HORSLEY DRIVE BUSINESS PARK

Proposed Spec Warehouse DC
SSDA Noise Impact Assessment

Prepared for:

Charter Hall
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EXECUTIVE SUMMARY

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Tenancy 202 Submarine School, Sub Base Platypus, 120 High Street
North Sydney NSW 2060 Australia

T: +61 2 9427 8100
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Charter Hall (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.

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Charter Hall on behalf of Bieson Pty Ltd (the Applicant) to undertake a noise impact assessment in support of a State Significant Development (SSD) application (SSD 17161650) for Stage 2 of the Horsley Drive Business Park.

SSD 7664 was approved for development on 9 November 2017 and allows for the:

- Establishment of up to 88,700 m^2 of Gross Floor Area for general industrial, light industrial, warehouse and distribution and ancillary office land uses
- Conceptual development levels, footprints, building envelopes and car parking rates for Lots 1-3, road layout and site access and landscape designs.

This SSD application is the next phase of the development of the Horsley Drive Business Hub (the Business Hub) – Stage 2 and proposes to seek consent for the construction and operation of two warehouses at the northern end of the Business Hub (the site).

SLR is suitably qualified and endorsed by the Planning Secretary to produce SSD 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).

This report summarises the assessment of the potential construction and operational noise impacts associated with the proposal.

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

1.1 Proposal Description

The site is located within the Business Hub – Stage 2 which is located within Western Sydney Parklands (WSP). The proposed development includes two light industrial warehouse buildings with car parking spaces, hardstand loading areas, ancillary office spaces and utilities buildings.

The future operators of the warehouses are currently unknown. The warehouses have been designed to accommodate a wide range of user requirements and are generic in their design:

- Building/Warehouse 2 (~17,000 sqm building) would be suited to a wide range of occupiers with the potential to have faster moving goods given the longer dock face, drive around access and large super awning. Users could include 3PLs (third party logistics operators), e-commerce retailers, conventional business to business discretionary retailer, or corporate headquarters for conventional warehousing and distribution.
- Building/Warehouse 3 (~12,500 sqm) would have a narrower range of occupiers because of the access provisions. It is likely that users would have less frequent vehicle movements, store slower moving goods and may include ancillary features such as small showrooms or the like. Users could include building materials suppliers (plumbing/bathroom supplies, or similar), discretionary retails storing larger, slower moving items (ie furniture, large electronics, etc), or 3PLs with specific contracts that may have slower moving goods.

The site location is shown in **Figure 1** and the proposed ground floor layout is shown in **Figure 2**.

The identified sources of noise from the proposed development include:

- Mechanical plant
- Operation of the east-facing loading docks
- Garbage compactors
- Truck and light vehicle movements on internal access roads, and in hardstands and parking areas.

The developed would operate 24 hours a day and deliveries could occur at any time.

Figure 1 Site Location, Surrounding Receivers and Noise Monitoring Locations

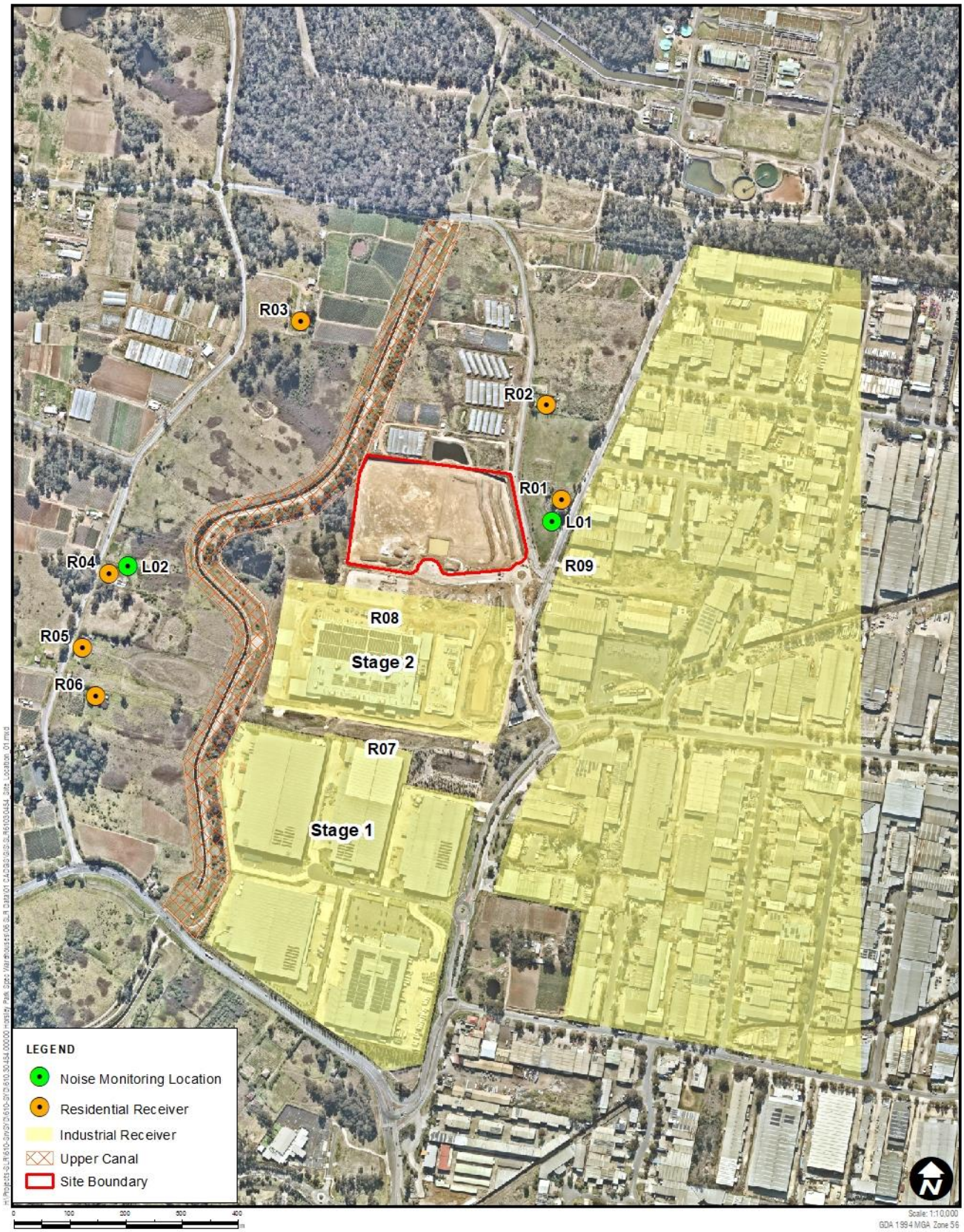
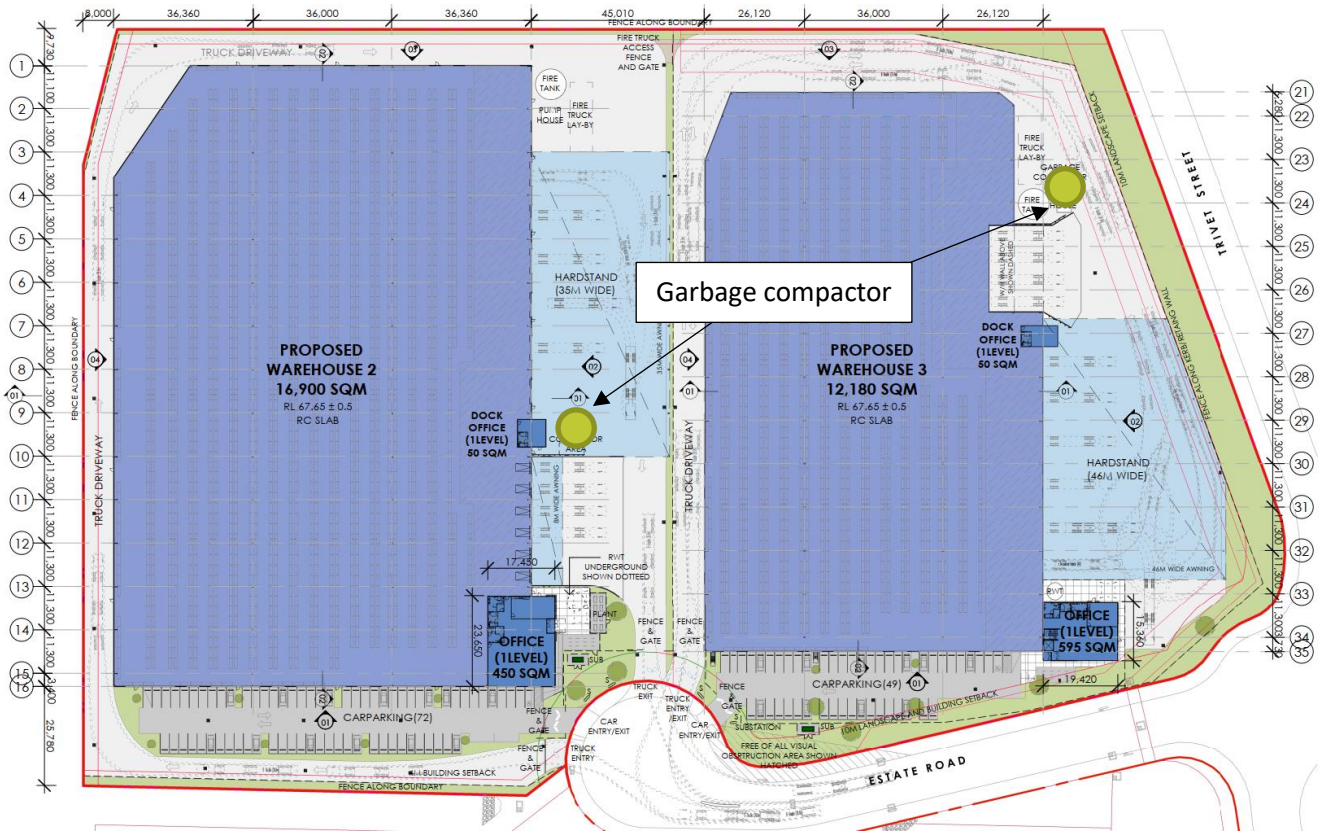


Figure 2 Proposed Development



1.2 Secretary's Environmental Assessment Requirements – SSD 17161650

The Secretary's Environmental Assessment Requirements (SEARs) for SSD 17161650 were issued by the Department of Planning, Industry and Environment (DPIE) in April 2021. The requirements relevant to noise and vibration are shown in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements, SDD10404, 18 December 2019

Noise and Vibration	Where Addressed
Noise and Vibration – including: a quantitative noise and vibration impact assessment undertaken by a suitably qualified acoustic consultant in accordance with the relevant Environment Protection Authority guidelines and Australian Standards which includes:	This document
The identification of impacts associated with construction, site emission and traffic generation at noise affected sensitive receivers, including the provision of operational noise contours and a detailed sleep disturbance assessment	**Section 5.1, 5.2, 5.3** **Appendix D**
Details of noise monitoring survey, background noise levels, noise source inventory and 'worst case' noise emission scenarios	**Section 2, 4.1, 4.2** **Appendix B** **Appendix C**

Noise and Vibration	Where Addressed
Consideration of annoying characteristics of noise and prevailing meteorological conditions in the study area	**Section 3.3.2.4, Section 4.2.3**
A cumulative impact assessment inclusive of impacts from other developments	**Section 5.3.4**
Demonstration the predicted impacts do not exceed the noise limits outlined in Condition B12 of SSD 7664	**Section 5.3**
Details and analysis of the effectiveness of proposed management and mitigation measures to adequately manage identified impacts, including a clear identification of residual noise and vibration following application of mitigation these measures and details of any proposed compliance monitoring programs.	**Section 5.3, 6 Appendix E**

1.3 Nearest Receivers

The nearest sensitive receivers are residential properties located 60 m to the east, 140 m to the north east and 266 m to the north west. The nearest commercial receivers are located 120 m to east and 330 m to the south of the site. The nearest receivers are shown in **Figure 1** and detailed in **Table 2**.

Table 2 Surrounding Sensitive Receivers

ID	Address	Type	Distance (m)	Direction
R01	28 Trivet Street/82 Cowpasture Road, Wetherill Park	Residential	60	East
R02	70 Trivet Street, Wetherill Park	Residential	140	North east
R03	158-170 Ferrers Road, Horsley Park	Residential	265	North west
R04	70-84 Ferrers Road, Horsley Park	Residential	410	South west
R05	46 Ferrers Road, Horsley Park	Residential	490	South west
R06	34 Ferrers Road, Horsley Park	Residential	500	South west
R07	Horsley Drive Business Park (Stage 1)	Industrial / Commercial	330	South
R08	Horsley Drive Business Park (Stage 2)	Industrial / Commercial	120	South
R09	Wetherill Park Industrial Precinct	Industrial / Commercial	110	East

2 Existing Noise Environment

Unattended noise monitoring was completed in the study area in October 2021. 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 2021 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 Horsley Park Equestrian Centre), to establish representative existing noise levels in in the study area.

The noise monitoring locations are shown in **Figure 1** and the results are summarised in **Table 3**. Details of the unattended monitoring completed in 2021 together with graphs of the measured daily noise levels are provided in **Appendix B**.

Table 3 Summary of Unattended Noise Logging Results

ID	Address	Measured Noise Levels (dBA)[1]					
		Background Noise (RBL)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L01	28 Trivet Street, Wetherill Park[2]	47	44	42	-	-	-
L02	70-84 Ferrers Road, Horsley Park	45	42	38	56	53	53

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: Data measured in March 2017 as part of the acoustic assessment for Horsley Drive Business Park – Stage 2 (see Acoustic Logic report 20161624.1/1811A/R6/HP). Average L_{Aeq} levels were not presented.

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 industrial noise from the adjacent existing business park and road traffic from the surrounding road network. The nearest major roads are Horsley Drive and Cowpasture Road, which are to the south and east of the development, respectively.

3 Assessment Criteria

3.1 Construction Noise Criteria

3.1.1 Interim Construction Noise Guideline

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.

3.1.1.1 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:
		  ◦ 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
		  ◦ If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
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: The 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).

3.1.1.2 'Other Sensitive' Land Uses and Commercial Receivers

The ICNG NMLs for 'other sensitive' non-residential land uses are shown in **Table 5**.

Table 5 Construction NMLs at 'Other Sensitive' Land Uses

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	55[1]
Hospital wards and operating theatres	45	65[2]
Places of worship	45	55[1]
Active recreation areas (characterised by sporting activities and activities which generate noise)	-	65
Passive recreation areas (characterised by contemplative activities that generate little noise)	-	60
Commercial	-	70
Industrial	-	75
Non-ICNG 'Other Sensitive' Receivers		
n/a	-	-

Note 1: It is assumed that these receivers have windows partially open for ventilation which results in internal noise levels being around 10 dB lower than the external noise level.

Note 2: 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.

3.1.1.3 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**.

Table 6 Project Specific Noise Management Levels (dBA)

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[1]	Evening	Night-time
Residential (R01 and R02)	L01	57	52	49	47
Residential (R03 to R06)	L02	55	50	47	43
Commercial	-	70	-	-	-
Industrial	-	75	-	-	-

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 Vibration Guidelines

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.

