20 October 2021

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Department of Planning, Industry & Environment
Planning Secretary
12 Darcy St
Parramatta NSW 2150

To the Secretary,

Prospect Logistics Estate, Pemulwuy
SSD 10399

We write to advise the Department that pursuant to Condition A11, the development of the estate will be undertaken in stages, each subject to a Construction Certificate from the Principal Certifying Authority. The staging of the works is proposed as follows:

Stage	Work Elements
Stage 1a	Earthworks and associated retaining (excluding those works impacting on the Sydney Water main, and Warehouse 1 & 7 impacted by Blacktown City Council's regional stormwater basin)
Stage 1b	Earthworks and associated retaining not included in Stage 1a
Stage 2	Construction of warehouse 2
Stage 3	Construction of warehouse 7
Stage 4	Internal estate roadway and associated infrastructure including authority services connections
Stages 5 & 6	Remaining warehouse construction

Stage 1A works are currently underway with the commencement of Stage 2 anticipated in the coming weeks subject to the Construction Certificate.

In line with the staging of the development, the Department's endorsement of the Design Acoustic Validation required under Condition B34 is also sought to be staged. Prior to commencement of each warehouse, the Design Noise Validation Report will be submitted for endorsement by the Planning Secretary. The report accompanying this letter seeks endorsement for Warehouse 2 only, outlining that the operational noise levels of the warehouse are expected to comply with the trigger levels following the inclusion of reasonable mitigation measures.

The report will be updated to reflect the noise impacts of the entirety of the estate once wider design information is confirmed, particularly prior to the construction of Warehouse 3 where further additional mitigation measures will be required.

Aliro and ISPT seek the Department's endorsement for the operational noise levels for Warehouse 2 enabling construction of warehouse 2 to commence.

Yours Sincerely

Colin MacDonald
Development Manager

Cc: Athlene Kyle, ISPT Pty Ltd

Encl: Elevation at Greystanes: Operational Noise Impact Assessment Warehouse 2, SSD 10399

ELEVATION AT GREYSTANES

Operational Noise Impact Assessment
Warehouse 2
SSD 10399

Prepared for:

Aliro Group
Level 38
Gateway
1 Macquarie Place
Sydney NSW 2000

SLR Ref: 610.30560-R02
Version No: -v1.0
October 2021

EXECUTIVE SUMMARY

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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 Aliro Group (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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

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

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30560-R02-v1.0	20 October 2021	Antony Williams Jason Rasquinha	Aaron McKenzie	Antony Williams

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DOCUMENT REFERENCES

TABLES

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FIGURES

APPENDICES

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Aliro Group on behalf of ISPT Pty Ltd (the Applicant) to undertake a noise impact assessment in support of a State Significant Development (SSD) application (SSD 10399) for Elevation at Greystanes at 44 Clunies Ross Street, Lot 107 Clunies Ross Street, Prospect NSW and 615A Great Western Highway Pemulwuy, NSW (the development/project).

SSD 10399 was approved for development on 2 July 2021 and allows for the establishment of a warehouse and logistics estate with a combined gross floor area of 95,150 m^2.

This report summarises the assessment of the potential operational noise impacts associated with the development and details the mitigation and management procedures for dealing with potential impacts. Operational noise impacts were previously assessed in a report produced by White Noise Acoustics title *Clunies Ross Street, SSD 10399 – Prospect Logistics Estate, Noise Impact Assessment* in August 2020 (the DA NIA).

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

This report assesses the potential impacts from the entire Elevation at Greystanes development but is focused on evaluating the impacts at receivers adjacent to Warehouse 2. Reasonable assumptions have been made regarding the likely noise sources at the other warehouses based on the currently available information. This report will be updated at a later stage to assess the impacts adjacent to the remaining warehouses when design information for the wider site is confirmed.

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

1.1 Proposal Description

Elevations at Greystanes is being developed to offer modern, high-quality warehousing, distribution and logistics facilities with associated ancillary offices, internal roads and carparking, landscaping and a small cafe. The development, comprising of seven warehouse buildings, will allow a range of potential industrial uses, each consistent with the land use zoning approved under the WSEA SEPP. These may include but not be limited to, logistic and distribution centres, depots, freight transport facilities and hardware and building supplies. Two of the warehouses have procured incoming tenants with one identified for cold storage and distribution of food and another as a distribution centre.

