Horsley Logistics Park Stage 2

SSD-71144719 Noise and Vibration Impact Assessment

ESR Australia

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Prepared by:

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.2	11 October 2024	Mark Irish Dario Barbosa	Antony Williams	Mark Irish
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Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with ESR Australia (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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1.0 Introduction

A State Significant Development Application (SSDA) has been prepared in support of the proposed Horsley Logistics Park Stage 2 warehouse and distribution centre (the Project) located at 3 Johnston Crescent, Horsley Park (the Site).

The Project consist of minor site works to the existing lot and the development of two warehouses for a total GFA55,900 of across the 8.6ha site with a combination of shard and exclusive hardstands. Vehicular parking is accommodated predominantly via undercroft configuration, with the balance on grade.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) and accompanying cover letter issued for the Horsley Logistics Park Stage 2 project (SSD-71144719) dated 29 May 2024.

Specifically, this report has been prepared to respond to the SEARs requirement shown in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements

Item	Description of Requirement	Section Reference (this report)
11. Noise and Vibration	Provide a noise and vibration assessment prepared in accordance with relevant EPA guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.	**Construction:** **Section 3.1**, **3.2**, **4.1**, **5.1** and **5.2** **Operation:** **Section 3.3**, **4.2** and **5.3** **Mitigation:** **Section 7.0**

SLR is suitably qualified and endorsed by the Planning Secretary to produce SSDA noise impact assessments. SLR is a member of the Australian Acoustical Society (AAS) and a member firm of the Association of Australasian Acoustical Consultants (AAAC).

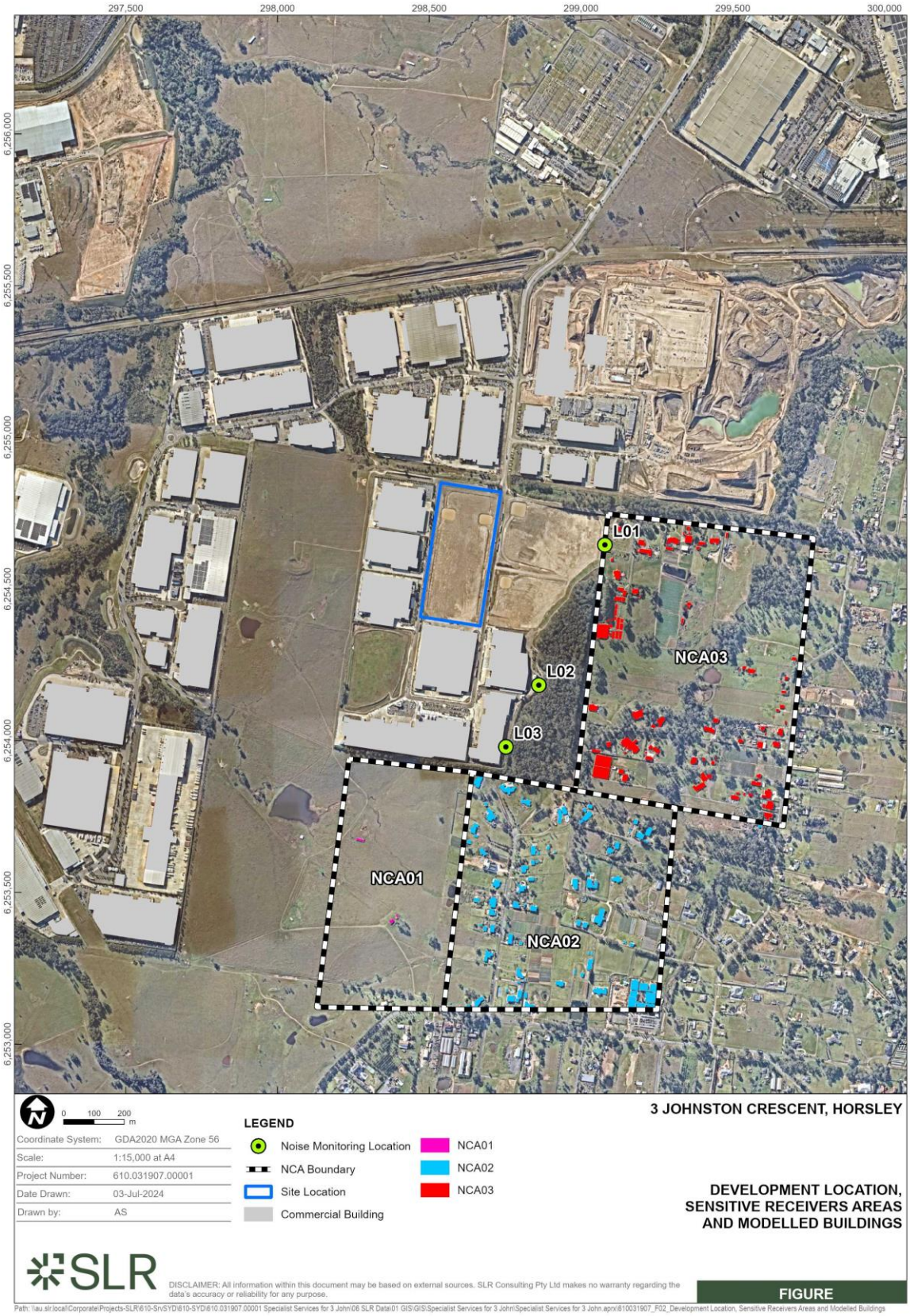
The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

1.1 The Site

The Project is proposed to be located at 3 Johnston Crescent, Horsley Park, approximately 16 km west of Parramatta Central Business District (CBD) and 36 km west of Sydney CBD. The Site is bordered by Johnston Crescent to the north, south, east and west.

The closest residential uses include residential dwellings approximately 350m east from the Site. The site location and surrounding noise-sensitive receivers are shown in **Figure 1.** The proposed layout of the site is shown in **Figure 2**.

Figure 1 Site Location



1.2 Nearest Receivers

The site is situated in the Horsley Park industrial area and is surrounded by existing and future commercial premises. The nearest residential receivers are located around 350 m east of the site on Burley Road.

The nearest receivers are shown in **Figure 1** and detailed in **Table 2**.

Table 2 Surrounding Sensitive Receivers

NCA	Receiver	Type	Direction
NCA01	2b Aldington Rd, Kemps Creek NSW 2178	Residential	South
NCA02	47-48 Greenway Pl, Horsley Park NSW 2175	Residential	South east
	49-53 Greenway Pl, Horsley Park NSW 2175	Residential	South east
	38-40 Greenway Pl, Horsley Park NSW 2175	Residential	South east
	41-43 Greenway Pl, Horsley Park NSW 2175	Residential	South east
	44-46 Greenway Pl, Horsley Park NSW 2175	Residential	South east
	47-48 Greenway Pl, Horsley Park NSW 2175	Residential	South east
NCA03	263-273 Burley Rd, Horsley Park NSW 2175	Residential	East
	287-299 Burley Rd, Horsley Park NSW 2175	Residential	East
	301-313 Burley Rd, Horsley Park NSW 2175	Residential	East
	321-325 Burley Rd, Horsley Park NSW 2175	Residential	East
	275-285 Burley Rd, Horsley Park NSW 2175	Residential	East
	315-319 Burley Rd, Horsley Park NSW 2175	Residential	East
Commercial	2 Johnston Cr, Horsley Park NSW 2175	Commercial	West
	2A Johnston Cr, Horsley Park NSW 2175	Commercial	West
	4 Johnston Cr, Horsley Park NSW 2175	Commercial	West

Figure 2 Proposed Development – Site Plan

2.0 Existing Noise Environment

Unattended noise monitoring was conducted during May 2024. The measured noise levels have been used to determine the existing noise environment and to set the criteria used to assess the potential impacts from the proposal.

The monitoring equipment was positioned to measure existing noise levels that are representative of receivers potentially most affected by the proposal, within constraints such as accessibility, security and landowner permission.

The noise monitoring equipment continuously measured existing noise levels in 15-minute periods during the daytime, evening and night-time. All equipment carried current National Association of Testing Authorities (NATA) or manufacturer calibration certificates and equipment calibration was confirmed before and after each measurement.

The measured data has been processed to exclude noise from extraneous events and periods affected by adverse weather conditions, such as strong wind or rain measured at the Horsley Park Equestrian Centre AWS (BOM weather station), to establish representative existing noise levels in the study area.

The noise monitoring locations are shown in **Figure 1** and the results are summarised in **Table 3.** Noise monitoring data from location L03 was corrupted due to logger failure and could not be used**.** Details of the unattended monitoring together with graphs of the measured daily noise levels are provided in **Appendix B**.

Table 3 Summary of Unattended Noise Monitoring Results

ID	Location Description	Measured Noise Levels (dBA) [1]					
		Background Noise (RBL)[2]			Average Noise ($L_{Aeq(period)}$)[3]		
		Daytime	Evening	Night-time	Daytime	Evening	Night-time
L01	Nearest to Burley Road	39	39	39 (40 actual)	51	45	46
L02	Intermediate	40	39	39 (40 actual)	51	45	46
L03[4]	Southern	-	-	-	-	-	-

Note 1: The assessment periods are the daytime which is 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and public holidays, the evening which is 6 pm to 10 pm, and the night-time which is 10 pm to 7 am on Monday to Saturday and 10 pm to 8 am on Sunday and public holidays. See the NSW EPA *Noise Policy for Industry*.

Note 2: The RBL noise level is representative of the 'average minimum background sound level', or simply the background level.