3.2.3.2 Heritage Items

Heritage buildings and structures should be considered on a case-by-case basis but as noted in BS 7385 should not be assumed to be more sensitive to vibration, unless structurally unsound. Where a heritage building is deemed to be sensitive, the more stringent DIN 4150 Group 3 guideline values in **Table 9** can be applied.

No heritage buildings have been identified in the study area. The WaterNSW Upper Canal is to the west of the site, see **Figure 1**, and is listed in the State Heritage Inventory.

3.2.3.3 WaterNSW Upper Canal

WaterNSW owns and manages the Upper Canal corridor, which is critical water supply infrastructure that forms the western boundary of Horsley Drive Business Park. Condition B26 of Development Consent SSD-10404 (construction of the adjacent Stage 2 warehouse) has the following requirement with regard to vibration impacts on the Upper Canal:

> *"Vibration caused by construction at the site must comply with a vibration criterion of 8-10mm/s at the Upper Canal corridor in accordance with the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999)."*

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

3.3.1 HDBP Stage 2 Development Consent - SDD 7664

The conditions of consent for the conceptual development (SDD 7664) that relate to operational noise are shown below.

B12. For all future development at the site, noise generated during operations must not exceed the noise limits outlined in Table 3 when measured at the property located at 28 Trivet Street, Wetherill Park.

Table 3: Noise Limits dB(A)

Location	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$	Night $L_{A1(1\ minute)}$
28 Trivet Street, Wetherill Park	52	49	47	57

***Note**: Noise is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*

B13. If the construction of an acoustic barrier is required to achieve the noise limits in Condition B12 above, the barrier must be maintained as required and comprise a density of at least 10-15 kg/m².

The assessment property at 28 Trivet Street is located to the east of the site and shown as R01 in **Figure 1**.

3.3.2 Noise Policy for Industry

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.

3.3.2.1 Industrial Noise Trigger Levels

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.
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.

Receiver Category	Typical Planning Land Use Zoning	Typical Existing Background Noise Levels (RBL)	Description
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		
East (R1 and R2)	Unzoned[1]	47	44	42	Urban	The area is unzoned as it is part of the Western Sydney Parklands SEPP (2009). The residences in this area have been classified as urban due to high existing background noise levels that are dominated by industrial noise and being near to commercial/ industrial districts. This is consistent with previous assessments of the Horsley Drive Business Hub.
West (R3 to R5)		45	42	38	Suburban	The area is unzoned as it is part of the Western Sydney Parklands SEPP (2009). The residences have been classified as suburban due to relatively high existing background noise levels that are influenced by industrial noise and intermittent road traffic.

Note 1: The surrounding land is unzoned, noting the provisions of the Fairfield LEP 2014 do not apply to the site. Clause 9(2) of State Environmental Planning Policy (Western Sydney Parklands) 2009 (WSP SEPP) state that from the commencement of the policy, the land is unzoned. Development on the land is permissible with development consent in accordance with Clause 11 of the WSP SEPP. SSD-7664 provides approval for general industrial, light industrial, warehouse and distribution and ancillary office land uses. Furthermore, the site is located within Precinct 9 of the WSPT Plan of Management. The objectives of precinct include supporting ongoing WSPT Business Hubs at the sites designated by the Trust, of which this site is one. Part of supporting the subject business hub, would involve suitably supporting the approved land use.

3.3.2.2 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. 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	Period	Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
			RBL[1]	$L_{Aeq(period)}$	Intrusiveness	Amenity[2,3]
Residential (R01 and R02)	Day	60	47	-	**52**	58
	Evening	50	44	-	49	**48**
	Night	45	42	-	47	**43**
Residential (R03 to R06)	Day	55	45	56	**50**	53
	Evening	45	42	53	47	**43**
	Night	40	38	53	43	**38**
Commercial	When in use	65			-	63
Industrial		70			-	68

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.

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

The above NPfI PNTLs are more stringent at R01 (28 Trivet Street) than the SSD 7664 criteria (see **Section 3.3.1**). The impacts from the development have, therefore, been assessed against the NPfI PNTLs.

3.3.2.3 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events during the night-time period from the development is required to be considered.

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 development 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]
R01 and R02	42	57
R03 to R05	38	53

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.

3.3.2.4 Modifying Factors

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 factors, shown in **Table 15**, which are to be applied where annoying characteristics are present.

Table 15 NPfI Modifying Factors

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.	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.

Details of the modifying factors applied in the assessment are provided in **Section 4.2**.

3.3.3 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 16**.

Table 16 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 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 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 17**.

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 is presented in **Appendix C.**

Table 17 Construction Equipment

Scenario	Equipment
Civil Works	Excavator (30t) – With Hammer, Forklift, Roller - Smooth Drum, Tipper Truck, Truck, Water Cart
Piling	Concrete Mixer Truck, Excavator (15 t), Hand Tools, Mobile Crane (35 t), Water Cart
Structural Steel	Elevated Working Platform, Excavator 30T, Grader, Mobile Crane - Franna, Water Cart
Cladding	Elevated Working Platform, Grader, Hand Tools, Mobile Crane (100 t), Water Cart
Fitout (Internal)	Concrete Mixer Truck, Concrete Pump, Concrete Saw, Elevated Working Platform, Flatbed Truck, Grader, Hand Tools, Roller – Vibratory
Stormwater and Pavements	Concrete Mixer Truck, Excavator (30t) – With Hammer, Excavator (15 t), Forklift, Hand Tools, Piling – Bored, Roller - Smooth Drum, Scissor Lift, Tipper Truck, Water Cart

4.1.2 Hours of Construction

In accordance with Condition B22 of SSDA 7664, the construction activities 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 CONCAWE industrial noise algorithms in SoundPLAN. The model includes ground topography, buildings and representative noise sources from the proposal.

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

4.2.1 Operational Noise Sources

The project is in the early planning stages and the future tenants are currently unknown. Several assumptions have been made regarding the likely future tenants, uses and sources of noise. 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 noise sources associated with the operation of the development is provided below.

On-Site Traffic

On-site vehicles have been modelled using the data in **Table 18**. The volumes are representative of the worst-case 15-minute period for the daytime, evening and night-time.

Table 18 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	Evening	Night-time
Large Trucks	Estate roads	108[2]	25	5	3	1
	Loading docks		5			
Light Vehicles	Car park	96[3]	20	10	10	8

Note 1: Two-way movement, includes both inbound and outbound vehicles.

Note 2: Based on a combined sound power level of 106 dBA for large trucks at slow speed for 80% of the time and 111 dBA for trucks accelerating at slow speed for 20% of the time.

Note 3: Taken from *Road Traffic Noise Prediction Model "ASJ RTN-Model 2013" Proposed by the Acoustical Society of Japan – Part 2: Study on Sound Emission of Road Vehicles*, OKADA et al, Internoise 2014, and accounts for vehicles accelerating.

Loading Docks

Details of the loading dock noise sources are shown in **Table 19**. It is assumed that five loading docks could be concurrently used during the daytime, three during the evening period, and two during the night-time.

Sources were modelled in the loading docks which represent the worst-case situation for the nearest receivers to the north and east. Loading and unloading at the recessed loading docks of Warehouse 3 would be completed internally. Only one truck is expected to access the development during the worst-case 15-minute period in the night-time. Night-time loading dock activities were modelled separately in the various loading docks (see **Figure 3**) and the highest predicted receiver noise levels presented.

Table 19 Typical Loading Dock Noise Sources

Noise Source	Sound Power Level (dBA)	Typical Duration of Use in Worst-case 15-minute Period	Source Height (m)
Truck reversing alarm[1]	107[2]	60 seconds	1.0
Forklift reversing alarm[1]	102[2]	90 seconds	0.5
Air brakes	118	1 second	1.0
Roller door	94	15 seconds	4.0
Gas Forklift	93	900 seconds	1.0
Garbage Compactor[3]	94	450 seconds	1.5

Note 1: It is noted that the operation of this equipment is typically intermittent and a +5 dB modifying correction factor has been added to the night-time noise level in accordance with the NPfI.

Note 2: SWL includes a -3 dB reduction due to alarms being discrete events.

Note 3: See **Figure 2** for compactor locations. Would only be used during the daytime to process paper, cardboard or other soft materials.

Internal Activities

The internal noise-generating activities at all warehouses are expected to generally be minimal. An internal sound power level of 75 dBA has been included for each warehouse to cover general internal activities. Warehouse roller shutter doors are assumed to be open during loading dock activities.

Mechanical Plant

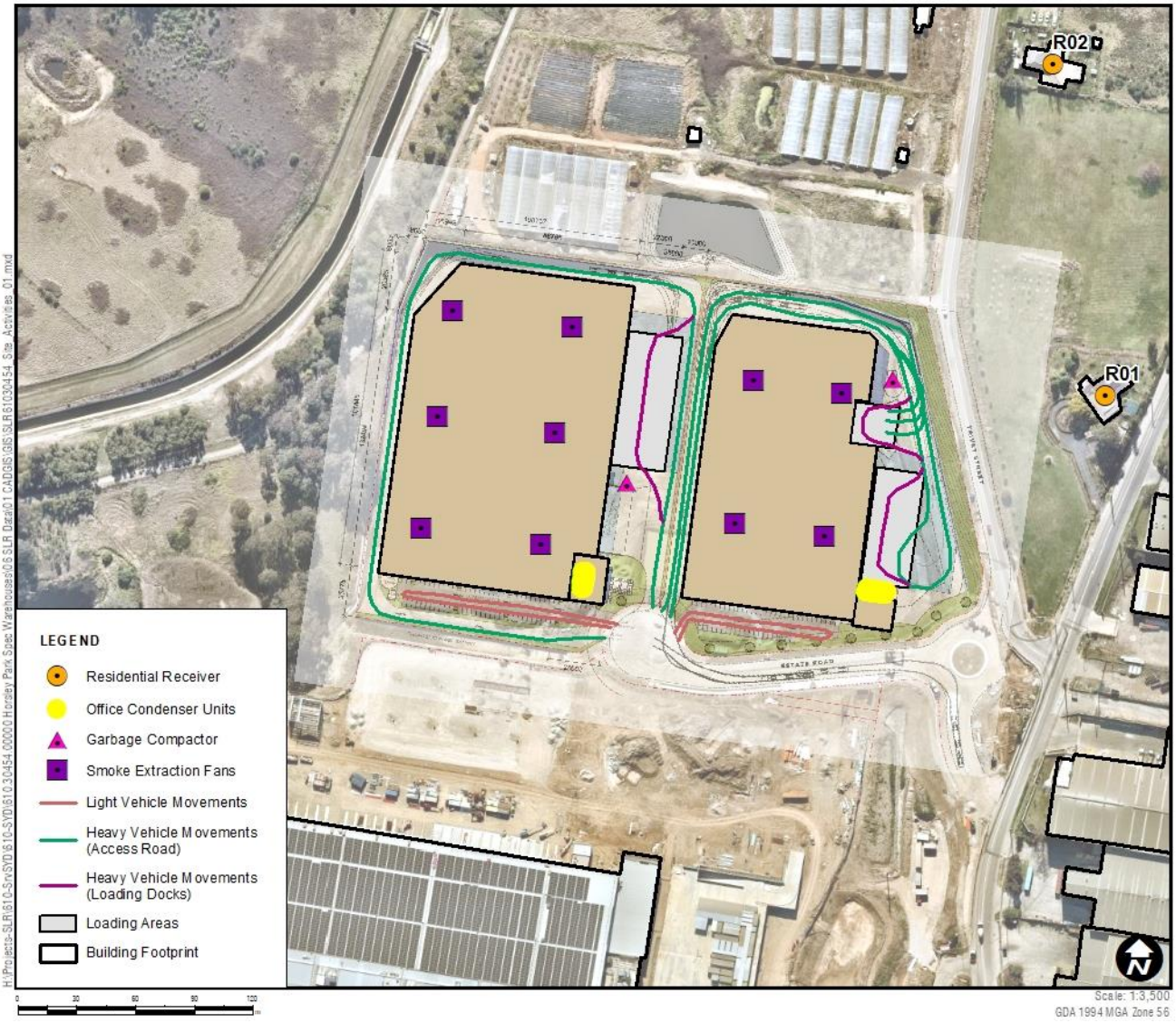
Mechanical plant associated with the proposal includes air-conditioning equipment serving the office buildings associated with each warehouse and smoke extraction fans for each warehouse. The details of the mechanical plant associated with the proposal is based on preliminary data and is shown in **Table 20**. The office air-conditioning is assumed to be operational during the daytime and evening periods, with the smoke extraction fans operational during the daytime only.

Table 20 Mechanical Plant

Noise Source	Sound Power Level (dBA)	Number of Sources
Airconditioning equipment	59	2
	62	2
	64	2
	65	3
	69	9
Smoke extraction fans	83	10

The locations of the above sources are shown in **Figure 3**.

Figure 3 Modelled Source Locations



4.2.2 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 21**.

Table 21 Sleep Disturbance Noise Events – L_{Amax} Sound Power Levels

Noise Source	Sound Power Level L_{Amax} (dBA)	Source Height
Trucks manoeuvring around warehouses	111	1 m
Truck airbrakes	118	1 m
Truck reversing alarm	110	1 m
Forklift reversing alarm	105	0.5 m
Roller Door	94	4 m

These sources have been assumed to be in the loading docks that would result in the highest impacts at the nearest receivers to the north and east.

4.2.3 Weather Conditions

Certain weather conditions can increase noise levels by focusing noise towards receivers. Noise-enhancing weather conditions can occur where wind blows from the source to the receiver, or where temperature inversions occur.

The NPfI defines 'standard' and 'noise-enhancing' weather conditions as shown in **Table 22**. Noise-enhancing weather should be included in the assessment where they occur for more than 30% of the daytime, evening or night-time period in any season.

Table 22 Standard and Noise-Enhancing Weather Conditions

Weather Conditions	Meteorological Parameters
Standard	Daytime/evening/night-time: stability categories A–D with wind speed up to 0.5 m/s
Noise-enhancing	Daytime/evening: stability categories A–D with light winds up to 3 m/s Night-time: stability categories A–D with light winds up to 3 m/s and/or stability category F with winds up to 2 m/s

The NPfI contains guidance for determining prevailing weather conditions. Data measured for 12-months between January and December 2020 at Horsley Park AWS has been used to determine the prevailing weather conditions at the site and a summary is shown in **Table 23**.

Table 23 Prevailing Weather Conditions

Period	Wind Speed from 0.5 to 3 m/s (Frequency of Occurrence > 30%)				Atmospheric Stability Class F or G[1]
	Southerly	South Westerly	Westerly	North Westerly	
Daytime	-	-	-	-	-
Evening	-	Yes	Yes	Yes	-
Night-time	Yes	Yes	Yes	-	Yes

Note 1: Noise-enhancing conditions for temperature inversions based on atmospheric stability class are only applied to the night-time assessment.

The weather analysis shows that noise-enhancing weather conditions are expected to be a feature of the site during the evening and night-time. No noise enhancing weather conditions are expected during the daytime. The weather conditions used in the assessment are shown in **Table 24**.