The location of the development and surrounding receivers is shown in **Figure 1** and the proposed layout is shown in **Figure 2**.

Vehicle access to the site would be via Foundation Place to the west and Clunies Ross Street to the east. The development would operate 24 hours a day. The identified sources of noise from the proposed development include:

- Vehicle movements on public roads, internal access roads, and in hardstands and parking areas.
- Mechanical plant and operation of the loading docks.

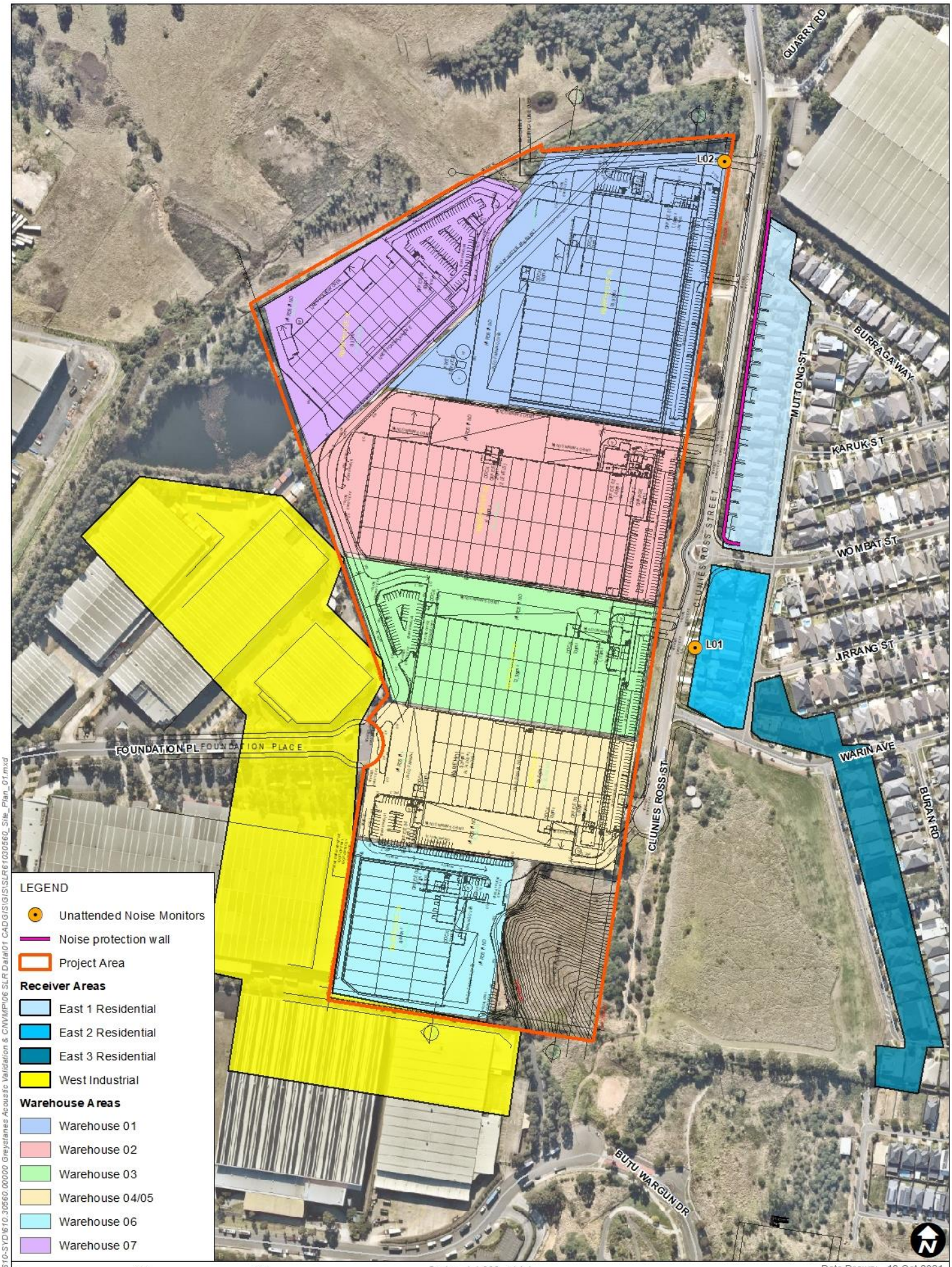
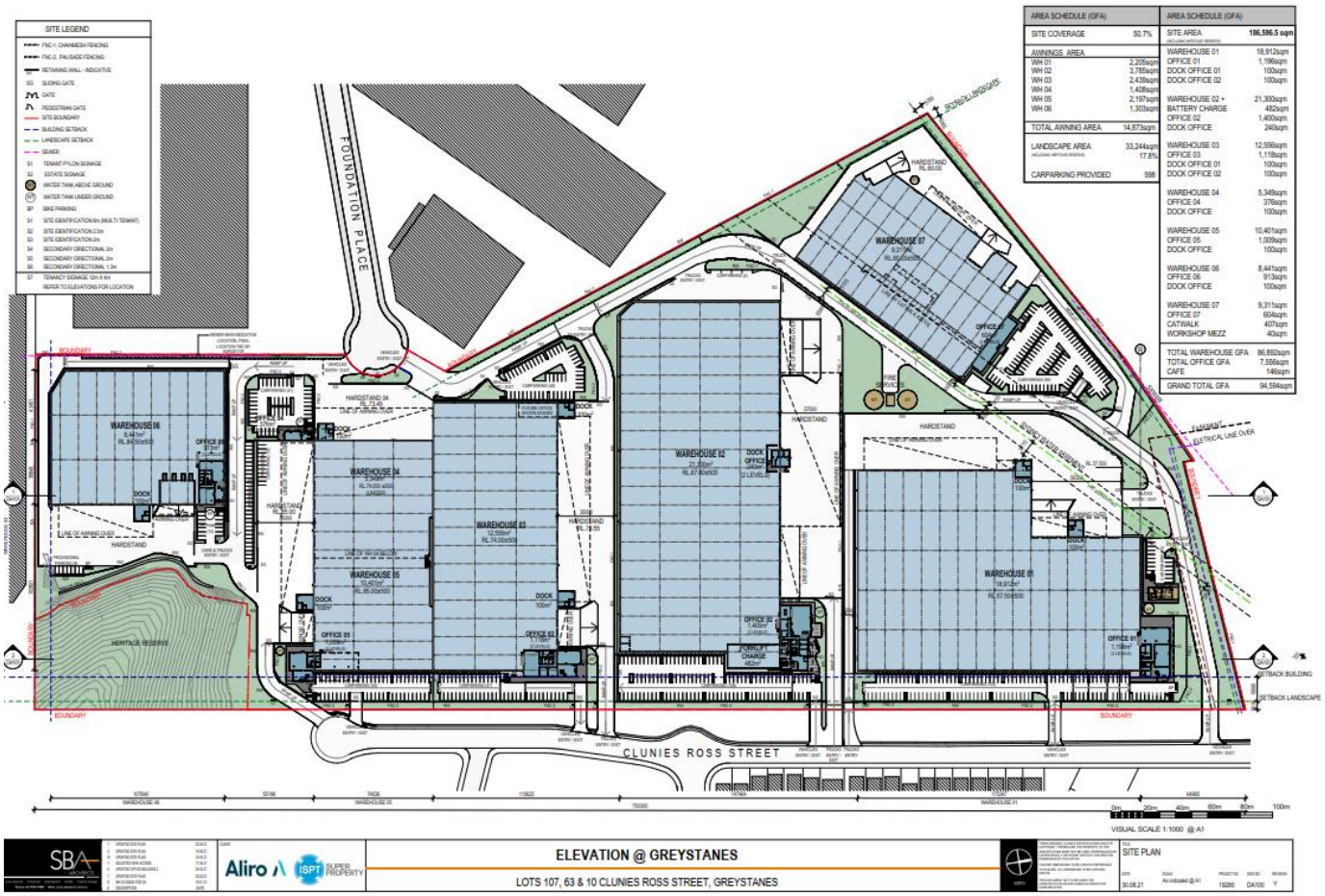