Note 3: The L_{Aeq} is essentially the 'average sound level'. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

Note 4: The monitoring data from location L03 was corrupted and could not be utilised.

Short-term attended noise monitoring was also completed. The attended measurements allow the contributions of the various noise sources at each location to be determined. Detailed observations from the attended measurements are provided in **Appendix B**.

The attended measurements were generally found to be consistent with the results of the unattended noise monitoring and show that existing ambient noise levels are typically dominated by road traffic noise from the surrounding road network and industrial noise from existing industrial developments.

3.0 Assessment Criteria

3.1 Construction Noise Criteria

The NSW *Interim Construction Noise Guideline* (ICNG) is used to assess and manage impacts from construction noise on residences and other sensitive land uses in NSW.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) for sensitive receivers based on the existing background noise in the area. The 'worst-case' noise levels from construction of a proposal are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impact of the proposal.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

3.1.1 Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in **Table 4**.

Table 4 ICNG NMLs for Residential Receivers

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Standard Construction Hours Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays	Noise affected RBL[1] + 10 dB	• The noise affected level represents the point above which there may be some community reaction to noise • Where the predicted or measured $L_{Aeq(15minute)}$ 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 (HNA) 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 restructuring the hours that the very noisy activities can occur, taking into account: o 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 o If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Standard Construction 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 practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: RBL is the Rating Background Level and the ICNG refers to the calculation procedures in the NSW *Industrial Noise Policy* (INP). The INP has been superseded by the NSW EPA *Noise Policy for Industry* (NPfI).

3.1.2 Other Sensitive' Land Uses and Industrial Receivers

Non-residential land uses have been identified in the study area. The NMLs for 'other sensitive' receivers are shown in **Table 5**.

Table 5 Construction NMLs for ICNG 'Other Sensitive' Receivers

Land Use	Noise management level $L_{Aeq(15minute)}$ (dBA) (applied when the property is in use)	
	Internal	External
ICNG 'other sensitive' receivers		
Classrooms at schools and other educational institutions	45	65[1]
Hospital wards and operating theatres	45	65[1]
Places of worship	45	65[1]
Active recreation areas (characterised by sporting activities and activities which generate noise)	-	65
Passive recreation areas (characterised by contemplative activities which generate little noise)	-	60
Commercial	-	70
Industrial	-	75

Note 1: It is assumed that these receivers have fixed windows which conservatively results in internal noise levels being around 20 dB lower than the external noise level.

3.1.3 NML Summary

The construction NMLs for the proposal have been determined using the results from the unattended noise monitoring and are shown in **Table 6**.

Out of hours NMLs would be applicable should works be required to be undertaken outside ICNG standard construction hours.

Table 6 Project Specific Noise Management Levels

Receiver Type	Monitoring Location	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)			
		Standard Construction (RBL +10 dB)[1]	Out of Hours (RBL +5 dB)		
		Daytime	Daytime[2]	Evening	Night-time
Residential (NCA02)	L02	50	45	44	44
Residential (NCA03)	L01	49	44	44	44
Commercial	n/a	70	70	-	-

Note 1: RBL = Rating Background Level.

Note 2: Daytime out of hours is 7 am to 8 am and 1 pm to 6 pm on Saturday, and 8 am to 6 pm on Sunday and public holidays.

3.2 Construction Vibration Criteria

The effects of vibration from construction works can be divided into three categories:

- Those in which the occupants of buildings are disturbed (human comfort)
- Those where building contents may be affected (building contents)
- Those where the integrity of the building may be compromised (structural or cosmetic damage).

3.2.1 Human Comfort Vibration

People can sometimes perceive vibration impacts when vibration generating construction works are located close to occupied buildings.

Vibration from construction works tends to be intermittent in nature and the EPA's *Assessing Vibration: a technical guideline* (2006) provides criteria for intermittent vibration based on the Vibration Dose Value (VDV). The 'preferred' and 'maximum' VDVs for human comfort impacts are shown in **Table 7**.

Table 7 Vibration Dose Values for Intermittent Vibration

Building Type	Assessment Period	Vibration Dose Value[1] ($m/s^{1.75}$)	
		Preferred	Maximum
Critical Working Areas (eg operating theatres or laboratories)	Day or night-time	0.10	0.20
Residential	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night-time	0.40	0.80
Workshops	Day or night-time	0.80	1.60

Note 1: The VDV accumulates vibration energy over the daytime and night-time assessment periods, and is dependent on the level of vibration as well as the duration.

3.2.2 Effects on Building Contents

People perceive vibration at levels well below those likely to cause damage to building contents. For most receivers, the human comfort vibration criteria are the most stringent and it is generally not necessary to set separate criteria for vibration effects on typical building contents.

Exceptions to this can occur when vibration sensitive equipment, such as electron microscopes, are located in buildings near to construction works. No such items of equipment have been identified in the proposal area.

3.2.3 Structural and Cosmetic Damage Vibration

If vibration from construction works is sufficiently high it can cause damage to structural elements of affected buildings. The levels of vibration required to cause cosmetic damage tend to be at least an order of magnitude (10 times) higher than those at which people can perceive vibration.

Examples of damage that can occur includes cracks or loosening of drywall surfaces, cracks in supporting columns and loosening of joints. Structural damage vibration limits are contained in British Standard BS 7385 and German Standard DIN 4150.

BS 7385

British Standard BS 7385 recommends vibration limits for transient vibration judged to give a minimal risk of vibration induced damage to affected buildings. The limits for residential and industrial buildings are shown in **Table 8**.

Table 8 BS 7385 Transient Vibration Values for Minimal Risk of Damage

Group	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 at 4 Hz and above	
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

Note 1: Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

For heritage buildings, the standard states that "*a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive*".

DIN 4150

German Standard DIN 4150 also provides guideline vibration limits for different buildings. Damage is not expected to occur where the values are complied with and the values are generally recognised to be conservative. The DIN 4150 values for buildings and structures are shown in **Table 9**.

Table 9 DIN 4150 Guideline Values for Short-term Vibration on Structures

Group	Type of Structure	Guideline Values Vibration Velocity (mm/s)				
		Foundation, All Directions at a Frequency of			Topmost Floor, Horizontal	Floor Slabs, Vertical
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified as Group 1 or 2 **and** are of great intrinsic value (eg heritage listed buildings)	3	3 to 8	8 to 10	8	20[1]

Note 1: It may be necessary to lower the relevant guideline value markedly to prevent minor damage.

3.2.4 Minimum Working Distances for Vibration-intensive Works

Minimum working distances for typical vibration-intensive construction equipment are provided in the Roads and Maritime (now Transport for NSW) *Construction Noise and Vibration Guideline* (CNVG) and are shown in **Table 10**. The minimum working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from the NSW EPA Vibration Guideline). They are based on empirical data which suggests that where works are further from receivers than the quoted minimum distances then impacts are not considered likely.

Table 10 Recommended Minimum Working Distances from Vibration-intensive Equipment

Plant Item	Rating/Description	Minimum Distance		
		Cosmetic Damage		Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1–2 tonne)	5 m	11 m	15 m to 20 m
	<100 kN (2–4 tonne)	6 m	13 m	20 m
	<200 kN (4–6 tonne)	12 m	25 m	40 m
	<300 kN (7–13 tonne)	15 m	31 m	100 m
	>300 kN (13–18 tonne)	20 m	40 m	100 m
	>300 kN (>18 tonne)	25 m	50 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	5 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	15 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	44 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	5 m to 40 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	5 m	4 m
Jackhammer	Hand held	1 m (nominal)	3 m	2 m

The minimum working distances are indicative and will vary depending on the particular item of equipment and local geotechnical conditions. The distances apply to cosmetic damage of typical buildings under typical geotechnical conditions.

3.3 Operational Noise Criteria

The NSW *Noise Policy for Industry* (NPfI) was released in 2017 and sets out the requirements for the assessment and management of operational noise from industry in NSW.

The NPfI defines how to determine 'trigger levels' for noise emissions from industrial developments. Where a development is likely to exceed the trigger levels at existing noise-sensitive receivers, feasible and reasonable noise management measures are required to be considered to reduce the impacts.

There are two types of trigger levels – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses:

- The **intrusiveness** of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15-minutes, does not exceed the representative background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended **amenity** levels specified in the NPfI for that particular land use.

Intrusive and amenity noise levels are not used directly as regulatory limits. They are used to assess the potential impact of noise, assess feasible and reasonable mitigation options and subsequently determine achievable noise requirements.

The NPfI provides guidance on assigning residential receiver amenity noise categories based on the site-specific features shown in **Table 11**.

Table 11 Residential Receiver Amenity

Receiver Category	Typical Planning Land Use Zoning	Typical Existing Background Noise Levels (RBL)	Description
Rural	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime <40 dBA Evening <35 dBA Night <30 dBA	Rural – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.

Receiver Category	Typical Planning Land Use Zoning	Typical Existing Background Noise Levels (RBL)	Description
Suburban residential	RU5 – village RU6 – transition R2 – low density residential R3 – medium density residential E2 – environmental conservation E3 – environmental management	Daytime <45 dBA Evening <40 dBA Night <35dBA	Suburban – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban residential	R1 – general residential R4 – high density residential B1 – neighbourhood centre (boarding houses and shop-top housing) B2 – local centre (boarding houses) B4 – mixed use	Daytime >45 dBA Evening >40 dBA Night >35 dBA	Urban – an area with an acoustical environment that: • Is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources • Has through-traffic with characteristically heavy and continuous traffic flows during peak periods • Is near commercial districts or industrial districts • Has any combination of the above.