Table 24 Modelled Weather Conditions

Period	Weather Condition	Meteorological Parameters used in Assessment
Daytime	Standard	Stability categories A–D with wind speed up to 0.5 m/s
Evening	Noise-enhancing	Stability categories A–D with light winds up to 3 m/s
Night-time	Noise-enhancing	Stability categories A–D with light winds up to 3 m/s and stability category F with winds up to 2 m/s

4.2.4 Off-site Road Traffic

Transport Noise Model (TNM) has been used in SoundPLAN to model traffic on the surrounding roads. The following has been included in the assessment:

- Heavy vehicle volumes have been modelled as 'heavy trucks' in TNM
- Development related traffic has been modelled separately with all vehicles accelerating from the site entrance for a distance of 150 m (distance calculated based on a typical acceleration rate for a cat 3 semi-trailer heavy vehicle to 60 km/h). Once the site vehicles are past this point they are assumed to be free-flowing.

Light and heavy vehicles would access the development directly from Victoria Street from the east and Cowpasture Road from the south. The potential noise impacts from additional traffic have been assessed based on traffic data shown in **Table 25**.

Table 25 Traffic Volumes

Road	Existing Traffic volumes				Proposal 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
Trivet Street[1]	2809	111	1139	11	60	22	11	3
Cowpasture Road	5864	926	999	432	340	127	61	18
Estate Road[2]	1638	76	722	110	400	149	72	21

Note 1: The volumes for Trivet Street are based on the trip distribution rates previously approved under SSD 7664 and SSD 7664 Mod1 which have an assumed assignment of Stage 2 traffic as 15% to/from Trivet Street. This trip distribution rate has been applied to both heavy and light vehicles to be consistent with previous approvals, acknowledging that there is a 5-tonne limit on Trivet Street. The modelled scenario is conservative and allows for some non-compliance with load restrictions on Trivet Street.

Note 2: Existing traffic is from the Customer Fulfillment Centre (Warehouse 1).

5 Assessment of Impacts

5.1 Construction Noise Predictions

The predicted noise levels at the most-affected sensitive receivers surrounding the site are shown in **Table 26** and the exceedances of the NMLs are shown in **Table 27**.

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 at Nearest Receivers

ID	Address	NML	Predicted Noise Level – $L_{Aeq(15minute)}$ (dBA)					
			Civil Works	Piling	Structural Steel	Cladding	Fitout (Internal)	Stormwater and Pavements
R01	28 Trivet Street/82 Cowpasture Road, Wetherill Park	57	65	59	54	49	47	65
R02	70 Trivet Street, Wetherill Park	57	63	57	52	47	45	63
R03	158-170 Ferrers Road, Horsley Park	55	56	50	45	40	38	56
R04	70 Ferrers Road, Horsley Park	55	53	47	42	37	35	53
R05	46 Ferrers Road, Horsley Park	55	51	45	40	35	33	51
R06	34 Ferrers Road, Horsley Park	55	53	47	42	37	35	53
R07	Horsley Drive Business Park (Stage 1)	70	46	40	35	30	28	46
R08	R08 - Horsley Drive Business Park (Stage 2 – Warehouse 1)	70	53	47	42	37	35	53
R09	Wetherill Park Industrial Precinct	70	69	63	58	53	51	69

Note 1: Worst-case predicted noise levels are representative of the 'noisiest' construction periods during concurrent operation of equipment in the closest location to the various receivers.

Table 27 Predicted Exceedance at Nearest Receivers

ID	Address	NML	Exceedance (dBA)					
			Civil Works	Piling	Structural Steel	Cladding	Fitout (Internal)	Stormwater and Pavements
R01	28 Trivet Street/82 Cowpasture Road, Wetherill Park	57	8	2	-	-	-	8
R02	70 Trivet Street, Wetherill Park	57	6	-	-	-	-	6
R03	158-170 Ferrers Road, Horsley Park	55	1	-	-	-	-	1
R04	70 Ferrers Road, Horsley Park	55	-	-	-	-	-	-
R05	46 Ferrers Road, Horsley Park	55	-	-	-	-	-	-
R06	34 Ferrers Road, Horsley Park	55	-	-	-	-	-	-
R07	Horsley Drive Business Park (Stage 1)	70	-	-	-	-	-	-
R08	R08 - Horsley Drive Business Park (Stage 2 – Warehouse 1)	70	-	-	-	-	-	-
R09	Wetherill Park Industrial Precinct	70	-	-	-	-	-	-

The above shows that the works are generally expected to comply with the NMLs at the nearest receivers due to most receivers being distant from the site.

Worst-case exceedances of up to 8 dB and 6 dB are predicted at R01 and R02, which are residential receivers to the north-east and north of the site, respectively, however, this would only be expected to occur when noisy works are being completed close to the eastern and north eastern site boundaries. Works in other areas of the site are expected comply with the NMLs.

No residential receivers are predicted to be Highly Affected during any of the works.

5.2 Construction Vibration

The major potential sources of vibration from the proposed construction activities would likely be during 'Civil Works' and 'Stormwater and Pavements' stage when vibratory rollers and excavators with impact hammers are being used.

Vibration offset distances have been determined from the CNVG minimum working distances for cosmetic damage and human response (see **Table 10**) and the assessment is summarised in **Figure 4**, **Figure 5** and **Figure 6** for a 20 t vibratory roller, 20 t vibratory roller and an large hydraulic hammer respectively. Buildings within the minimum working distances are shown in the figures.

Where works are required within the minimum working distances, vibration monitoring would be completed at the nearest potentially affected buildings and structures to check that vibration levels are within appropriate thresholds.

Figure 4 Construction Vibration – 20 t Vibratory Roller

Figure 5 Construction Vibration – 7 t Vibratory Roller

Figure 6 Construction Vibration – Large Hydraulic Hammer

Cosmetic Damage Assessment

The above figures show that the distance between the construction works and the nearest sensitive receivers is generally sufficient for all residential and commercial buildings to be outside of the cosmetic damage minimum working distance for all vibration intensive equipment.

The Upper Canal is within the cosmetic damage minimum working distance for heritage structures when the 20t vibratory roller and impact hammer are in use.

Construction mitigation and management measures are discussed further in **Section 6**.

Human Comfort Vibration Assessment

The residence at 28 Trivet Street and commercial warehouses along Cowpasture Road are within the human comfort minimum working distance and occupants of these buildings may be able to perceive vibration impacts at times when 20 t and 7 t vibratory rollers are in use. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is in use.

5.3 Operational Noise Assessment

5.3.1 Predicted Unmitigated Noise Levels

A summary of the operational noise assessment at the receivers surrounding the proposal is shown in **Table 28**. The predicted worst-case levels are compared to the Project Noise Trigger Levels to determine the potential impact from the proposal. Predicted noise levels include noise enhancing wind conditions where appropriate.

Noise contours of the operational noise impacts are in **Appendix D.** Only one truck is expected to access the development during the worst-case 15-minute period in the night-time. Night-time loading dock activities were modelled separately in the various loading docks (see **Figure 3**) and the highest predicted noise levels presented.

Table 28 Industrial Noise Assessment – Unmitigated

Receiver Location	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
		Noise Criteria[1]	Predicted	Exceedance	
R01 - 28 Trivet Street, Wetherill Park	Day	52	54	2	**No**
	Evening	48	54	6	**No**
	Night	43	52	9	**No**
R02 - 70 Trivet Street, Wetherill Park	Day	52	50	-	Yes
	Evening	48	51	3	**No**
	Night	43	47	4	**No**
R03 - 158-170 Ferrers Road, Horsley Park	Day	50	38	-	Yes
	Evening	43	40	-	Yes
	Night	38	38	-	Yes
R04 - 70 Ferrers Road, Horsley Park	Day	50	31	-	Yes
	Evening	43	32	-	Yes
	Night	38	32	-	Yes
R05 - 46 Ferrers Road, Horsley Park	Day	50	30	-	Yes
	Evening	43	31	-	Yes
	Night	38	30	-	Yes
R06 - 34 Ferrers Road, Horsley Park	Day	50	31	-	Yes
	Evening	43	31	-	Yes
	Night	38	32	-	Yes
R07 - Horsley Drive Business Park (Stage 1)	When in use	63	42	-	Yes
R08 - Horsley Drive Business Park (Stage 2 – Warehouse 1)	When in use	63	52	-	Yes
R09 - Wetherill Park Industrial Precinct	When in use	63	54	-	Yes

Note 1: The assessment at R01 and R02 has been completed against the NPfI criteria (see **Section 3.3.2**) as they are more stringent than the SDD 7664 criteria (see **Section 3.3.1**).

The above assessment indicates that noise from the proposal is predicted to comply at most receivers except for exceedances of 2 dB, 6 dB and 9 dB at R01 during the day, evening and night-time periods respectively, and 3 dB and 4 dB at R02 during the evening and the night-time periods, respectively.

The predicted exceedances at R01 are caused by truck movements along the access route around Warehouse 3 (the eastern warehouse) and loading activities at the hardstands and recessed loading docks of Warehouse 3. The exceedances at R02 are caused by truck movements along the access route around Warehouse 3 and loading activities at the loading docks of both warehouses.

5.3.2 Predicted Mitigated Noise Levels

Feasible and reasonable mitigation measures have been investigated for the development with the aim of reducing noise levels to the Project Noise Trigger Levels. A detailed investigation of feasible and reasonable mitigation is provided in **Section 6.2**. In summary, the following key measures have been applied to reduce noise emissions:

- 3 m boundary noise barrier at a setback distance of 2 m from the eastern and northern site boundary.
- Restricting the use of certain the loading docks during the evening at Warehouse 2 and night-time at both warehouses.

A summary of the predicted impacts in the noise mitigation scenario is shown in **Table 29**.

Table 29 Operational Noise Assessment – Mitigated

Receiver Location	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
		Noise Criteria	Predicted	Exceedance	
R01 - 28 Trivet Street, Wetherill Park	Day	52	49	-	Yes
	Evening	48	45	-	Yes
	Night	43	42	-	Yes
R02 - 70 Trivet Street, Wetherill Park	Day	52	48	-	Yes
	Evening	48	45	-	Yes
	Night	43	40	-	Yes
R03 - 158-170 Ferrers Road, Horsley Park	Day	50	38	-	Yes
	Evening	43	36	-	Yes
	Night	38	38	-	Yes
R04 - 70 Ferrers Road, Horsley Park	Day	50	31	-	Yes
	Evening	43	<30	-	Yes
	Night	38	<30	-	Yes
R05 - 46 Ferrers Road, Horsley Park	Day	50	30	-	Yes
	Evening	43	<30	-	Yes
	Night	38	<30	-	Yes
R06 - 34 Ferrers Road, Horsley Park	Day	50	31	-	Yes
	Evening	43	<30	-	Yes
	Night	38	<30	-	Yes
R07 - Horsley Drive Business Park (Stage 1)	When in use	63	42	-	Yes
R08 - Horsley Drive Business Park (Stage 2 – Warehouse 1)	When in use	63	52	-	Yes
R09 - Wetherill Park Industrial Precinct	When in use	63	53	-	Yes

The above assessment indicates that the proposed mitigation is expected to reduce noise levels to comply with the criteria at all receivers.

5.3.3 Sleep Disturbance

The predicted night-time L_{Amax} noise levels at the nearest residential receivers are shown in **Table 30**. These include the mitigation measures specified in **Section 5.3.4**.

Table 30 Sleep Disturbance Assessment

Receiver Location	Source	Maximum Noise Level L_{Amax} (dBA)			Below Screening Level
		Sleep Dist. Screening Level	Predicted	Exceedance	
R01 - 28 Trivet Street, Wetherill Park	Truck Movements	57	59	2	**No**
	Reversing Alarms (Trucks)		56	-	Yes
	Reversing Alarms (Forklifts)		n/a[1]	n/a	n/a
	Airbrake		64	7	**No**
	Roller Door		40	-	Yes
R02 - 70 Trivet Street, Wetherill Park	Truck Movements	57	55	-	Yes
	Reversing Alarms (Trucks)		55	-	Yes
	Reversing Alarms (Forklifts)		n/a[1]	n/a	n/a
	Airbrake		63	6	**No**
	Roller Door		40	-	Yes
R03 - 158-170 Ferrers Road, Horsley Park	Truck Movements	53	49	-	Yes
	Reversing Alarms (Trucks)		43	-	Yes
	Reversing Alarms (Forklifts)		39	-	Yes
	Airbrake		51	-	Yes
	Roller Door		<30	-	Yes
R04 - 70 Ferrers Road, Horsley Park	Truck Movements	53	47	-	Yes
	Reversing Alarms (Trucks)		40	-	Yes
	Reversing Alarms (Forklifts)		35	-	Yes
	Airbrake		48	-	Yes
	Roller Door		<30	-	Yes
R05 - 46 Ferrers Road, Horsley Park	Truck Movements	53	43	-	Yes
	Reversing Alarms (Trucks)		34	-	Yes
	Reversing Alarms (Forklifts)		<30	-	Yes
	Airbrake		42	-	Yes
	Roller Door		<30	-	Yes
R06 - 34 Ferrers Road, Horsley Park	Truck Movements	53	47	-	Yes
	Reversing Alarms (Trucks)		39	-	Yes
	Reversing Alarms (Forklifts)		34	-	Yes
	Airbrake		47	-	Yes
	Roller Door		<30	-	Yes

Note 1: The recommended noise mitigation measures include restricting night-time loading activities at Warehouse 3 to the recessed loading docks. Loading would, therefore, be completed internally.

The above shows that maximum noise levels are generally expected to comply with the sleep disturbance screening level at most receivers except at R01 and R02 where exceedances are predicted from trucks and airbrake use at the northern loading docks of Warehouse 3.

The NPfI requires a detailed maximum noise level assessment to be completed where night-time noise levels exceed the screening level.

5.3.3.1 Detailed Maximum Noise Level Assessment

The detailed maximum noise levels assessment is summarised in **Table 31**. Receivers R01 and R02 were predicted to have exceedances of the sleep disturbance screening level during the use of trucks and airbrakes at the northern loading docks of Warehouse 3.

Table 31 Detailed Maximum Noise Level Assessment

Receiver	Maximum Noise Level L_{Amax} (dBA)					Comments
	Sleep Disturbance Goals (dBA)		Development Related Maximum Noise Events		Existing Maximum Noise Levels	
	Awakening Response[1]	Good Sleep	Predicted	Frequency of Occurrence		
R01	65	Around 55 (10 to 15 times per night)	64	~10 events	65-70[3]	**Awakening Response:** maximum noise levels predicted to be below the 'awakening response' level. **Good Sleep:** up to 21 trucks are expected to access the development during the night-time period (see **Table 25**). When assuming a 50% split between both warehouses, maximum noise events from truck airbrakes at Warehouse 3 are not expected adversely affect 'good sleep' (ie they wouldn't occur more than 10-15 times per night). **Existing maximum noise levels:** attended night-time noise monitoring was completed near to R01 and R02 in October 2021. This showed that trucks frequently use the surrounding roads during the night-time. Existing maximum noise levels were measured to be in the order of 65-70 dBA at R01 and 64-69 dBA at R02. Development related maximum noise levels are likely to be similar in magnitude, or lower than, existing maximum noise levels.
R02	65	Around 55 (10 to 15 times per night)	63	~10 events	64-69[3]	

Note 1: Based on RNP guidance that maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep. This equates to an external noise level of 65 dBA when assuming a 10 dB loss for partially open windows for ventilation.

Note 2: Based on RNP guidance that for a good sleep over eight hours the indoor L_{Amax} sound pressure level should not exceed around 45 dBA more than 10 or 15 times per night. This equates to an external noise level of around 55 dBA when assuming a 10 dB loss for partially open windows for ventilation.