QUARRY RD
L02
BURRAGA WAY
MUTTONG ST
KARUK ST
CLUNIES ROSS STREET
WOMBAT ST
L01
JIRRANG ST
FOUNDATION PL FOUNDATION PLACE
WARIN AVE
CLUNIES ROSS ST
BURAN RD
BUTU WARGUN DR
LEGEND
Unattended Noise Monitors
Noise protection wall
Project Area
Receiver Areas
East 1 Residential
East 2 Residential
East 3 Residential
West Industrial
Warehouse Areas
Warehouse 01
Warehouse 02
Warehouse 03
Warehouse 04/05
Warehouse 06
Warehouse 07
0
100
200
m
Scale: 1:4,000 at A4
Coordinate System: GDA 1994 MGA Zone 56
Date Drawn: 19-Oct-2021
Project Number: 610.30560
Data Source:
Nearmap Imagery August 2021
Site Plan
FIGURE 1
H:\Projects-SLR\610-SnySYD\610.30560.00000 Greystanes Acoustic Validation & CNVMP\06 SLR Data\01 CAD\GIS\GIS\SLR610305660_Site_Plan_01.mxd

Figure 2 Proposed Development



1.2 Nearest Receivers

The nearest sensitive receivers are residential properties to the east. The nearest commercial receivers are located to the immediate west. The nearest receivers are shown in **Figure 1** and detailed in **Table 1**.

Table 1 Surrounding Sensitive Receivers

ID	Address	Type	Distance (m)	Direction
East 1 Residential	Residences north of Wombat Street, Pemulwuy	Residential	50	East
East 2 Residential	Residences south of Wombat Street, Pemulwuy	Residential	50	East
East 3 Residential	Residences on Durawi Street, Pemulwuy	Residential	180	South east
West Industrial	Industrial developments on Foundation Place, Pemulwuy	Industrial	40	West

1.3 Development Consent Conditions

The Development Consent Conditions for SSD 10399 were issued by the Department of Planning, Industry and Environment (DPIE) in July 2021. The requirements relevant to noise and vibration are shown in **Table 2**.

Table 2 Development Consent Conditions

Noise	Where Addressed
Design Noise Validation *B34. Prior to the commencement of construction of each warehouse, the Applicant must prepare a noise validation report(s), to the satisfaction of the Planning Secretary. The report(s) must:*	-
(a) be prepared by a suitably qualified and experienced noise expert whose appointment has been endorsed by the Planning Secretary;	**Section 1**
(b) establish noise criteria for the nearest sensitive receivers in accordance with the EPA's Noise Policy for Industry 2017;	**Section 3**
(c) detail the design specifications for mechanical plant and equipment, ducting and fans, and any acoustic treatments to ensure compliance with the noise limits established in accordance with condition B34(b); and	**Section 6**
(d) recommend, prioritise and implement measures to improve noise controls on site, including but not limited to, programming mechanical plant to reduce night-time noise, implementing a driver code of conduct to reduce vehicle noise and ensuring roller doors are closed when there is no un/loading	**Section 6**
B35. The Applicant must:	-
(a) not commence construction of the relevant warehouse until the noise validation report required by condition B34 is approved by the Planning Secretary; and	-
(b) implement the noise control recommendations of the noise validation report approved by the Planning Secretary, in a timeframe agreed with the Planning Secretary.	-

2 Existing Noise Environment

Unattended noise monitoring was completed in the study area during January and February 2020 and as part of the DA NIA. 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 noise monitoring locations are shown in **Figure 1** and the results are summarised in **Table 3**.

Table 3 Summary of Unattended Noise Monitoring Results

ID	Address	Measured Noise Levels (dBA)[1,2]					
		Background Noise (RBL)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
R01	Northern location	52	50	44	58	54	52
R02	Southern location	48	46	40	52	51	44

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

Note 2: The survey was completed by White Noise Acoustics in 2020.

Short-term attended noise monitoring was also completed at each monitoring location for the DA NIA. The attended measurements concluded that the noise levels during the survey were dominated by vehicle movements of Clunies Ross Street, nearby motorways and existing industrial facilities.

3 Assessment Criteria

3.1 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.

3.1.1 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 4**.

Table 4 Residential Receiver Amenity

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

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

Amenity noise categories have been determined with reference to the NPFI. The assessment is shown in **Table 5**.