Amenity noise categories for the surrounding receivers have been determined with reference to the NPfI. The assessment is shown in **Table 12**.

Table 12 Residential Receiver Amenity Category Assessment

Area	Land Use Zoning	Existing Background Noise Levels RBL (dBA)			Resulting Amenity Classification	Discussion
		Day	Eve	Night		
NCA01 NCA02 NCA03	RU4 Primary Production Small Lots	39	39	39	Rural	The residences in NCA01, NCA02 and NCA03 are zoned as RU4 Primary Production Small Lots and existing noise levels are relatively low and controlled by distant road traffic noise, industrial noise and natural environment. Residences have, therefore, been classified as rural.

3.3.1 Project Noise Trigger Levels

The trigger levels for industrial noise from the proposal are summarised in **Table 13**. They are based on the previously measured background noise levels, where appropriate. The Project Noise Trigger Levels (PNTL) are the most stringent of the intrusiveness and amenity trigger level for each period and are highlighted below.

Table 13 Project Noise Trigger Levels

Receiver Type	Monitoring Location	Period	Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level (dBA)	Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
				RBL[1]	Intrusiveness	Amenity[2,3]
Residential (NCA01, NCA02) (rural)	L02	Day	50	40	**45**	48
		Evening	45	39	44	**43**
		Night	40	39	44	**38**
Residential (NCA03) (rural)	L01	Day	50	39	**44**	48
		Evening	45	39	44	**43**
		Night	40	39	44	**38**
Commercial	-	When in use	65	-	-	**63**

Note 1: RBL = Rating Background Level.

Note 2: The recommended amenity noise levels have been reduced by 5 dB, where appropriate, to give the project amenity noise levels due to other sources of industrial noise being present in the area, as outlined in the NPfI.

Note 3: The project amenity noise levels have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

3.3.2 Cumulative Noise Impacts

The NSW Government *Cumulative Impact Assessment Guidelines for State Significant Projects* requires that the potential combined effect of cumulative impacts on all nearby industrial developments to be considered when assessing potential noise impacts from state significant projects. The guideline references the NPfI when determining the approach to assessing the cumulative industrial noise impacts.

The NPfI states that it aims to limit continuing increases in cumulative industrial noise through the application of amenity noise levels, which are applicable to all industrial noise sources in an area.

The NPfI requires that the amenity noise levels which are applied to an individual project be reduced by 5 dB to allow for the potential cumulative impact from multiple sources of industrial noise in an area (including existing and new).

By doing this, the policy accounts for potential cumulative impacts by lowering the criteria for each individual development to ensure that the ambient noise level within an area from all industrial noise sources combined remains below the recommended amenity noise levels, where feasible and reasonable. The NPfI states that *"where the project amenity noise level applies and it can be met, no additional consideration of cumulative industrial noise is required"*.

The potential cumulative impacts from the development and other sources of industrial noise in the area are therefore accounted for in the proposal-specific PNTLs (see **Table 13**).

3.3.3 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events from the proposal during the night-time period is required to be considered. This is applicable only to residential receivers.

The NPfI defines the sleep disturbance screening level as 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is greater.

The sleep disturbance screening levels for the proposal are shown in **Table 14**.

Table 14 Sleep Disturbance Screening Levels

Location	Noise Level (dBA)	
	Measured Prevailing Night-time Background Level	Sleep Disturbance Screening Level[1]
NCA01, NCA02, NCA03	39	54

Note 1: The sleep disturbance screening level as 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is greater

A detailed maximum noise level event assessment should be completed where the sleep disturbance screening level is exceeded. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.

The NPfI refers to the *Road Noise Policy* (RNP) for additional information regarding sleep disturbance. enHealth Council studies are referenced which indicate that for short-term or transient noise events, for good sleep over eight hours the indoor L_{AFmax} sound pressure level should ideally not exceed around 45 dBA more than 10 or 15 times per night.

The RNP goes on to conclude that from the research on sleep disturbance to date:

- Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep
- One or two events per night with maximum internal noise levels of 65-70 dBA are not likely to affect health and wellbeing significantly.

3.3.4 Noise Source Inventory

A noise source inventory which includes the details of the various operational noise sources at the development is shown in **Table 15**.

Table 15 Noise Source Inventory

Category	Noise Source	Usage	Reference for Noise Data
On-site traffic	Light vehicles	Light vehicles would access the development and park in the various car parks. Modelled in all locations shown in **Figure 3** using vehicle volumes in **Table 21**.	Sound power level taken from measurement data of various light vehicle types and models at speeds of up to around 40 km/h, including vehicle acceleration.
	Medium vehicles	Deliveries to the development would be via medium and heavy vehicles. Medium and heavy vehicles would access the development and travel to the various hardstands/loading docks. Modelled on all medium/heavy vehicle routes shown in **Figure 3** using vehicle volumes in **Table 21**.	Sound power level taken from historical measurement data of various medium rigid truck types and models in approximate 5 to 15 tonne range.
	Heavy vehicles		Sound power level taken from Federal Highway Administration's Traffic Noise Model. Assumes slow speed for 80% of the time and truck acceleration for 20% of the time.
Hardstand and loading docks	Forklifts, reversing alarms, air brakes, roller doors	Heavy vehicle deliveries would be unloaded by forklifts in the various hardstands/loading docks. Modelled in all hardstands/loading docks shown in **Figure 3** using vehicle volumes in **Table 21**. Forklifts have been conservatively assumed to operate externally at all hardstands/loading docks.	Sound power level taken from historical measurement data of typical loading dock activities at similar warehousing and distribution facilities.
Internal activities	Typical warehousing and distribution activities	Internal noise-generating activities at all warehouses would be associated with typical warehousing and distribution activities. Noise from these activities is expected to be minimal.	Sound power level based on observations of typical internal activities at similar warehousing and distribution facilities.
Mechanical plant	Roof fans	Roof fans would be used to cycle air in the warehouses. At this early stage of the development, specific mechanical plant requirements for each building have not been determined.	Sound power level taken from measurement data and manufacturers specifications for typical roof fans at similar warehousing and distribution facilities.
	Office air-conditioning units	Air-conditioning units would be used for all office buildings. At this early stage of the development, specific mechanical plant requirements for each building have not been determined.	Sound power level taken from measurement data and manufacturers specification data for typical air-conditioning units.

3.3.5 Corrections for Annoying Noise Characteristics

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, intermittency or dominant low-frequency content. The NPfI specifies the following modifying factor corrections, shown in **Table 16**, which are to be applied where annoying characteristics are present. The corrections are to be added to the noise level at the receiver before comparison with the Project Noise Trigger Levels.

Table 16 NPfI Modifying Factor Corrections

Factor	Assessment/ Measurement	When to Apply	Correction[1]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by the levels defined in the NPfI.	5 dB[2]
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements	Measure/assess source contribution C and A weighted $L_{eq,t}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level to which the thresholds defined in the NPfI are exceeded.	2 or 5 dB[2]
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level	The source noise heard at the receiver varies by more than 5 dB and the intermittent nature of the noise is clearly audible. The NPfI further defines intermittent noise as noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB, for example, equipment cycling on and off. The EPA has confirmed[4] that the intermittent correction does not apply to short-term events that emerge above the general industrial noise level and is therefore not applicable to industrial or commercial sites that have vehicle or plant movements at night, including audible reversing alarms. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.	5 dB[3]
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction of 10 dB[2] (excluding duration correction)

Note 1: Corrections to be added to the measured or predicted levels.

Note 2: Where a source emits tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

Note 3: Adjustment to be applied to night-time only.

Note 4: *How to Apply the Noise Policy for Industry Intermittent Modifying Factor Corrections*, NSW Environment Protection Authority, Acoustics Australia Vol. 50, No. 3, September 2022.

Details of the modifying factor corrections applied in the assessment are provided in **Section 4.2.2**.

3.3.6 Residual Impacts

The NPfI defines residual noise impacts as exceedances of the Project Noise Trigger Levels which remain after all feasible and reasonable source and pathway mitigation measures have been considered.

The significance of residual noise impacts, as defined in the NPfI, is shown in **Table 17.** Examples of receiver-based treatments that can be used to mitigate residual impacts are shown in **Table 18**.

Table 17 NPfI Significance of Residual Noise Impacts

If the Predicted Noise Level minus the Project Noise Trigger Level is:	And the Total Cumulative Industrial Noise Levels is:	Then the Significance of the Residual Noise Level is:
≤ 2 dBA	Not applicable	Negligible
≥ 3 but ≤ 5 dBA	< recommended amenity noise level or > recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1dB	Marginal
≥ 3 but ≤ 5 dBA	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate
> 5 dBA	≤ recommended amenity noise level	Moderate
	> recommended amenity noise level	Significant

Table 18 NPfI Examples of Receiver-based Treatments to Mitigate Residual Noise Impacts

Significance of Residual Noise Impact	Example of Potential Treatment
Negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
Marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
Moderate	As for ‘marginal’, but also upgraded facade elements, such as windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Significant	May include suitable commercial agreements where considered feasible and reasonable.

3.3.7 Traffic on Surrounding Roads

The potential impacts from proposal-related traffic on the surrounding public roads are assessed using the NSW EPA *Road Noise Policy* (RNP).

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB. Where this is considered likely, further assessment is required using the RNP criteria shown in **Table 19**.