Note 3: Distance corrected from attended monitoring location to receiver. Trucks were measured on Cowpasture Road and light vehicles on Trivet Street.

The predicted maximum noise levels at all surrounding receivers are expected to be below the levels outlined in the RNP that would be considered to have the potential to cause sleep disturbance, and are comparable to or lower than existing maximum noise levels from existing vehicles on the surrounding roads.

Based on the above, the predicted sleep disturbance exceedances are considered of low significance and do not warrant any specific mitigation measures.

5.3.4 Cumulative Industrial Impacts

Cumulative noise impacts from this proposal and other developments have the potential to increase noise impacts at surrounding receivers. The potential cumulative operational noise impacts are shown in **Table 32**. The predicted noise levels for this proposal include the recommended mitigation measures in **Section 5.3.2** and **6.2.**

Table 32 Industrial Noise Assessment – Cumulative Impacts

Receiver Location	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)						Compliance
		Noise Criteria[1]	Predicted				Exceedance	
			This Proposal	Stage 1[2]	Stage 2 CFC[3]	Total		
R01 - 28 Trivet Street, Wetherill Park	Day	63	49	n/a	45	50	-	Yes
	Evening	53	45	n/a	44	47	-	Yes
	Night	48	42	n/a	44	46	-	Yes
R02 - 70 Trivet Street, Wetherill Park	Day	63	48	n/a	42	49	-	Yes
	Evening	53	45	n/a	40	46	-	Yes
	Night	48	40	n/a	40	43	-	Yes
R03 - 158-170 Ferrers Road, Horsley Park	Day	58	38	n/a	40	42	-	Yes
	Evening	48	36	n/a	38	40	-	Yes
	Night	43	38	n/a	38	41	-	Yes
R04 - 70 Ferrers Road, Horsley Park	Day	58	31	<50	43	43	-	Yes
	Evening	48	21	<50	42	42	-	Yes
	Night	43	28	<45	42	42	-	Yes
R05 - 46 Ferrers Road, Horsley Park	Day	58	30	<50	41	41	-	Yes
	Evening	48	19	<50	40	40	-	Yes
	Night	43	28	<45	40	40	-	Yes
R06 - 34 Ferrers Road, Horsley Park	Day	58	31	<50	42	42	-	Yes
	Evening	48	21	<50	41	41	-	Yes
	Night	43	29	<45	41	41	-	Yes

Note 1: The cumulative noise criteria are the amenity level plus 3 dB (to convert it to a 15-minute assessment level), as per the NPfI.

Note 2: Taken from Acoustic Logic Report *HDBP Lot 3 – Two Staged Speculative Warehouse/Industrial Facility, Noise and Vibration Impact Assessment*, dated June 2017. This assessment only included predictions to the receivers to the west of Stage 1 (ie at R04 to R06) and would not contribute significantly to noise levels at other receivers. Absolute predicted levels were not provided at receivers to the west and noise levels are assumed to be mostly controlled by emissions from Stage 2.

Note 3: Taken from SLR assessment of Stage 2 CFC.

The above assessment indicates that cumulative noise is predicted to comply with the relevant noise criteria at all receivers. Mitigated noise emissions from this proposal alone are significantly below the amenity criteria.

5.3.5 Off-site Traffic Assessment

The results of the off-site traffic assessment are shown in **Table 33**. The assessment has been completed at R01 and R02 as these receivers are adjacent to roads.

Table 33 Traffic Noise Assessment

ID	Address	RNP Increase Criterion (dB)	Predicted Increase (dB)	
			Day	Night
R01	28 Trivet Street/82 Cowpasture Road, Wetherill Park	2.0	0.8	0.4
R02	70 Trivet Street, Wetherill Park		0.5	0.5

The above assessment shows that the increase in noise from vehicle movements on the surrounding roads at the nearest residences are expected to be below 2.0 dB. Increases of less than 2.0 dB represent a minor impact that is considered barely perceptible to the average person.

A small number of b-double trucks may also potentially access the site. Indicatively, up to five B-doubles during the 7 am to 10 pm period may access the site via the existing approved b-double route, which is to the south of the site along Cowpasture Road and The Horsley Drive.

Accelerating b-doubles may introduce additional noise impacts for receivers along the route. They are, however, considered unlikely to significantly increase noise levels given the existing volume of traffic on these roads relative to the small number of b-doubles that may be required by the proposal. The potential impact of b-doubles should be reviewed at a later design stage when more information is available.

6 Mitigation and Management Measures

6.1 Construction Impacts

6.1.1 Standard Measures

The impacts during construction of the project are predicted to be minor and no works outside of Standard Construction Hours are proposed. The use of standard mitigation measures to minimise the impacts is considered sufficient. Examples of such measures are provided in the Roads and Maritime (now Transport for NSW) CNVG (see **Appendix E**).

Additionally, the conditions of consent for SSD 7664 require a Construction Noise Management Plan to be produced as part of the CEMP for the development (in Condition C5). The plan must:

(a) be prepared by a suitably qualified and experienced noise expert.

(b) describe procedures for achieving the noise management levels in the EPA's Interim Construction Noise Guideline 2009.

(c) describe the measures to be implemented to manage high noise generating works such as piling and excavation in close proximity to sensitive receivers.

{d) include strategies that have been developed with the community for managing high noise generating works.

(e) describe the community consultation undertaken to develop the strategies in d) above; and

(f) include a complaints management system.

6.1.2 WaterNSW Upper Canal

Vibration impacts on the Upper Canal due to construction activities should be monitored to check vibration levels do not exceed the applicable limits (refer to **Section 3.2.3.2**).

Minimum working distances for various items of equipment when operating near heritage items are provided in **Table 10.** These indicate that monitoring should be completed when vibration intensive works are within around 50 m of the structure, depending on the type of vibration intensive equipment being used.

6.2 Operational Noise Impacts

The project is in the early planning stages and the future tenants are currently unknown. Several assumptions have been made regarding the likely future uses and sources of noise. As such, 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 regarding the future uses.

6.2.1 Feasible and Reasonable Mitigation Assessment

Potential feasible and reasonable mitigation measures have been investigated and a summary of the measures considered are shown in **Table 34**.

Table 34 Feasible and Reasonable Mitigation Options

Mitigation Option	Noise Benefit	Comments	Reasonable and Feasible
Source Control			
Restrict use of loading docks during the evening and night-time	Noise from activities at the northern loading docks of the western warehouse (Warehouse 2) contributes to the predicted exceedances at R01 and R02	Restricting the use of northern loading docks of the Warehouse 2 during the evening and night-time (see **Figure 7**) provides a notable noise benefit and is considered feasible.	Yes
	Noise from activities at the hard stand loading docks of the eastern warehouse (Warehouse 3) contributes to the predicted exceedances at R01 and R02	Restricting the use of the hard stand loading docks of Warehouse 3 during the night- time (see **Figure 7**) provides a notable benefit and is considered feasible.	Yes
Limit truck volumes during the night-time	Noise from trucks on the internal access roads contributes to the predicted exceedances at R01 and R02	The truck volumes used in the assessment are indicative, however, they are likely required to meet tenant's delivery requirements. Changes to internal truck routes and/or numbers unlikely to be feasible.	No
Broadband reversing beepers	Reduce potential for annoying noise emissions during the night-time from heavy vehicles and forklifts	Use of broadband and/or ambient sensing alarms on heavy vehicles and forklifts where they are required to reverse during the night-time.	Yes
Roller doors	Use of roller doors	Roller doors will be kept closed when un/loading is not occurring.	Yes
Path Control			
Noise barriers	Noise barriers can provide around 5 to 15 dB noise benefit where they screen the source of noise from the receiver(s).	A 3 m noise barrier on the eastern and northern site boundary (see **Figure 7**) is predicted to provide around 5 dB noise benefit at receiver R01 and 3 dB noise benefit at receiver R02, and is considered feasible.	Yes
Receiver Controls			
At-property treatment	Increased facade performance can reduce internal noise levels.	Higher performance glazing has already been provided to R01 by WSPT.	Already completed

Further details on the above key measures are provided below and shown in **Figure 7** These should be considered further as the project progresses:

- 3 m boundary noise barrier at a setback distance of 2 m from the eastern and northern site boundary. This should have a density of at least 10-15 kg/m^2 and must be maintained as required.
- Restricting the use of the loading docks during the evening and night-time at both warehouses.

Figure 7 Recommended Noise Mitigation

7 Conclusion

SLR has been engaged to assess the potential construction and operational noise emissions from the proposed development for Stage 2 of the Horsley Drive Business Park. The proposal includes the operation of light industrial warehouses used for distribution and storage of goods, which would be in use 24/7.

Construction noise levels are expected to comply with the management levels at most receivers. Minor exceedances are predicted at the nearest receivers to the north and north-east, however, this would only be expected to occur when noisy works are being completed close to the site boundary.

Operational noise levels are generally expected to comply with the trigger levels at most receivers, with the exception of the nearest residences to the north and north-east. These exceedances are primarily due to truck movements on the site access road and loading activities at both warehouses. The potential future tenants are currently unknown, and 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 regarding the future uses.

Indicative mitigation measures have been recommended, including a 3 m noise barrier along the eastern and northern boundary of the site and the restricting the use of certain load docks of Warehouse 2 and Warehouse 3 during the evening and night-time.

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

APPENDIX A

Acoustic Terminology

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

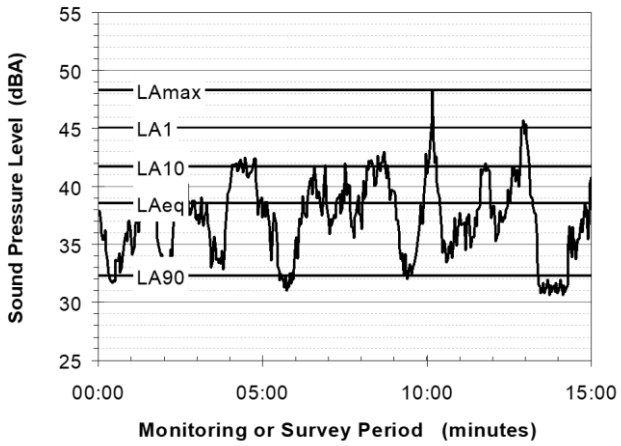
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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

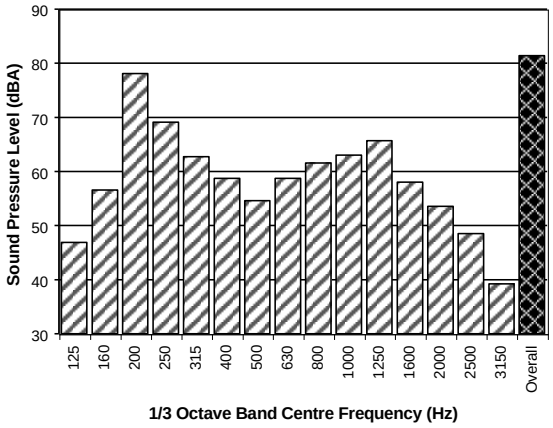
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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

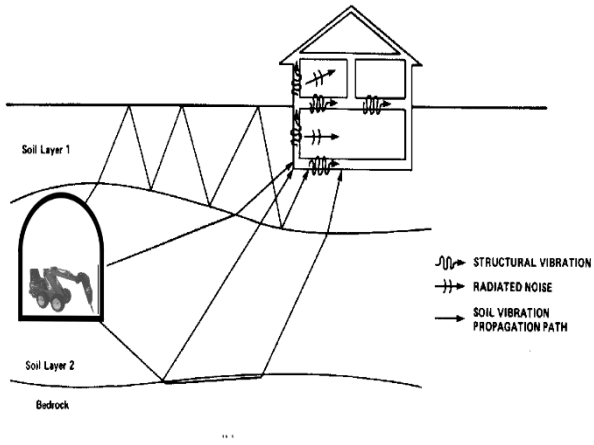
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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



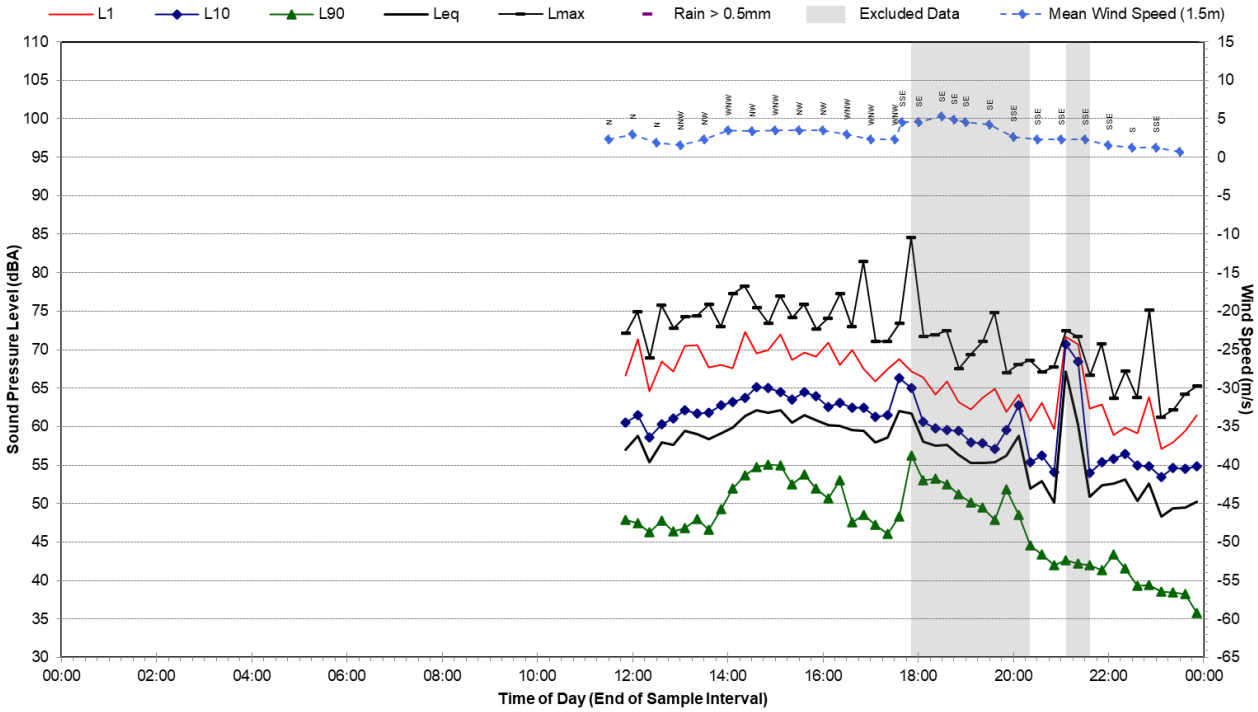
The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect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

