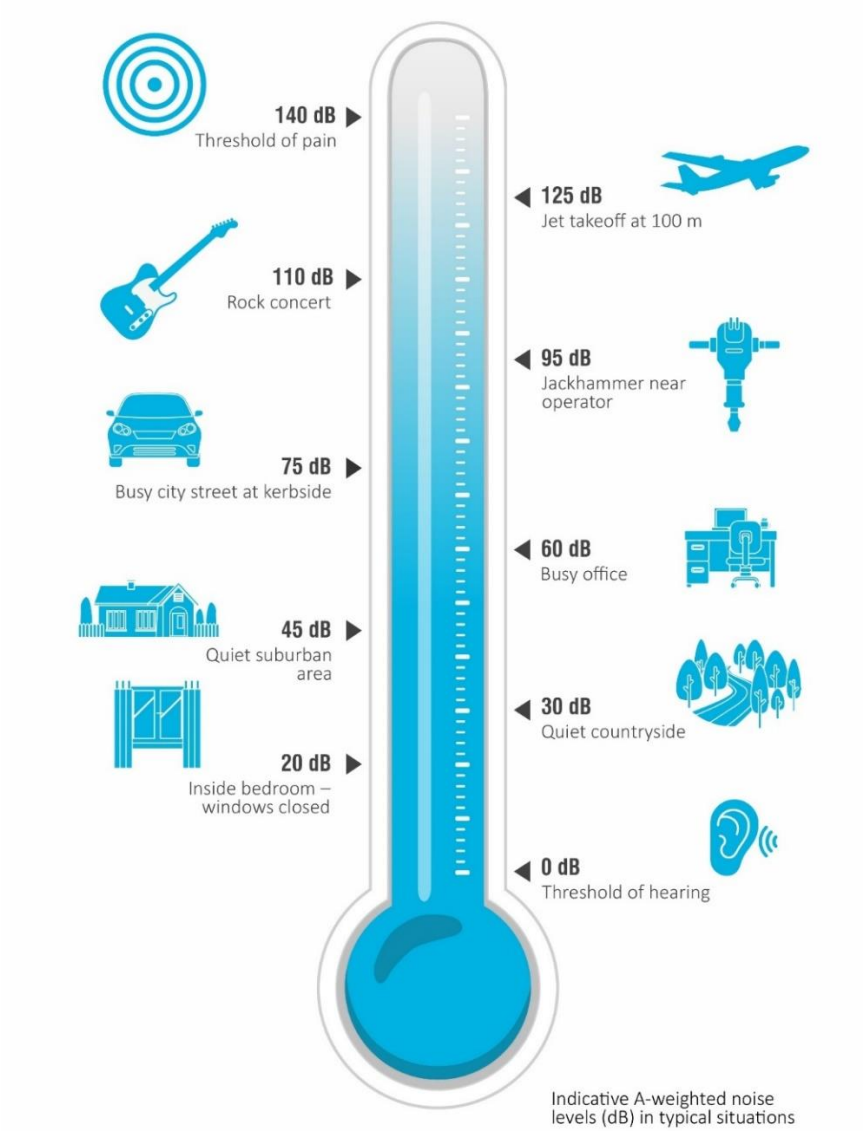
Term	Meaning
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Day period	Monday-Saturday: 7 am to 6 pm, on Sundays and public holidays: 8 am to 6 pm.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dBC	Noise is measured in units called decibels (dB). There are several scales for describing noise, with the 'C-weighted' scale typically used to assess low frequency noise.
Evening period	Monday-Sunday: 6 pm to 10 pm.
L1	The noise level exceeded for 1% of the time.
L10	The noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L90	The noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
Leq	The energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The Leq(15min) descriptor refers to a Leq noise level measured over a 15-minute period.
Linear peak	The peak level of an event is normally measured using a microphone in the same manner as linear noise (i.e. unweighted), at frequencies both in and below the audible range.
Lmax	The maximum sound pressure level received during a measuring interval.
Night period	Monday-Saturday: 10 pm to 7 am, on Sundays and public holidays: 10 pm to 8 am.
NPfI	Noise Policy for Industry.
NVIA	Noise and vibration impact assessment.
PNTL	The project-noise trigger level (PNTL) is criteria for a particular industrial noise source or industry. The PNTL is the lower of either the intrusive noise criteria or amenity noise criteria.
RBL	The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels.
Sound power level (Lw)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.

Common noise levels

The table below gives an indication as to what an average person perceives about changes in noise levels. Examples of common noise levels encountered on a daily basis are provided in the figure below.

Perceived change in noise

Change in sound level (dB)	Perceived change in noise
up to 2	typically indiscernible
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times as loud (or quarter) as loud



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