Table 19 RNP/NCG Criteria for Assessing Traffic on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am – 10 pm)	Night-time (10 pm – 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/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 existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

4.0 Methodology

4.1 Construction Noise and Vibration Assessment

A noise model of the study area has been used to predict noise levels from the proposed construction work to all surrounding receivers. The model uses ISO 9613-2 algorithms in SoundPLAN software.

Local terrain, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the construction sites and surrounding areas.

4.1.1 Construction Activities

Representative scenarios have been developed to assess the likely impacts from the various construction phases of the proposal. These scenarios are shown in **Table 20**. The site is provided as benched and serviced land and only minor earthworks are required using 10T Excavator, which is included in the equipment for both scenarios.

The assessment uses 'realistic worst-case' scenarios to determine the impacts from the noisiest 15-minute period that are likely to occur for each work scenario, as required by the ICNG. The impacts represent construction noise levels without mitigation applied.

The sound power levels for the construction equipment used in each scenario are presented in **Appendix C.**

Table 20 Construction Equipment

Scenario	Works Activity	Equipment
W.01	Construction of Pads, Hardstands & Ramps	Excavator 10T, vacuum truck, concrete pump, concrete truck, bored piling.
W.02	Construction of Structures	Excavator 10T, vacuum truck, mobile crane, hand tools, bored piling.

4.1.2 Hours of Construction

Construction activities for the proposal would only be undertaken during the following hours:

- 7:00 am to 6:00 pm, Mondays to Fridays
- 8:00 am to 1:00 pm on Saturdays
- At no time on Sundays or Public Holidays.

4.2 Operational Noise Assessment

The potential operational noise levels from the proposal have been predicted to the surrounding receivers using the ISO 9613-2 algorithm in SoundPLAN V8.2, implemented in accordance with ISO 17534.

ISO 9613-2 is an industry standard algorithm that is considered suitable for use in the prediction of noise from industrial sources where intervening objects provide acoustic shielding, such as at the subject site and surrounding area.

The ISO 9613-2 algorithm predicts continuous A-weighted sound pressure levels under noise-enhancing meteorological conditions favourable to downwind propagation, or equivalently, propagation under a well-developed, moderate, ground-based temperature inversion, such as commonly occurs on clear calm nights.

Downwind propagation conditions include wind from source to receiver, with wind speeds of around 1 to 5 m/s, measured at a height of 3 to 11 m above the ground. These propagation conditions are considered consistent with the noise-enhancing weather conditions specified in *Fact Sheet D: Accounting for noise-enhancing weather conditions* of the NPfI.

ISO 9613-2 has been used extensively on industrial projects in Australia over several decades and has been accepted previously by NSW DPE (now DPHI) in numerous environmental noise assessments.

The noise model includes ground topography, ground type (ground absorption modelled at 0.5 in the residential area and 0.0 elsewhere), buildings and representative worst-case noise sources from the proposal.

The potential impacts have been determined by comparing the predicted worst-case noise levels to the NPfI PNTLs in a 15-minute assessment period.

Noise levels have been assessed at the identified sensitive receivers with reference to the requirements of ‘Section 2.6 – Assessment Locations’ of the NPfI. This includes assessment of impacts at all floors of identified multi-storey buildings.

4.2.1 Operational Noise Sources

The proposal is in the early design stages and the future tenants are currently unknown. Several assumptions have been made regarding the future tenants and likely sources of noise. These assumptions have been used to develop representative worst-case noise modelling scenarios that reflect the expected highest noise emissions that the development would likely emit.

The proposal is a speculative development with no tenants committed. The facility has been designed to accommodate typical warehouse and distribution centre uses and is not temperature controlled.

The development comprises two warehouse buildings with associated ancillary offices, truck access, hardstands, and undercroft carparking below each warehouse. Vehicle access to both warehouses would be from the eastern side of the Site via Johnston Crescent.

Internal noise sources would generally be minimal and associated with typical logistical, distribution, warehousing and office space activities. There would be no use of manufacturing equipment within any warehouses. Mechanical plant would typically be located on the roof. The development would operate 24 hours a day.

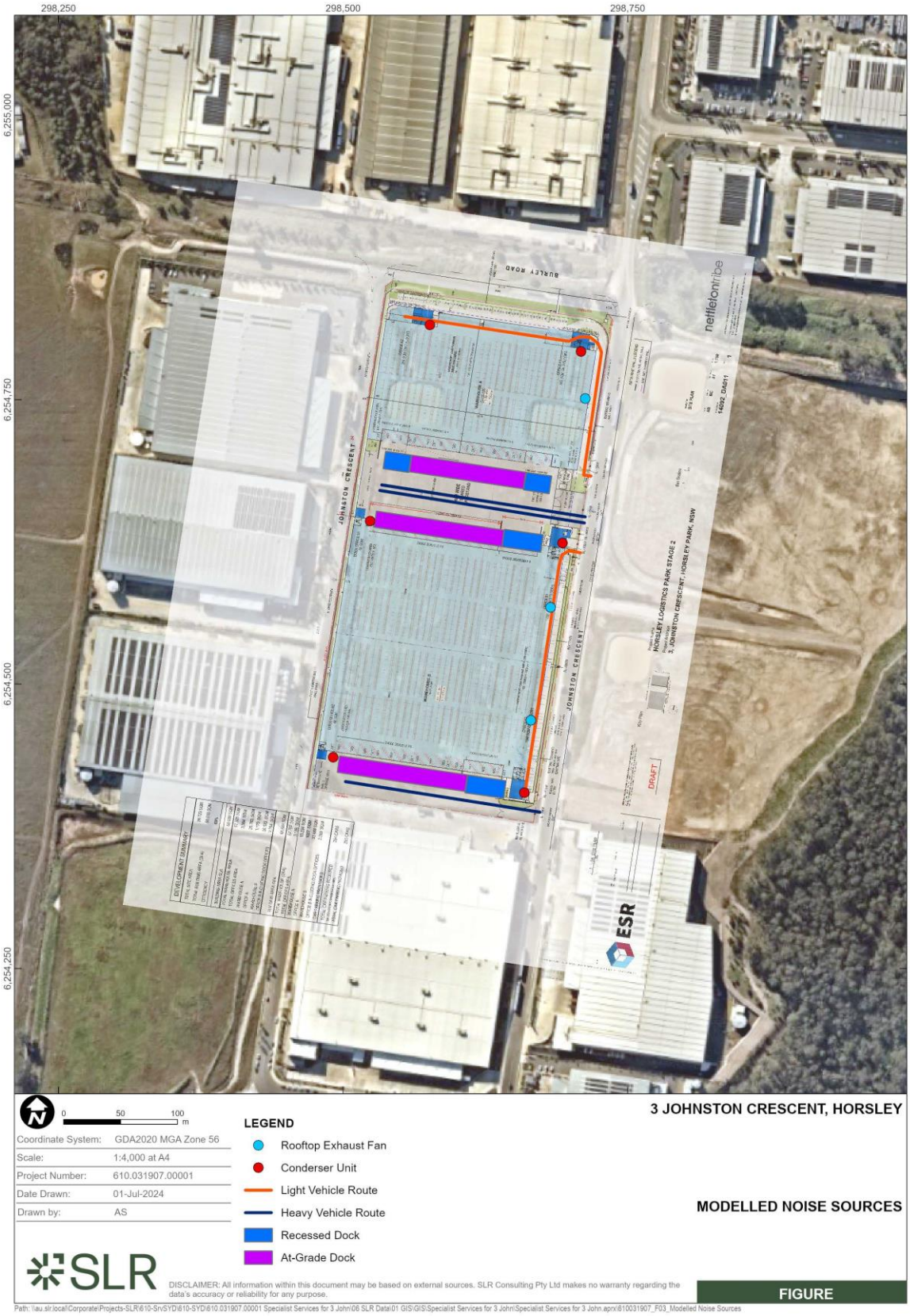
The main sources of operational noise at the development are expected to include:

- On-site light and heavy vehicle movements
- Loading dock activities in hardstands
- Mechanical plant
- Off-site vehicle movements.

A summary of the expected noise sources and representative worst-case assessment scenario associated with the operation of the development is provided below.

The location of the modelled noise sources is shown in **Figure 3**.

Figure 3 Modelled Noise Sources



On-Site Traffic

On-site vehicles have been modelled using the data provided by the project's traffic consultant in **Table 21**. The volumes are representative of the expected worst-case 15-minute period for the daytime, evening and night-time. The volumes conservatively assume that light and heavy vehicles access the site concurrently during the worst-case 15-minute assessment period. In reality, vehicle access would be unlikely to occur concurrently, particularly during the night-time.

Heavy vehicle deliveries to the warehouses would be via a range of freight vehicles including medium trucks (ie rigid trucks) and heavy trucks (ie articulated semi-trailers up to 20 m).

Table 21 Vehicle Traffic Data – Worst-case 15-Minute Period

Vehicle Type	Location	Sound Power Level (dBA)	Vehicle Speed (km/h)	Number of Vehicles in Worst-case 15-Minute Period[1]		
				Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night-time (10pm to 7am)
Heavy trucks	Warehouse A vehicle entry and hardstand	108[3]	10	1	1	1
	Warehouse B vehicle entry and hardstand		10	2	1	1
Medium trucks	Warehouse A vehicle entry and hardstand	97[2]	10	1	1	1
	Warehouse B vehicle entry and hardstand		10	2	2	2
Light vehicles	Warehouse A vehicle entry and undercroft carpark	90[2]	10	6	5	5
	Warehouse B vehicle entry and undercroft carpark		10	9	6	6

Note 1: Total vehicles, includes both inbound and outbound vehicles. Volumes are rounded up to whole numbers for display purposes.