APPENDIX B

Noise Monitoring Graphs

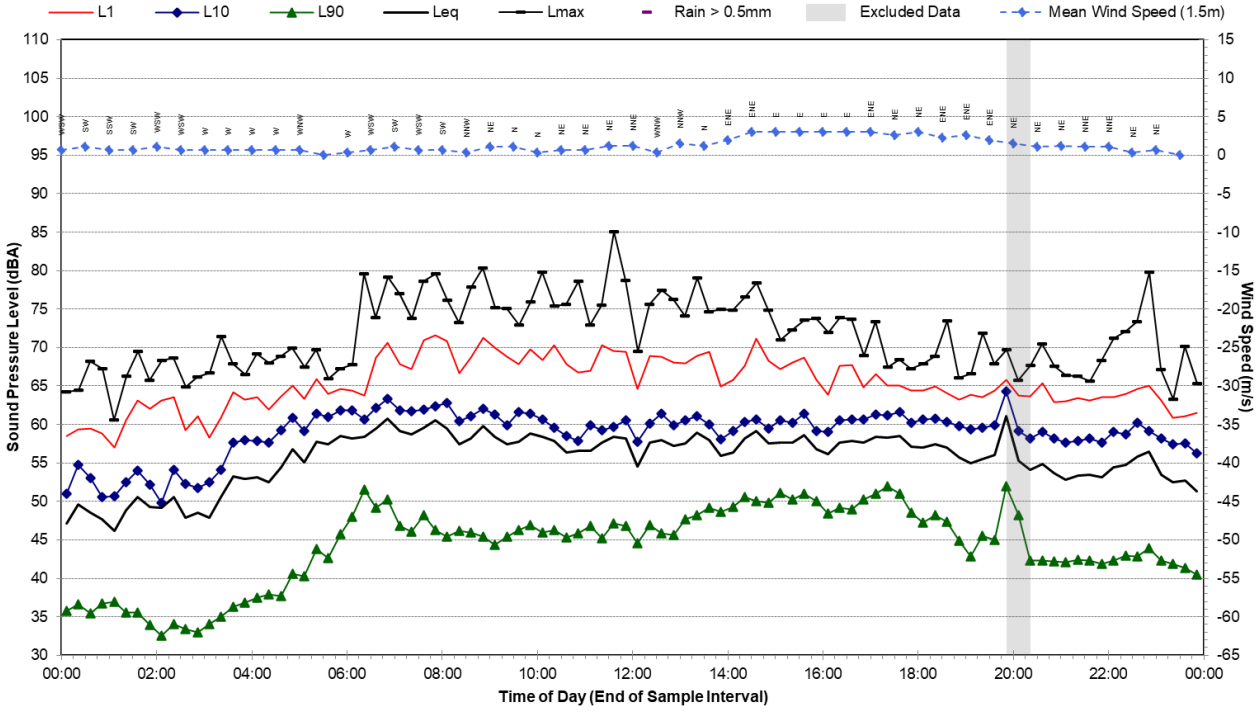
Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Thursday, 7 October 2021



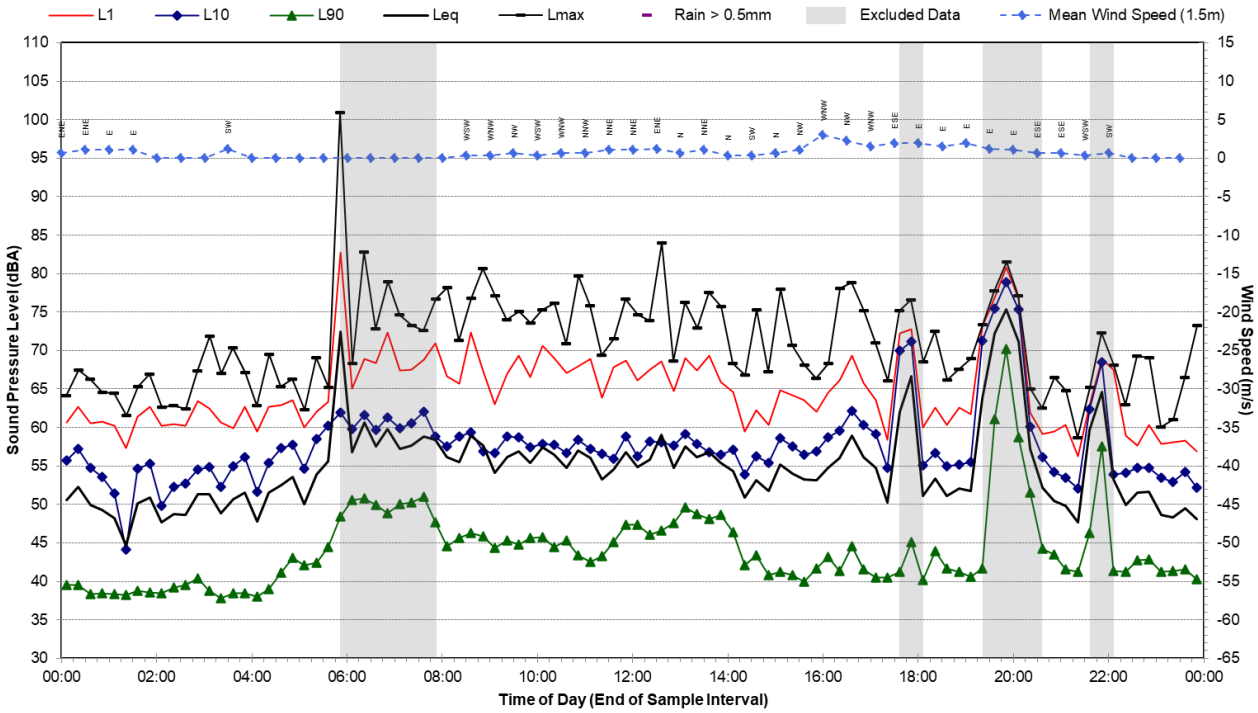
Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Friday, 8 October 2021



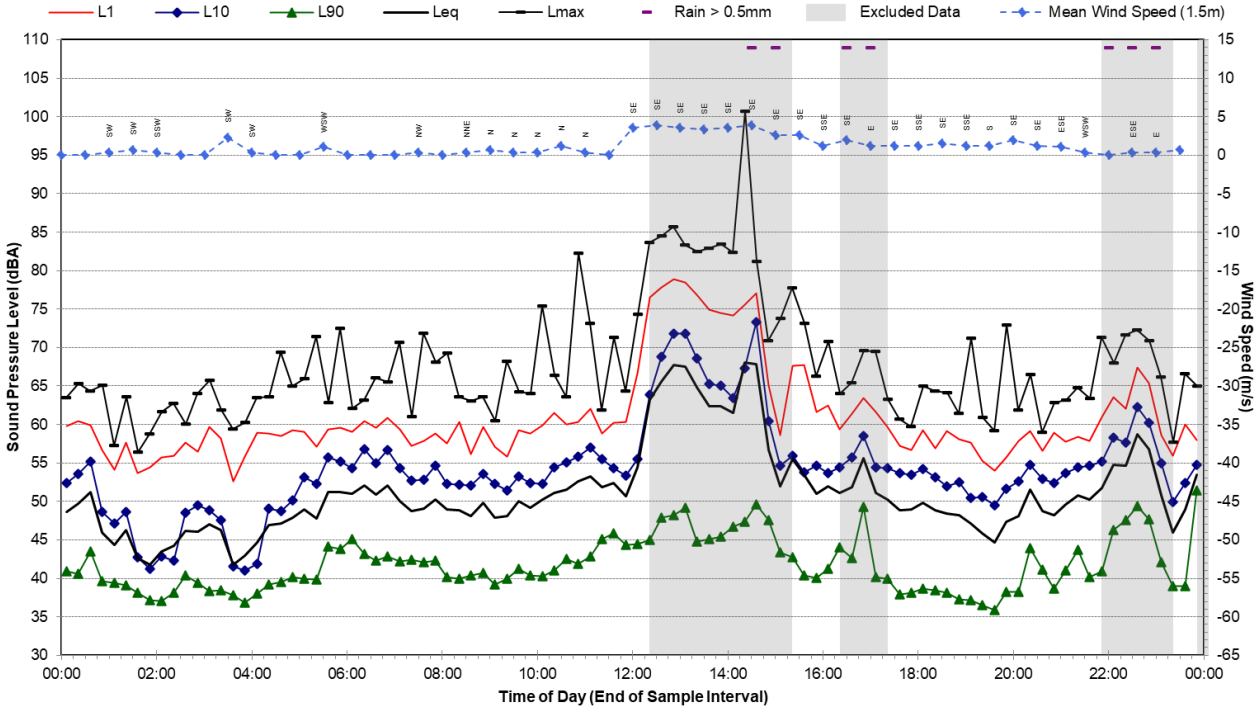
Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Saturday, 9 October 2021



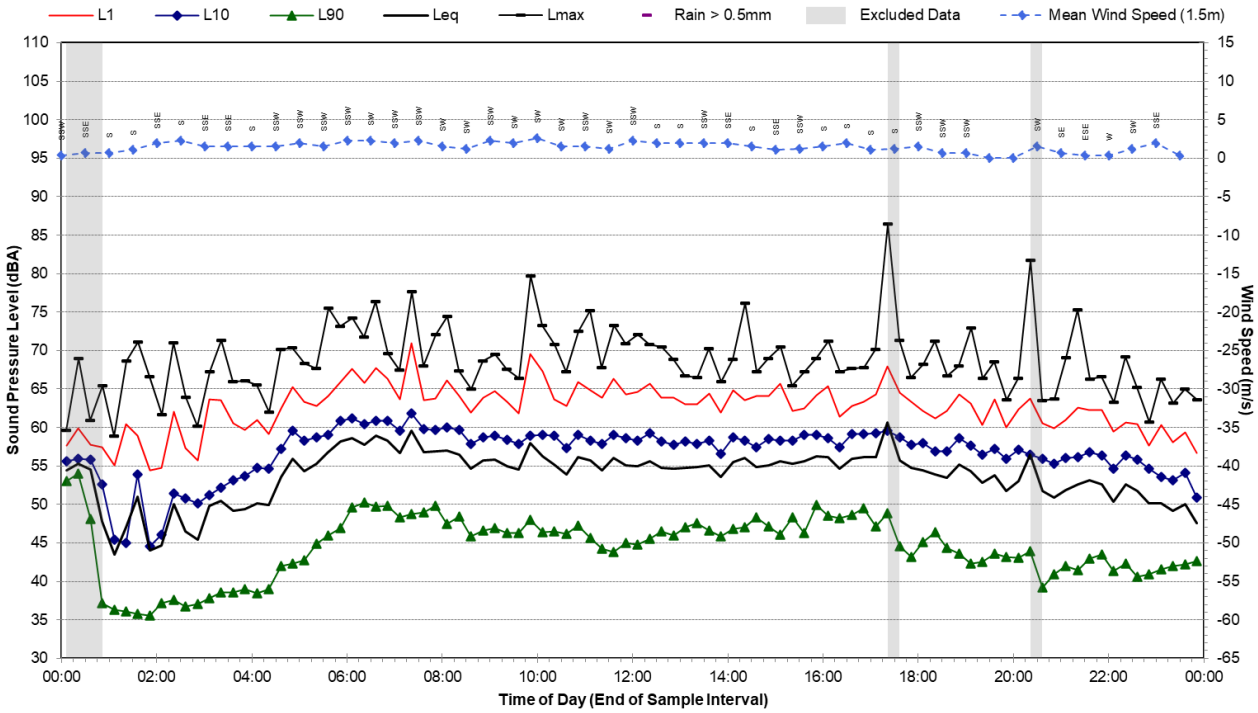
Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Sunday, 10 October 2021



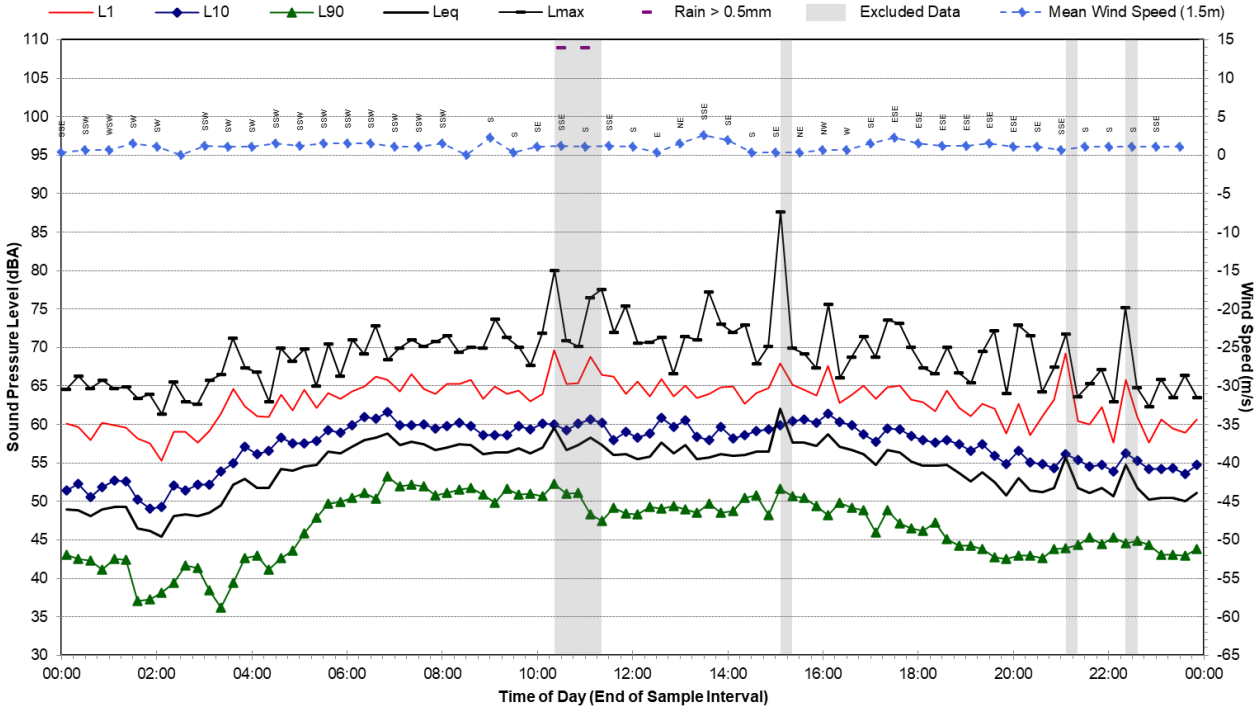
Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Monday, 11 October 2021



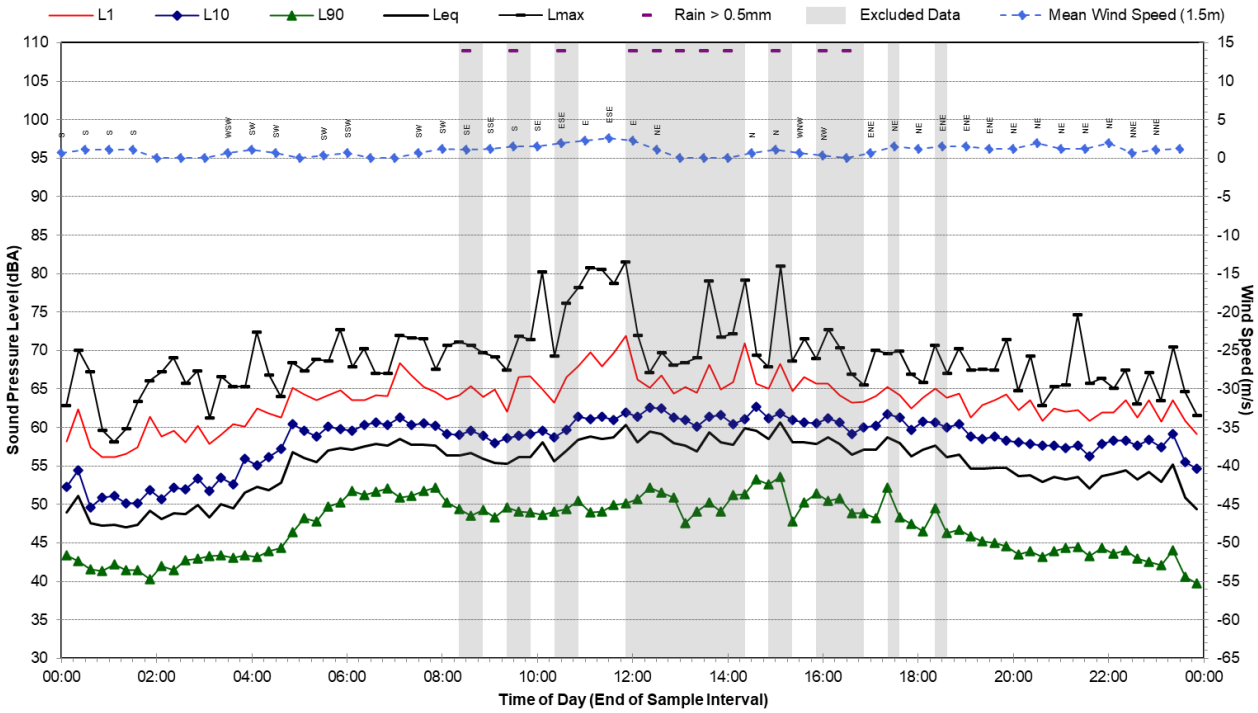
Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Tuesday, 12 October 2021



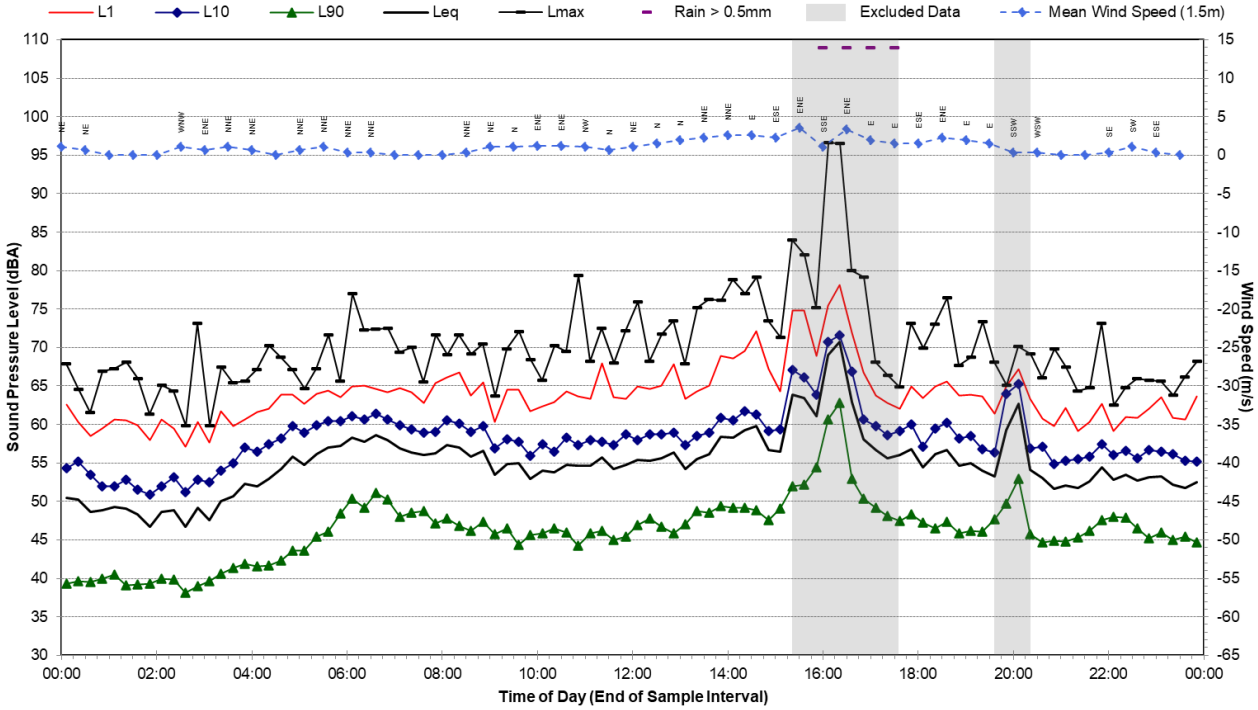
Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Wednesday, 13 October 2021



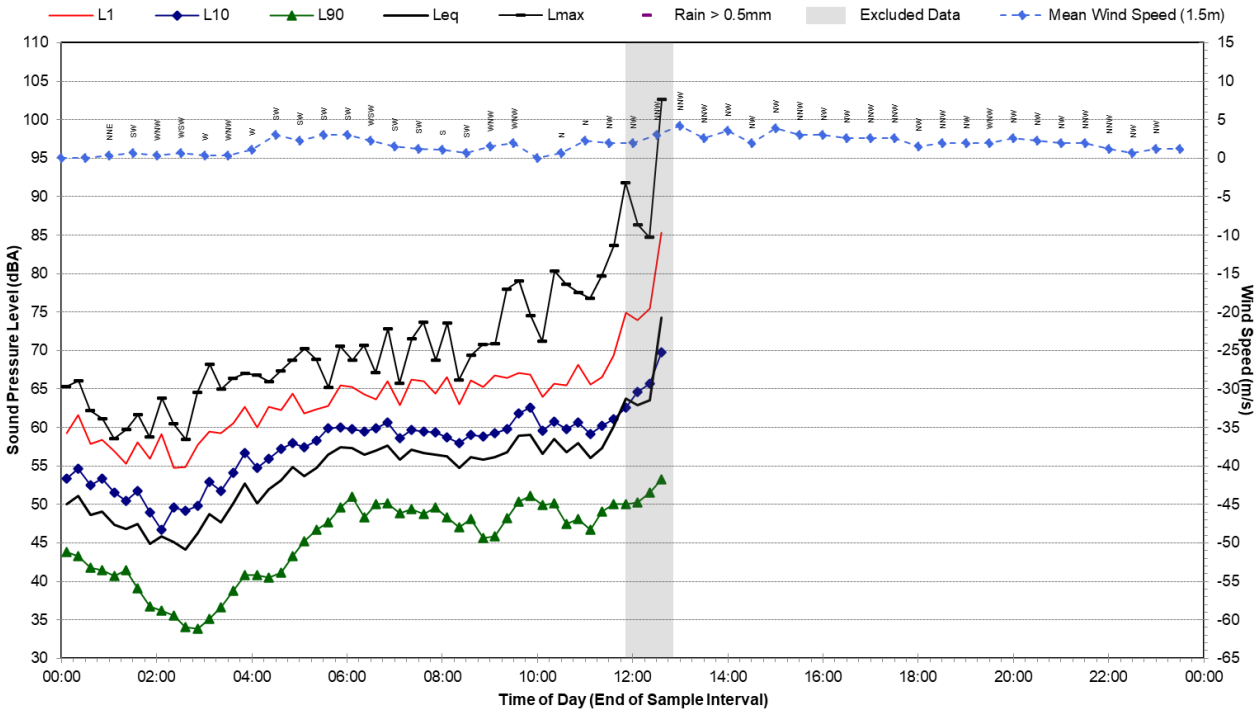
Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Thursday, 14 October 2021



Statistical Ambient Noise Levels

L02 - 70-84 Ferrers Road, Horsley Park - Friday, 15 October 2021



APPENDIX C

Construction Noise Sources

Scenario	Concrete Mixer Truck	Concrete Pump	Concrete Saw	Elevated Working Platform	Excavator (30t) – With Hammer	Excavator (15 t)	Excavator 30T	Flatbed Truck	Forklift	Grader	Hand Tools	Mobile Crane - Franna	Mobile Crane (100 t)	Mobile Crane (35 t)	Piling - Bored	Roller - Smooth Drum	Roller – Vibratory	Scissor Lift	Tipper Truck	Truck	Water Cart
SWL	103	106	103	97	121	97	109	100	101	108	94	98	100	98	111	107	109	92	97	107	107
Civil Works					X				X							X			X	X	X
Piling	X					X					X			X							X
Structural Steel				X			X			X		X									X
Cladding				X						X	X		X								X
Fitout (Internal)	X	X	X	X				X		X	X						X				
Stormwater and Pavements	X				X	X			X		X				X	X		X	X		X

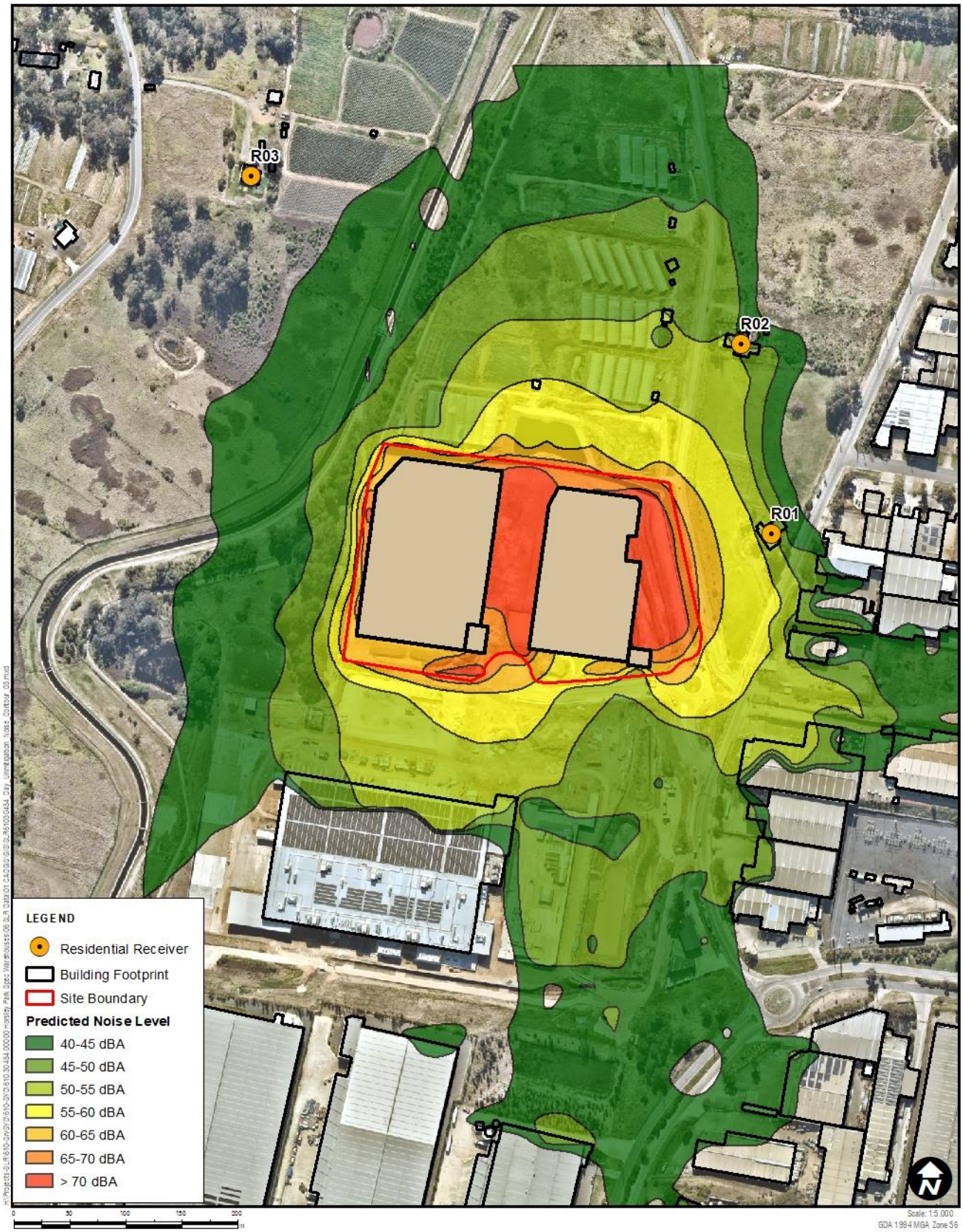
Note 1: In accordance with the ICNG, for activities identified as particularly annoying (such as jackhammering, rock breaking and power saw operations), a 5 dB 'penalty' is added to the source sound power level when predicting noise using the quantitative method.

Note 2: Sound power level data is taken from the DEFRA Noise Database, RMS *Construction and Vibration Guideline*, TfNSW *Construction Noise and Vibration Strategy* and SLR's database.