Note 2: Sound power level based on SLR measurement data.

Note 3: Sound power level for 'heavy trucks' based on 106 dBA for trucks at slow speed and is representative of trucks with three or more axles. 'Heavy trucks' on ramps are assumed to be accelerating 100% of the time with sound power level of 111 dBA. Sound power levels taken from the Federal Highway Administration's *Traffic Noise Model*. Sound power levels for 'medium trucks' based on measurements data.

Hardstands and Loading Docks

Details of the hardstand and loading dock noise sources are shown in **Table 22**. The various sources have been modelled in the hardstand areas (see **Figure 3**) based on the corresponding number of heavy vehicle movements in the worst-case 15-minute periods (see **Table 21**).

Table 22 Typical Hardstand and Loading Dock Noise Sources

Noise Source	Sound Power Level (dBA)[1]	Typical Duration of Use in Worst-case 15-minute Period
Truck reversing alarm	107[2,3]	30 seconds
Forklift reversing alarm	102[2,3]	90 seconds
Air brakes	118	1 second
Roller door	94	15 seconds
Electric forklift	83	900 seconds

Note 1: SWLs based on measurement data, where appropriate.

Note 2: SWL based on recommendation to use broadband reversing alarms, see **Section 7.2**.

Note 3: SWL includes a -3 dB reduction due to alarms being discrete events.

Internal Activities

The future tenants of the warehouses would likely be associated with typical warehousing and distribution uses. Internal noise-generating activities at all warehouses are expected to generally be minimal. A sound power level of 75 dBA has been applied at openings in the facades of each warehouse to cover potential break-out noise from general internal activities, based on observations of loading activities at similar warehouse facilities. Warehouse roller shutter doors are assumed to be open during loading dock activities.

Mechanical Plant

At this early stage of the development the specific mechanical plant requirements for each warehouse have not been determined. Indicative external mechanical plant types, sound power levels, number of units and locations were provided by the proposal team, as detailed in **Table 23**. The locations of the sources are shown in **Figure 3**.

Table 23 Mechanical Plant

Noise Source	Sound Power Level (dBA)	Indicative Locations
Office condensers	78	Six units – One unit on the roof of each office in Warehouse A and Warehouse B – conservatively assumed to operate 24 hours a day.
Extraction fans	90	Three units – One unit on the roof of Warehouse A and two units on the roof of Warehouse B – conservatively assumed to operate 24 hours a day.

The exact requirements for mechanical plant would be determined as the project progresses when specifics are known about tenant requirements. Further assessment of mechanical plant would be completed during the production of later noise assessments when the selected mechanical plant is known.

4.2.2 Corrections for Annoying Noise Characteristics

The potential annoying noise characteristics and modifying factor corrections relevant to the proposal are:

- **Tonality** – the only source identified with potential tonal characteristics is truck reversing alarms. However, when considering broadband reversing alarms have

been recommended as a noise mitigation measure (see **Section 7.2**), it is unlikely that this noise source would result in tonal noise impacts at the receivers and no corrections have been applied.

- **Low frequency noise** – noise levels from development-related mechanical plant are not expected to result in low frequency noise impacts at residential receivers and no corrections have been applied.
- **Intermittent noise** – the NPfI defines intermittent noise as noise heard at the receiver where the level suddenly drops or increases several times during the assessment period, with a noticeable change of at least 5 dB. The intermittent correction does not apply to short-term events that emerge above the general industrial noise level and is therefore not applicable to industrial or commercial sites that have vehicle or plant movements at night, including audible reversing alarms. While testing of the backup generators may be intermittent, the testing is only undertaken during the daytime when no correction is applicable. No other sources have been identified with potential intermittent characteristics.

4.2.3 Noise Sources with Potential for Sleep Disturbance

As the development is proposed to operate 24-hours a day, noise emissions during the night-time require assessment for potential sleep disturbance at the nearest residential receivers. The details of typical activities with the potential to cause sleep disturbance are shown in **Table 24**.

The various sources have been modelled in the hardstand areas (see **Figure 3**) with truck movements modelled on the truck access routes.

Table 24 Sleep Disturbance Noise Events – L_{Amax} Sound Power Levels

Noise Source	Sound Power Level L_{Amax} (dBA)
Truck movement	111
Truck airbrake	118
Truck reversing alarm	110
Roller door	94

4.2.4 Off-site Road Traffic

Access routes to/from the site would be via Johnston Crescent and Old Wallgrove Road. The potential noise impacts from additional traffic have been assessed based on traffic data provided by the transport consultant Ason and shown in **Table 25**.

Table 25 Traffic Volumes – Existing and Development-related

Road	Existing Traffic Volumes				Development-related Traffic Volumes			
	Daytime (7am to 10pm)		Night-time (10pm to 7am)		Daytime (7am to 10pm)		Night-time (10pm to 7am)	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
Johnston Crescent	1057	352	364	57	478	153	97	23

4.2.5 Weather Conditions

Fact Sheet D of the NPfI requires noise assessments to consider the potential effects of noise-enhancing weather conditions, such as wind from the source to the receiver and/or temperature inversions.

The nearest sensitive receivers are 368 m from the proposal site and the effects of weather on noise levels are expected to be minimal. Notwithstanding, the noise prediction modelling uses ISO 9613-2 algorithms which include noise-enhancing weather conditions including downwind propagation, or equivalently, propagation under a well-developed moderate ground-based temperature inversion.

As such, the assessment has conservatively applied noise-enhancing weather conditions for all periods as per Option 1 of Fact Sheet D of the NPfI.

5.0 Assessment of Impacts

5.1 Construction Noise

The predicted noise levels at the most-affected sensitive receivers surrounding the site are shown in **Table 26**.

The predictions represent a realistic worst-case scenario where the equipment in each scenario is working concurrently and the nearest location to each receiver. It is expected that noise levels would frequently be lower than the worst-case levels presented.

Table 26 Predicted Construction Noise Levels – Standard Daytime Construction Hours

NCA	Most-affected Receiver Location	Type	NML	Predicted Noise Level – $L_{Aeq(15minute)}$ (dBA)	
				W.01 Construction of Pads, Hardstands & Ramps	W0.2 Construction of Structures
NCA02	49-53 Greenway Pl, Horsley Park NSW 2175	Residential	50	36	37
NCA03	315-319 Burley Rd, Horsley Park NSW 2175	Residential	49	45	46
Commercial	2 Johnston Cr, Horsley Park NSW 2175	Commercial	70	64	65

Construction noise levels are predicted to comply with the relevant NMLs at all surrounding residential and commercial receivers.

5.2 Construction Vibration

The works are understood to not require any vibration intensive items of equipment. As such, vibration impacts are expected to be negligible and have not been assessed further.

5.3 Operational Noise

5.3.1 Predicted Unmitigated Noise Levels

A summary of the worst-case operational noise assessment at the receivers surrounding the proposal is shown in **Table 27**. Impacts have been predicted at all floors of the nearest receivers. The predicted worst-case levels are compared to the Project Noise Trigger Levels to determine the potential impact from the proposal.

Table 27 Operational Noise Assessment – Unmitigated

NCA	Most-affected Receiver Location	Type	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
				Noise Criteria	Predicted	Exceed-ance	
NCA01	2b Aldington Rd, Kemps Creek NSW 2178	Residential	Day	45	21	-	Yes
			Evening	43	19	-	Yes
			Night	38	19	-	Yes
NCA02	49-53 Greenway Pl, Horsley Park NSW 2175	Residential	Day	45	23	-	Yes
			Evening	43	21	-	Yes
			Night	38	21	-	Yes
NCA03	301-313 Burley Rd, Horsley Park NSW 2175	Residential	Day	44	33	-	Yes
			Evening	43	31	-	Yes
			Night	38	31	-	Yes
Commercial	2 Johnston Cr, Horsley Park NSW 2175	Commercial	Day	63	53	-	Yes
			Evening	63	51	-	Yes
			Night	63	51	-	Yes

The above assessment indicates that noise from the proposal is predicted to comply with the PNTLs at all of the surrounding receivers.

Noise contours of the predicted worst-case operational noise impacts are in **Appendix D**.

5.3.2 Sleep Disturbance

The predicted night-time maximum noise levels at the nearest residential receivers are shown in **Table 28**. These include the mitigation measures specified in **Section 7.2**.

The predictions include noise-enhancing weather conditions as discussed in **Section 4.2.5**.

Table 28 Sleep Disturbance Assessment

NCA	Type	Maximum Noise Level L_{Amax} (dBA)			Below Screening Level
		Sleep Dist. Screening Level	Maximum Predicted Level	Exceedance	
NCA01	Residential	54	36	-	Yes
NCA02	Residential	54	38	-	Yes
NCA03	Residential	54	49	-	Yes

The above shows that maximum noise levels are predicted to comply with the sleep disturbance screening level at the nearest residential receivers. Maximum noise levels from the development are unlikely to disturb sleep at these receivers and a detailed maximum noise level assessment is not required.

5.4 Off-site Traffic Assessment

The results of the off-site traffic assessment are shown in **Table 29**.

Table 29 Traffic Noise Assessment

Location	Road	RNP Increase Criterion (dB)	Predicted Change (dB)	
			Day	Night
Residential receivers in NCA3	Johnston Crescent	2.0	+1.6	+1.1

The above assessment shows that the predicted change in road noise levels at the nearest residences in NCA03 from development-related vehicles is expected to be below 2.0 dB. Increases of less than 2.0 dB are considered minor and not perceptible to the average person.