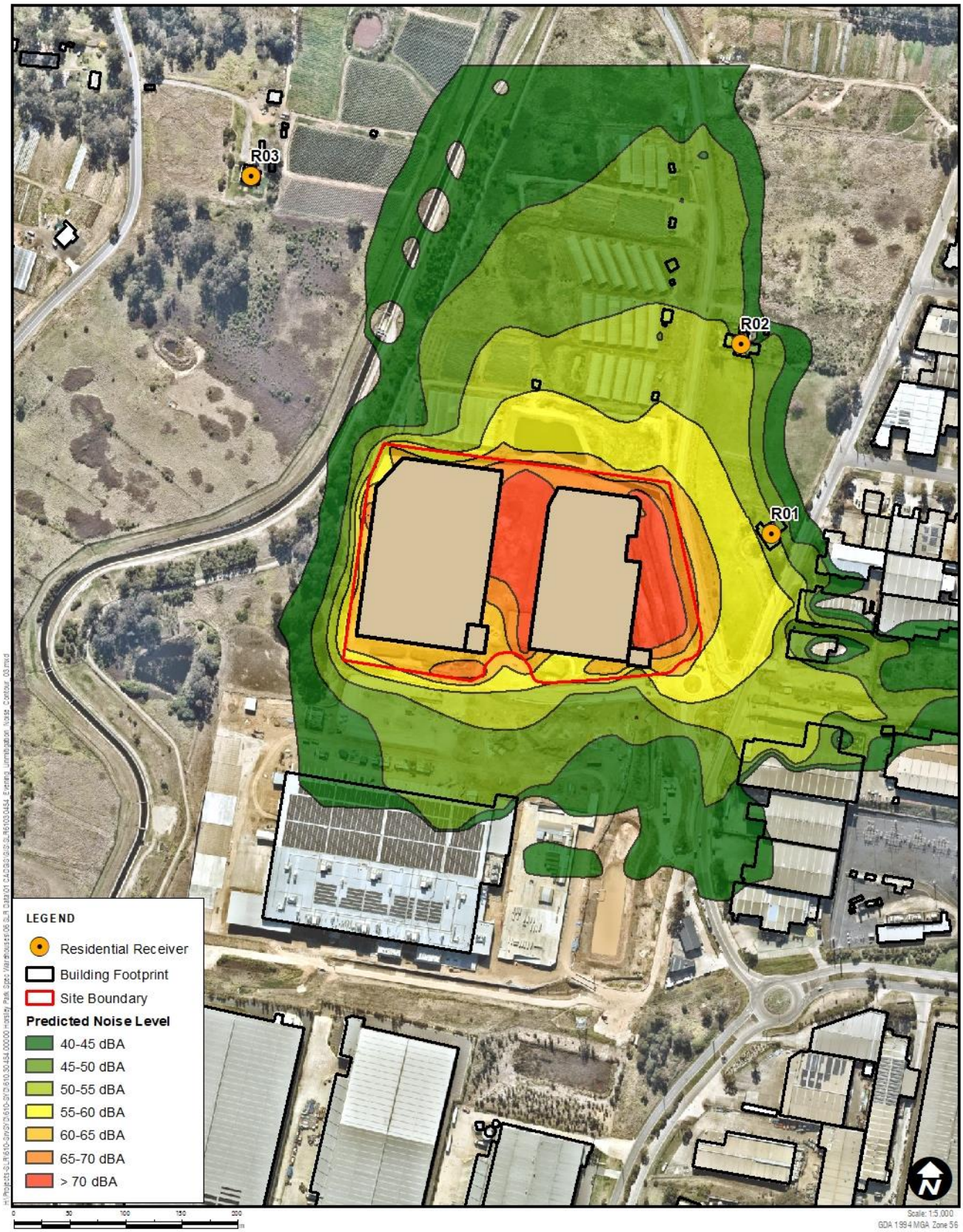
APPENDIX D

Operational Noise Contours

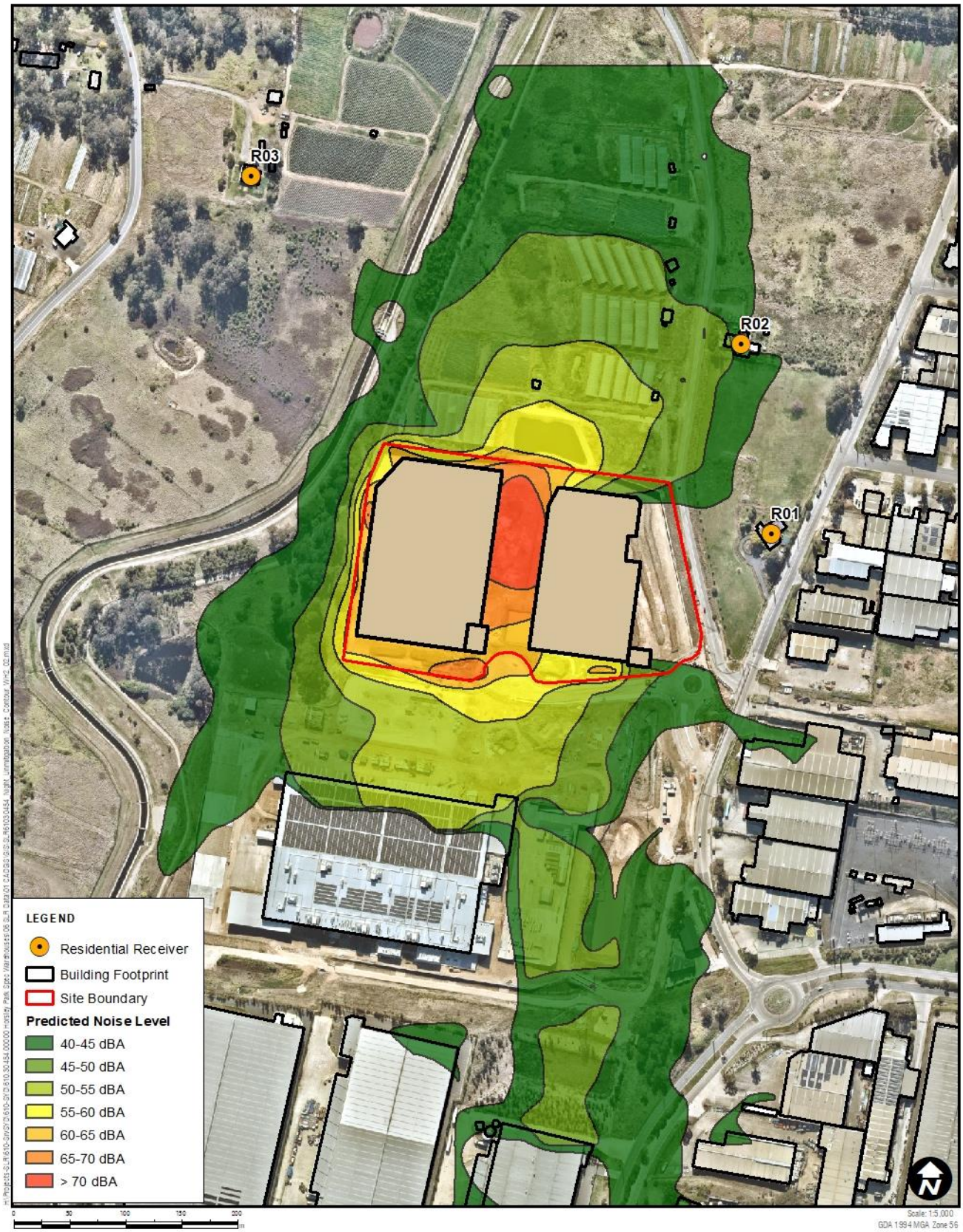
Site Operations – Day (Unmitigated)



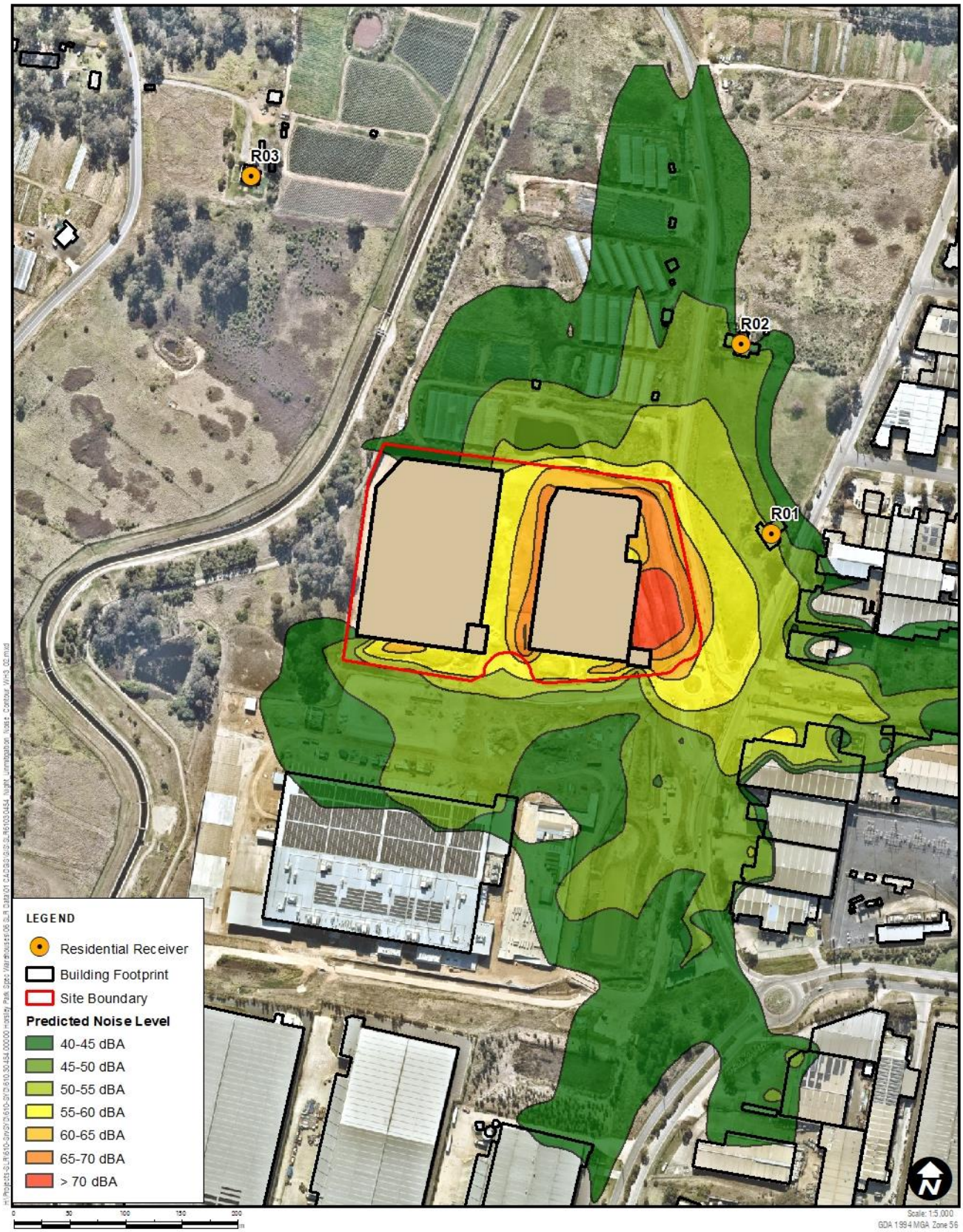
Site Operations – Evening (Unmitigated)



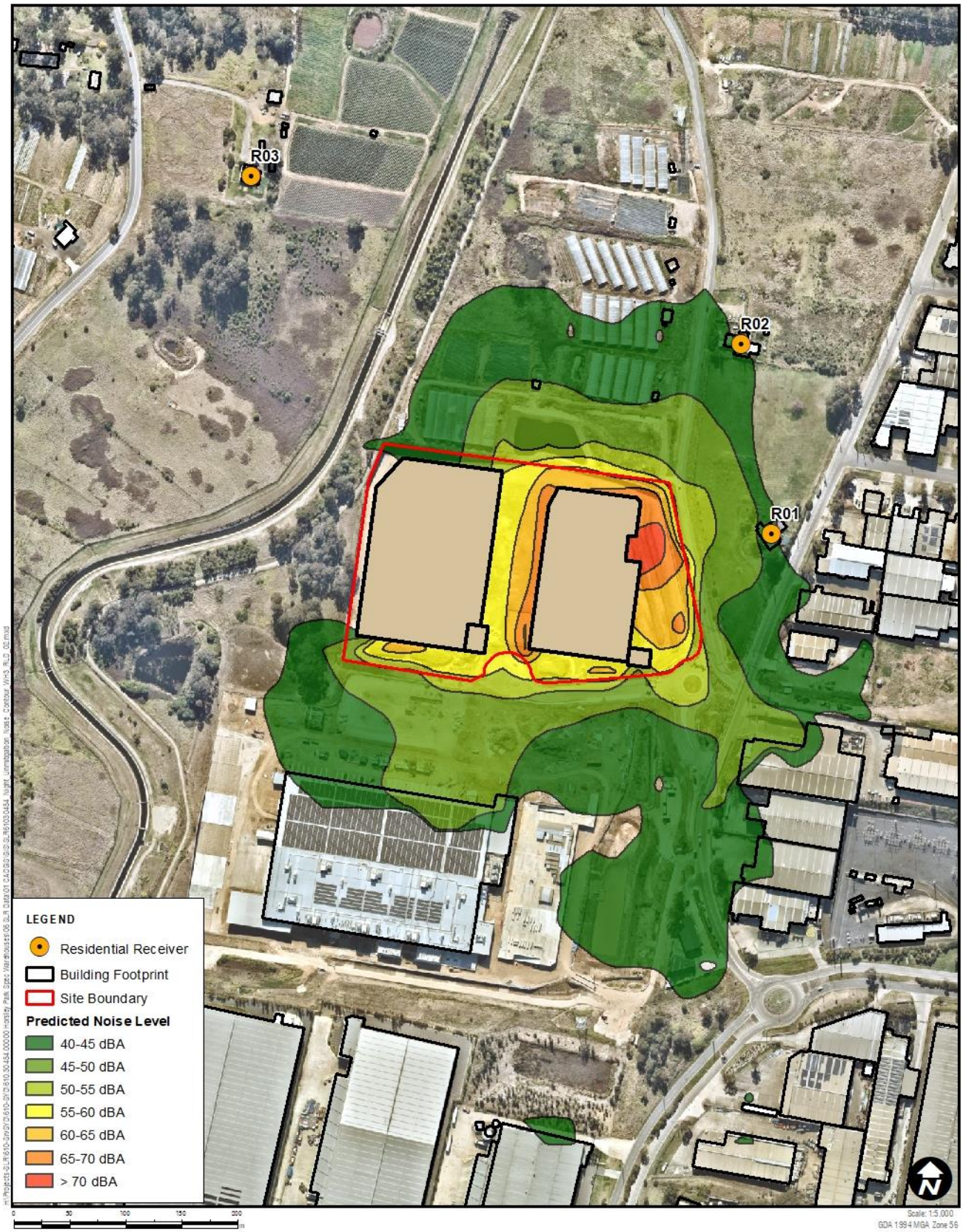
Site Operations – Night – Warehouse 2 (Unmitigated)



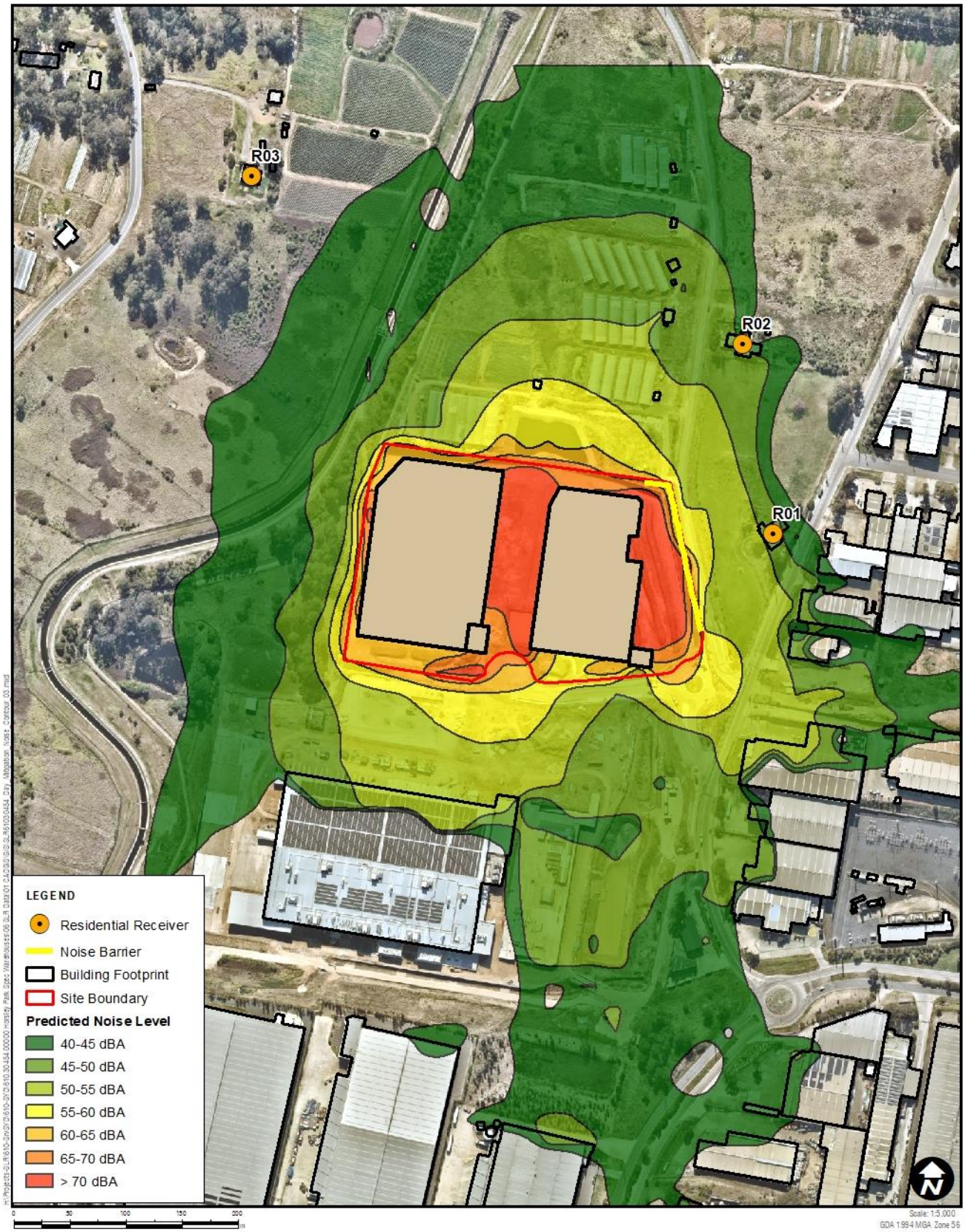
Site Operations – Night – Warehouse 3 Hardstand (Unmitigated)



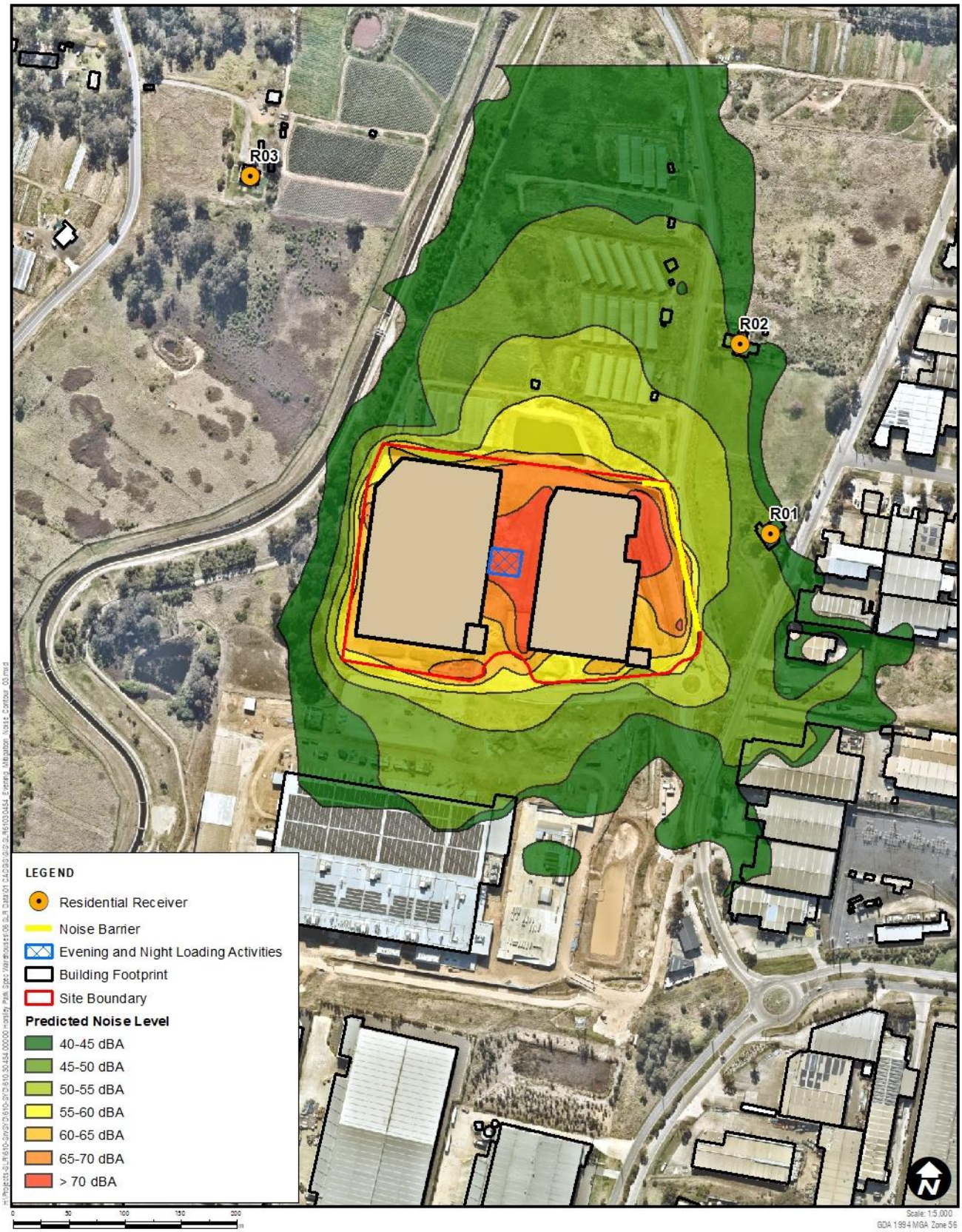
Site Operations – Night – Warehouse 3 Recessed Loading Docks (Unmitigated)



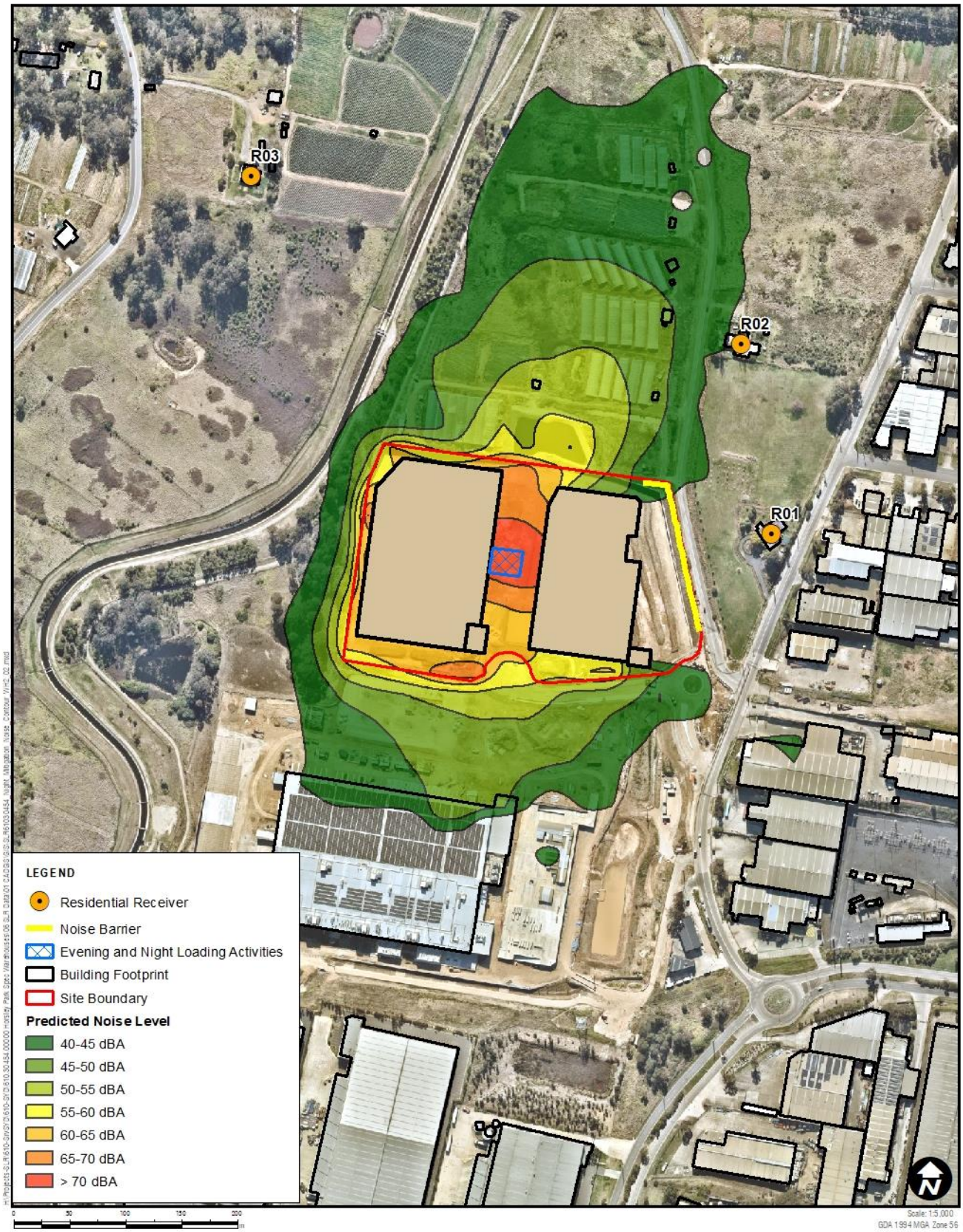
Site Operations – Day (Mitigated)



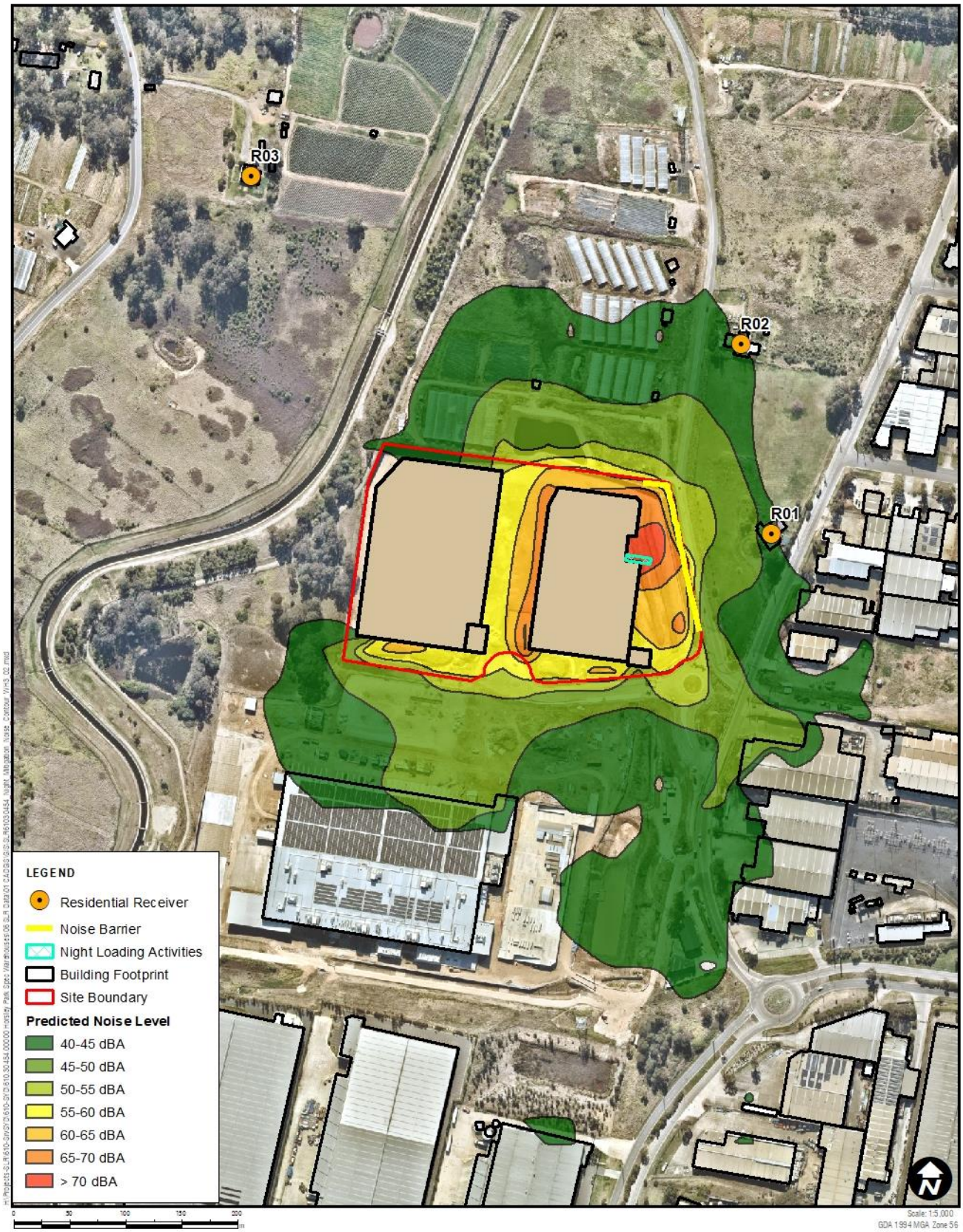
Site Operations – Evening (Mitigated)



Site Operations – Night – Warehouse 2 (Mitigated)



Site Operations – Night – Warehouse 3 (Mitigated)



APPENDIX E

CNVG Mitigation Measures

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.
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.

Action Required	Applies To	Details
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. 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.

Action Required	Applies To	Details
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.
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.

CNVG 'Additional Mitigation Measures'

Additional Mitigation Measure	Description
Notification (letterbox drop or equivalent)	Advanced warning of works and potential disruptions can assist in reducing the impact on the community. The notification may consist of a letterbox drop (or equivalent) detailing work activities, time periods over which these will occur, impacts and mitigation measures. Notification should be a minimum of five working days prior to the start of works.
Specific notifications (SN)	Specific notifications are letterbox dropped (or equivalent) to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. The specific notification provides additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops.
Phone calls (PC)	Phone calls detailing relevant information made to affected stakeholders within seven calendar days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs.
Individual briefings (IB)	Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Project representatives would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.
Respite Offers (RO)	Respite Offers should be considered where there are high noise and vibration generating activities near receivers. As a guide work should be carried out in continuous blocks that do not exceed three hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers. The purpose of such an offer is to provide residents with respite from an ongoing impact. This measure is evaluated on a project-by-project basis, and may not be applicable to all projects.
Respite Period 1 (R1)	Out of hours construction noise in 'out of hours period 1' shall be limited to no more than three consecutive evenings per week except where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and no more than six evenings per month.
Respite Period 2 (R2)	Night time construction noise in 'out of hours period 2' shall be limited to two consecutive nights except for where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and six nights per month. Where possible, high noise generating works shall be completed before 11pm.
Duration Respite (DR)	Respite offers and respite periods 1 and 2 may be counterproductive in reducing the impact on the community for longer duration projects. In this instance and where it can be strongly justified it may be beneficial to increase the work duration, number of evenings or nights worked through Duration Respite so that the project can be completed more quickly. The project team should engage with the community where noise levels are expected to exceed the NML to demonstrate support for Duration Respite.
Alternative Accommodation (AA)	Alternative accommodation may be offered to residents living in close proximity to construction works that are likely to experience highly intrusive noise levels. The specifics of the offer should be identified on a project-by-project basis. Additional aspects for consideration shall include whether the highly intrusive activities occur throughout the night or before midnight.
Verification (V)	Verification of construction noise and vibration levels should occur to ensure the actual impacts are consistent with the predicted levels. Appendix F of the CNVG contains further details about verification of Noise and Vibration levels as part of routine checks of noise levels or following reasonable complaints.

ASIA PACIFIC OFFICES

ADELAIDE
60 Halifax Street
Adelaide SA 5000
Australia
T: +61 431 516 449

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE CBD
Suite 2B, 125 Bull Street
Newcastle West NSW 2302
Australia
T: +61 2 4940 0442

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Grd Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
Level 4, 12 O'Connell Street
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

WELLINGTON
12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186

SINGAPORE
39b Craig Road
Singapore 089677
T: +65 6822 2203