6.0 Cumulative Impacts

The NSW Government *Cumulative Impact Assessment Guidelines for State Significant Projects* requires that the potential combined effect of cumulative impacts on all nearby industrial developments to be considered when assessing potential noise impacts from state significant projects.

Cumulative impacts can be caused by the compounding effects of multiple projects in an area, and by the accumulation of effects from past, current and future activities as they arise.

6.1 Construction Noise

Cumulative construction noise impacts can occur where multiple work activities are being completed near to a particular receiver at the same time.

The construction work associated with the proposal has the possibility of interacting with the construction activities of three other nearby projects described in **Table 30**.

Table 30 Nearby Developments – Potential Cumulative Construction Impacts

DA Reference	Development Description	Current Status	Comments Regarding Cumulative Impacts
Horsley Logistics Park Stage 1 SSD-10436	Construction of four warehouse & logistics buildings	Stage 1 has been constructed	Located directly to the south of the proposal. Construction of the development appears to be almost complete.
Oakdale East Estate SSD-37486043 MOD1	Stage 1 works including intersection upgrades, bulk earthworks, internal roads, services, expansion of an existing warehouse in Precinct 1 and construction and operation of a warehouse in Precinct 3.	MOD1 approved 21 February 2024 and construction commenced	MOD1 work area located around 300m to the north-west of the proposal. Construction schedule unknown, may potentially result in cumulative construction impacts if constructed at same time as proposal.
Next DC S4 Data Centre Horsley Park SSD-63741210	Staged construction of five data centre buildings	Response to Submissions	Located directly to the east of the proposal. Construction schedule unknown, may potentially result in cumulative construction impacts if constructed at same time as proposal.

The above indicates that the majority of the identified nearby construction projects are not expected to result in cumulative construction noise impacts, due to works on the projects being complete. There is potential for cumulative construction noise impacts from MOD1 works at Oakdale East Estate (SSD-37486043 MOD1) and Next DC S4 Data Centre Horsley Park (SSD-63741210) if it is constructed at the same time as the proposal. The construction schedule for those projects is currently unknown.

Since construction scenarios and equipment for Oakdale East MOD1 and Next DC S4 Data Centre would likely require similar items of equipment to the proposal, concurrent

construction work could theoretically increase the worst-case noise levels in this report by around 3 dB (ie a logarithmic adding of two sources of noise at the same level). The likelihood of worst-case noise levels being generated by works on different projects at the same time is, however, considered low.

As such, cumulative construction impacts are not likely to significantly alter the predictions in this report and no specific mitigation is expected to be required.

The potential cumulative impacts from the proposal and other projects would continue to be considered as the project progresses when detailed construction planning is developed.

6.2 Operational Noise

The *Noise Policy for Industry* states that it aims to limit continuing increases in cumulative industrial noise through the application of amenity noise levels, which are applicable to all industrial noise sources in an area.

The policy accounts for potential cumulative impacts by lowering the criteria for each individual development to ensure that the ambient noise level within an area from all industrial noise sources combined remains below the recommended amenity noise levels, where feasible and reasonable. As such (as discussed in **Section 3.3.2**), the potential cumulative impacts from the proposal and other potential sources of industrial noise in the area are accounted for in the proposal-specific PNTLs and, therefore, do not require further consideration.

It should also be noted that the operational noise predictions in this report do not account for the later construction of buildings on surrounding sites that may provide additional acoustic screening between the development site and the nearest noise sensitive receivers.

7.0 Mitigation and Management Measures

7.1 Construction Impacts

The impacts during construction of the proposal are predicted to be consistent with major construction work near sensitive receivers. No works outside of Standard Construction Hours are currently proposed.

The use of standard mitigation measures to minimise the impacts is considered sufficient to control the majority of the impacts. Examples of measures that could be applied to the work are provided in the Transport for NSW *Construction Noise and Vibration Guideline* (see **Appendix E**).

Construction impacts are expected to remain during certain work activities at the nearest sensitive receivers even with the implementation of all feasible and reasonable mitigation measures.

A Construction Noise and Vibration Management Plan (CNVMP) would be prepared before any work begins. This would identify all potentially impacted receivers, assess the potential noise and vibration impacts from the proposal and provide details regarding how the impacts would be minimised through the use of all feasible and reasonable mitigation measures. The CNVMP would also contain procedures for handling complaints, should they occur, and detail any compliance monitoring requirements.

7.2 Operational Noise Impacts

Where operational noise impacts from the development are predicted to exceed the relevant noise criteria, feasible and reasonable operational noise mitigation and management measures should be considered, with the aim of reducing noise emissions to the relevant criteria.

The typical hierarchy for mitigation and management of industrial noise sources is as follows:

- Reducing noise emissions at the source (ie noise source control)
- Reducing noise in transmission to the receiver (ie noise path control)
- Reducing noise at the receiver (ie at-receiver control).

A detailed assessment of potential feasible and reasonable mitigation measures that can be applied to the development to minimise the operational noise impacts has been completed and is summarised in **Table 31**.

The measures should be regarded as indicative and would be further refined during detailed design when more details regarding specific tenants are known.

Table 31 Operational Noise Mitigation Options

Ref.	Mitigation Option	Noise Impact/Benefit	Feasible and Reasonable to Apply
Source Control			
S1	Optimised site layout to minimise noise emissions from the site	Where possible, the site layout has been designed so that the warehouse buildings screen the noisier areas of the development (ie hardstands and truck routes) from the nearest receivers.	Yes – applied during design of the concept
S2	Limit vehicle movements	A reduction in concurrent vehicle movements across the site by staggering delivery/pickup times and/or employee shift change times could reduce noise emissions. In practice, this would occur naturally across the estate due to operational requirements of the different tenants.	No – vehicle volumes used in this assessment are likely needed to meet tenant's requirements. Placing restrictions on allowable vehicle movements across the different tenancies is unlikely to be feasible and reasonable.
S3	Hardstand/external equipment use	Minimising the concurrent use of forklifts or other mobile plant outside the warehouses and/or limiting their use to the less sensitive day and evening periods. In practice, this would occur naturally across the estate due to operational requirements of the different tenants.	No – placing restrictions on allowable external use of forklifts and equipment across the different tenancies is unlikely to be feasible and reasonable.
S4	Use broadband and/or ambient sensing alarms on heavy vehicles where they are required to reverse during the night-time.	Reduce potential for annoying noise emissions during the night-time.	Yes – encourage use of broadband and/or ambient sensing alarms on heavy vehicles where they are required to reverse during the night-time
S5	Appropriate specification and location of mechanical plant during detailed design.	Potential noise impacts from mechanical plant have been identified based on the indicative assumptions made regarding the likely requirements for mechanical plant. The following indicative limiting sound power levels have been used in the assessment: - Rooftop extraction fans SWL limited to 90 dBA.	Yes – the specified mitigation measures are required to minimise noise impacts from mechanical plant. The noise impacts from all items of mechanical plant would be investigated further during detailed design stage to confirm mitigation requirements.

Ref.	Mitigation Option	Noise Impact/Benefit	Feasible and Reasonable to Apply
S6	Appropriate design of warehouses during detailed design.	Appropriate warehouse materials to minimise noise break-out from internal activities would be selected during detailed design.	Yes – noise impacts from internal equipment would be investigated further during detailed design or construction certificate stages if tenant requires manufacturing plant or other noisy equipment.
S7	Roller doors kept closed when loading/unloading is not occurring.	Reduce potential for noise breakout from internal activity.	Yes – roller doors should be kept closed when not in use for loading/unloading.
S8	Appropriate design of site layout to minimise the need for trucks to stop or brake outside of loading docks with line of sight to residential receivers.	Minimise noise emissions, particularly from truck airbrakes.	Yes – applied during design of the concept masterplan.
S9	Production of an Operational Noise Management Plan.	This would detail the measures that could be used by the various tenants to minimise general noise emissions from the site. Reference can be made to the Best Management Practice (BMP) measures listed in the NPfI (see **Appendix F**).	Yes – the ONMP would detail any operational requirements for the development.
Path Control			
P1	Not considered required	n/a	n/a
Receiver Control			
R1	Not considered required	n/a	n/a

The proposal is a speculative development without any tenants committed and the exact operational procedures of the site are not known at this time. Several assumptions have been made regarding the likely future uses and sources of noise. The noise predictions in this report should be regarded as indicative for planning purposes and are required to be confirmed at a later stage when detailed information is available.

8.0 Conclusion

SLR has been engaged to assess the potential construction and operational noise emissions from the proposed development at 3 Johnston Crescent, Horsley Park. The proposal includes the operation of two warehouse & logistics buildings, which would be in use 24/7.

The potential impacts from the proposal have been assessed against the noise and vibration specific Secretary's Environmental Assessment Requirements.

Construction noise levels are expected to comply with the management levels during the proposed activities at all residential and commercial receivers.

The operational noise assessment indicates operational noise levels are expected to comply with the trigger levels at the nearest receivers. The potential operational impacts and requirements for mitigation would be confirmed during further acoustic assessments completed during detailed design when tenant requirements are known.

Based on the predicted levels and indicative mitigation measures, the proposal is considered appropriate from an acoustic standpoint.

Appendix A Acoustic Terminology

Horsley Logistics Park Stage 2

SSD-71144719 Noise and Vibration Impact Assessment

ESR Australia

SLR Project No.: 610.031907.00002

11 October 2024

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

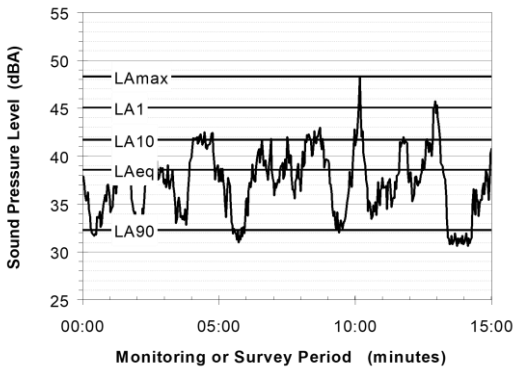
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

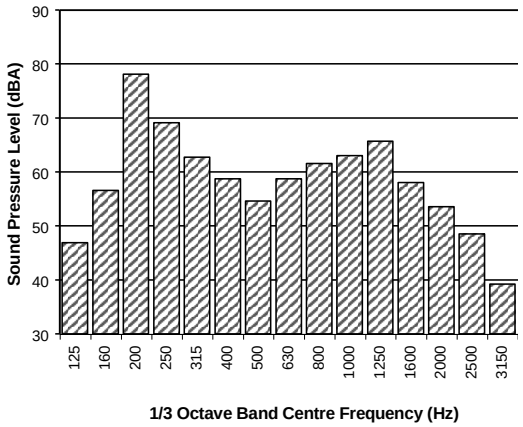
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

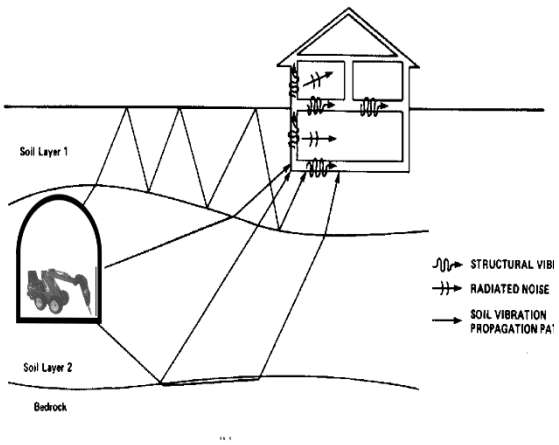
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience 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.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

Appendix B Noise Monitoring Results

Horsley Logistics Park Stage 2

SSD-71144719 Noise and Vibration Impact Assessment

ESR Australia

SLR Project No.: 610.031907.00002

11 October 2024

Appendix C Construction Noise Sources

Horsley Logistics Park Stage 2

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Equipment	Total SWL	Concrete Pump	Concrete Truck	Crane - Mobile (100t)	Excavator (10t)	Piling Rig – Bored	Hand Tools	Truck Vacuum
Sound Power Level[1]		109	109	113	100	112	104	109
Estimated on-time in any 15 minutes		15	15	15	15	5	15	15
Scenario								
W.01 Construction of Pads, Hardstands & Ramps	115	**X**	**X**		**X**	**X**		**X**
W.02 Construction of Structures	116			**X**	**X**	**X**	**X**	**X**

Note 1: Sound power level data is taken from the DEFRA Noise Database, RMS Construction and Vibration Guideline and TfNSW Construction Noise and Vibration Strategy.

Appendix D Operational Noise Contours

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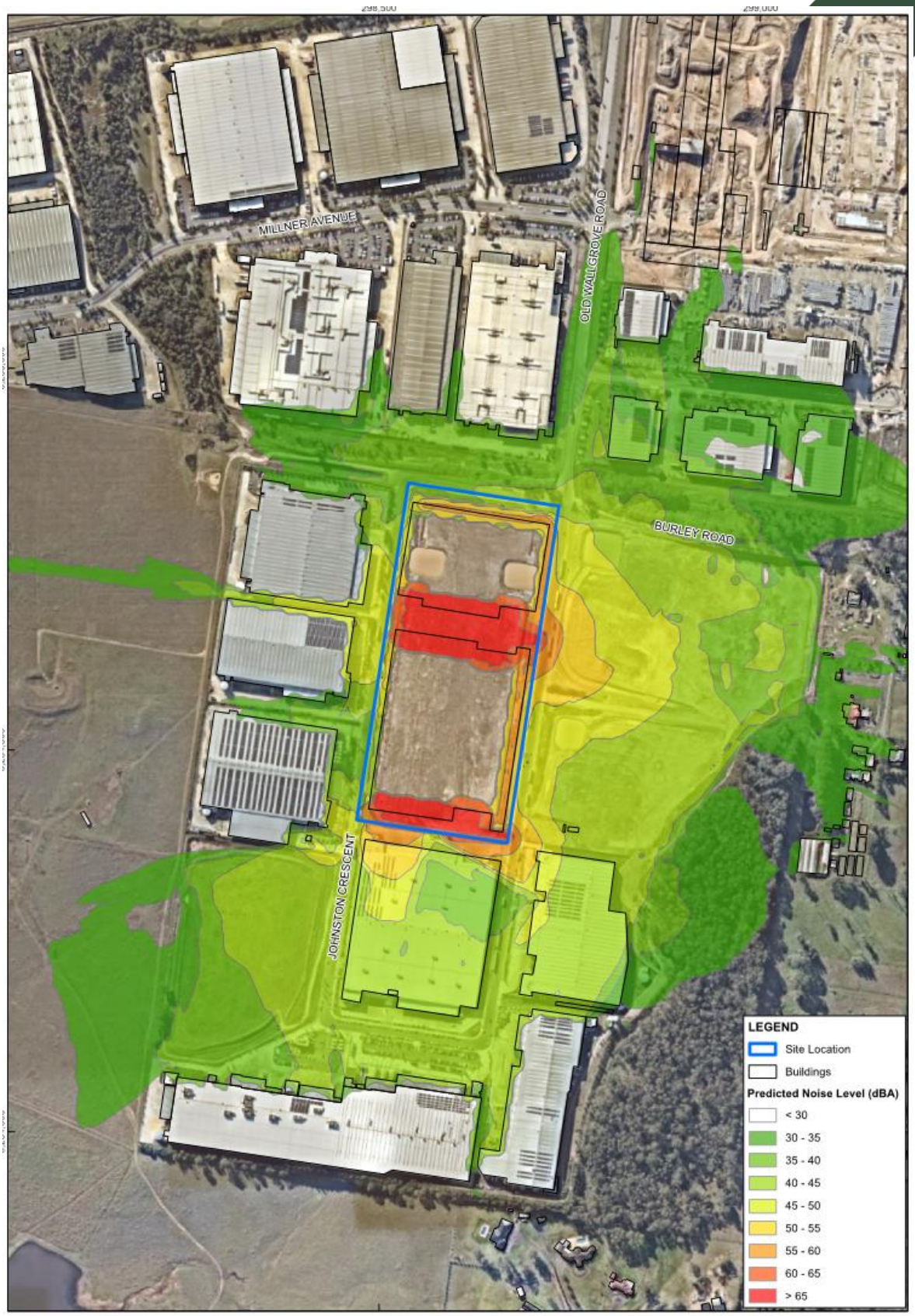
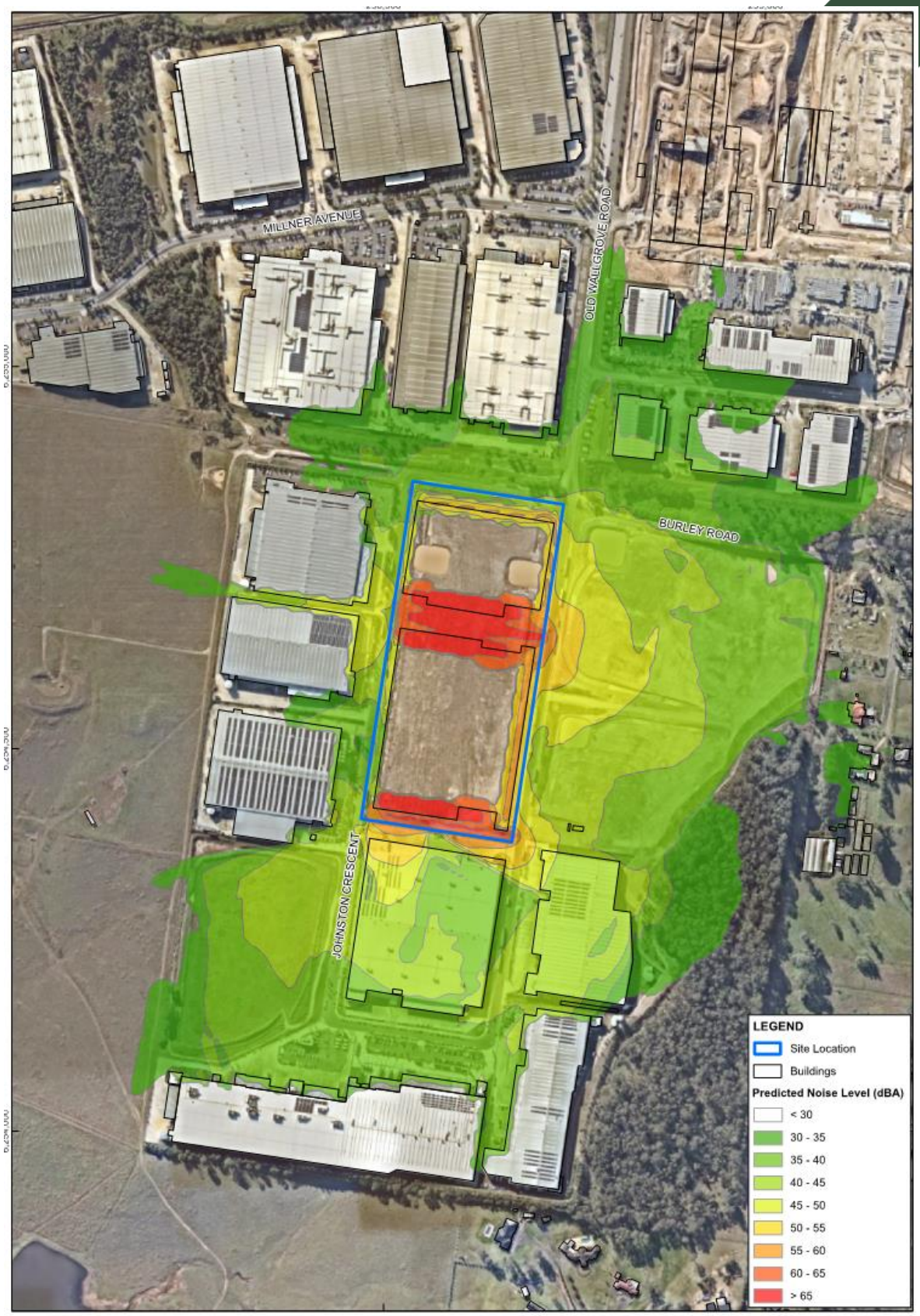
Predicted Operational Noise Contours – Day



Note 1: Noise contours calculated at 1.5 m above ground level.

Predicted Operational Noise Contours – Evening/Night



Note 1: Noise contours calculated at 1.5 m above ground level.

Appendix E CNVG Mitigation Measures

Horsley Logistics Park Stage 2

SSD-71144719 Noise and Vibration Impact Assessment

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CNVG Standard Mitigation and Management Measures

Action Required	Applies To	Details
Management measures		
Implementation of any project specific mitigation measures required.	Airborne noise	Implementation of any project specific mitigation measures required.
Implement community consultation or notification measures.	Airborne noise Ground-borne noise & vibration	Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required. Please contact Roads and Maritime Communication and Stakeholder Engagement for guidance. Website (If required) Contact telephone number for community Email distribution list (if required) Community drop-in session (if required by approval conditions).
Site inductions	Airborne noise Ground-borne noise & vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Verification	Airborne noise Ground-borne noise & vibration	Where specified under Appendix C of the CNVG a noise verification program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Attended vibration measurements	Ground-borne vibration	Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.

Action Required	Applies To	Details
Update Construction Environmental Management Plans	Airborne noise Ground-borne noise & vibration	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.
Building condition surveys	Vibration Blasting	Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage
Source controls		
Construction hours and scheduling	Airborne noise Ground-borne noise & vibration	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Construction respite period during normal hours and out-of-hours work	Ground-borne noise & vibration Airborne noise	See Appendix C of the CNVG for more details on the following respite measures: • Respite Offers (RO) • Respite Period 1 (R1) • Respite Period 2 (R2) • Duration Respite (DR)
Equipment selection.	Airborne noise Ground-borne noise & vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained.
Plant noise levels.	Airborne-noise	The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the CNVG. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturers specifications or Appendix H of the CNVG.
Rental plant and equipment.	Airborne-noise	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 2 of the CNVG.
Use and siting of plant.	Airborne-noise	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers. Only have necessary equipment on site.
Plan worksites and activities to minimise noise and vibration.	Airborne noise Ground-borne vibration	Locate compounds away from sensitive receivers and discourage access from local roads. Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.

Action Required	Applies To	Details
		Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. Very noise activities should be scheduled for normal working hours. If the work can not be undertaken during the day, it should be completed before 11:00pm. Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters. If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again.
Reduced equipment power	Airborne noise Ground-borne vibration	Use only the necessary size and power.
Non-tonal and ambient sensitive reversing alarms	Airborne noise	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.
Minimise disturbance arising from delivery of goods to construction sites.	Airborne noise	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out of hours movements where possible.
Engine compression brakes	Construction vehicles	Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.
Path controls		
Shield stationary noise sources such as pumps, compressors, fans etc.	Airborne noise	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities.	Airborne noise	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.

Action Required	Applies To	Details
Receptor control		
Structural surveys and vibration monitoring	Ground-borne vibration	Pre-construction surveys of the structural integrity of vibration sensitive buildings may be warranted. At locations where there are high-risk receptors, vibration monitoring should be conducted during the activities causing vibration.
See Appendix C of the CNVG for additional measures	Airborne noise Ground-borne vibration	In some instances, additional mitigation measures may be required.

Appendix F NPfl Mitigation Measures

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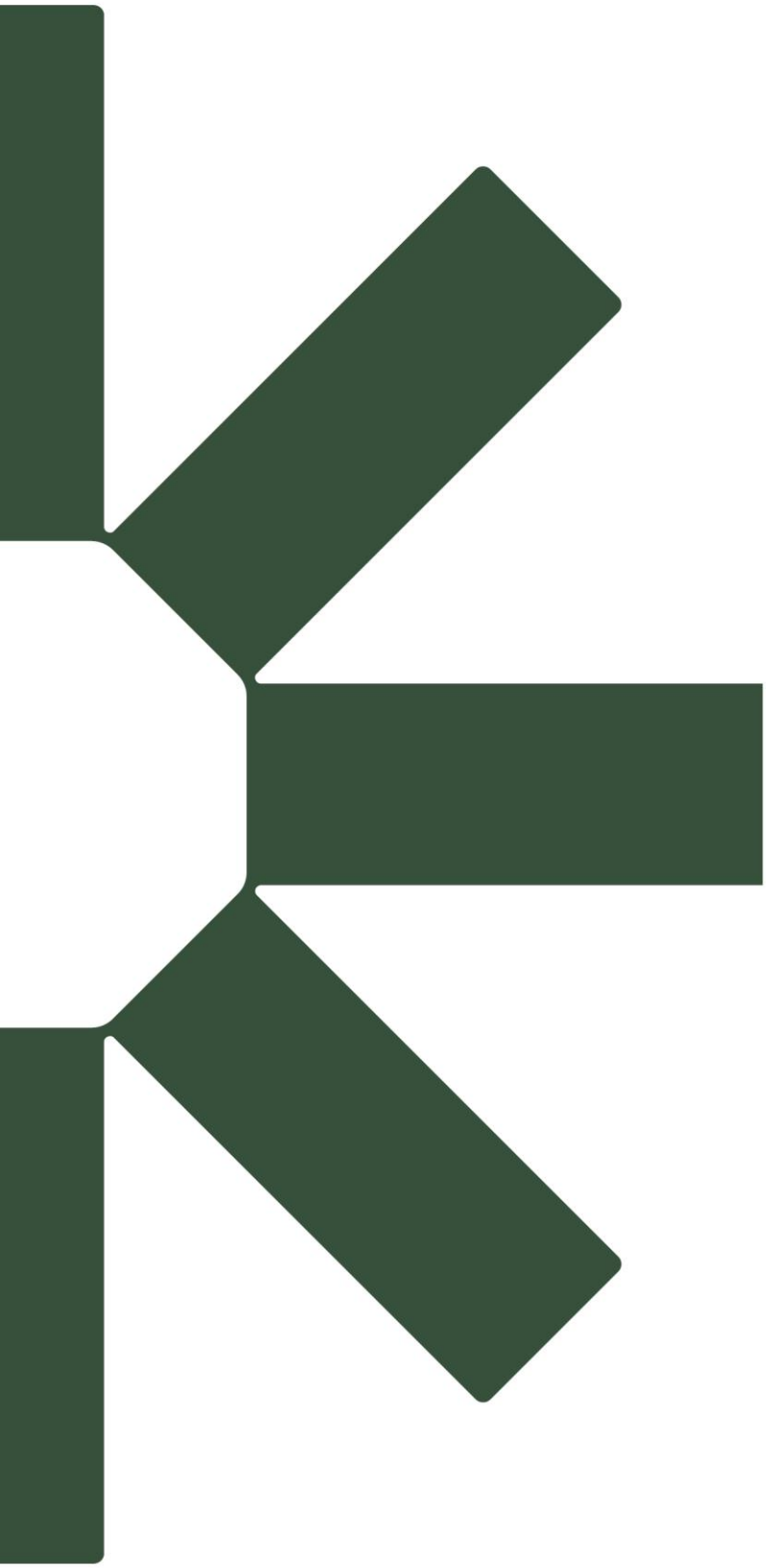
F.1 Best Management Practice (BMP)

Best management practice (BMP) is the application of particular operational procedures that minimise noise while retaining productive efficiency.

Where applied, these measures and practices are often documented in a noise management plan so that operational practices and undertakings are clearly understood and applied at all levels of an industrial operation. Application of BMP can include the following types of practice:

- Using the quietest plant that can do the job
- Scheduling the use of noisy equipment at the least-sensitive time of day
- Not operating, or reducing operations at night
- Siting noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise
- Where there are several noisy pieces of equipment, scheduling operations so they are used separately rather than concurrently
- Keeping equipment well-maintained and operating it in a proper and efficient manner
- Using ‘quiet’ practices when operating equipment, for example, positioning idling trucks in appropriate areas
- Running staff-education programs and regular tool box talks on the effects of noise and the use of quiet work practices.

For many industries there are a wide range of factors that can restrict the feasibility and reasonableness of applying BMP measures on a particular site. Work health and safety considerations must also be taken into account as well as any other regulatory and process requirements.



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