Table 5 Residential Receiver Amenity Category Assessment

Area	Land Use Zoning	Existing Background Noise Levels RBL (dBA)			Resulting Amenity Classification	Discussion
		Day	Eve	Night		
East 1	R3 – medium density residential	52	50	44	Urban	The area is zoned as R3 – medium density residential, however, residences have been classified as urban due to high existing background noise levels that are dominated by road traffic and industrial noise, and being near to commercial/industrial districts.
East 2 and East 3		48	46	40	Urban	

3.1.2 Project Noise Trigger Levels

The trigger levels for industrial noise from the proposal are summarised in **Table 6**. 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 6 Project Noise Trigger Levels

Receiver Location/ Type	Period	Amenity Noise Level L_{Aeq} (dBA)	Measured Noise Level (dBA)		Project Noise Trigger Levels $L_{Aeq(15minute)}$ (dBA)	
			RBL[1]	L_{Aeq}	Intrusiveness	Amenity[2]
East 1 Residential	Day	60	52	58	**57**	63[3]
	Evening	50	50	54	55	**53**[3]
	Night	45	44	52	49	**48**[3]
East 2 and East 3 Residential	Day	60	48	52	**53**	58[4]
	Evening	50	46	51	51	**48**[4]
	Night	45	40	44	45	**43**[4]
Commercial	When in use	65	-		-	63
Industrial		70	-		-	68

Note 1: RBL = Rating Background Level.

Note 2: The project amenity noise levels have been converted to a 15-minute level by adding 3 dB, as outlined in the NPfI.

Note 3: The recommended amenity noise levels have been used as the project amenity noise levels as no other sources of additional industrial noise would likely be introduced in the area that would affect these receivers and all existing sources are shielded by intervening buildings and structures.

Note 4: The recommended amenity noise levels have been reduced by 5 dB, where appropriate, to give the project amenity noise levels.

The residential receivers in the East 1 Residential area are in close proximity to the development site and noise from the development would be the dominant source at facades which face west. The existing industrial sites in the area are shielded from these facades by other intervening buildings and structures, and no future development is likely to occur that would introduce additional sources of industrial noise that would impact these receivers. For this reason, the recommended amenity noise levels have been used as the project amenity noise levels for receivers in the East 1 Residential area.

The residential areas to the south (East 2 and East 3 Residential) are potentially exposed to industrial noise from existing (or future) developments and the recommended amenity noise levels for these areas have been reduced by 5 dB to give the project amenity noise levels for these areas.

3.1.3 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 7**, which are to be applied where annoying characteristics are present.

Table 7 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 4.1**.

3.2 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events during the night-time 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 8**.

Table 8 Sleep Disturbance Screening Levels

Location	Noise Level (dBA)	
	Measured Prevailing Night-time Background Level	Sleep Disturbance Screening Level[1]
East 1	44	59
East 2 and East 3	40	55

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 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 9**.

Table 9 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 Operational Noise Assessment

The potential operational noise levels from the development 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.

4.1.1 Operational Noise Sources

The project is in the early design stages and certain future tenants are currently unknown. Several assumptions have been made by Aliro Group regarding the likely future tenants, uses and sources of noise, based on the likely uses which may include logistic and distribution centres, depots, freight transport facilities and hardware and building supplies. 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 10**. The volumes are representative of the worst-case 15-minute period for the daytime, evening and night-time. The vehicle routes are shown in **Figure 3** and **Figure 4**.

Table 10 Vehicle Traffic Data – Worst-case 15-Minute Period

Vehicle Type	Location	Sound Power Level (dBA)	Vehicle Speed (km/h)	Access Point	Number of Vehicles in Worst-case 15-minute Period[1]		
					Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night-time (10pm to 7am)
Warehouse 1							
Large Trucks	Access routes	108[2]	25	Entry via Clunies Ross St (100%), exit via Foundation Pl (70%) and Clunies Ross (30%)	3	3	2
	Loading docks		5				
Light Vehicles	Car park	96[3]	20	Clunies Ross Street (100%)	7	7	6

Vehicle Type	Location	Sound Power Level (dBA)	Vehicle Speed (km/h)	Access Point	Number of Vehicles in Worst-case 15-minute Period[1]		
					Daytime (7am to 6pm)	Evening (6pm to 10pm)	Night-time (10pm to 7am)
Warehouse 2							
Large Trucks	Access routes	108[2]	25	Entry and exit via Foundation Pl (70%) and Clunies Ross (30%)	2	2	2
	Loading docks		5				
Light Vehicles	Car park	96[3]	20	Clunies Ross Street (100%)	3	3	2
Warehouse 3							
Large Trucks	Access routes	108[2]	25	Entry and exit via Foundation Pl (70%) and Clunies Ross (30%)	2	2	2
	Loading docks		5				
Light Vehicles	Car park	96[3]	20	Clunies Ross Street (100%)	5	5	4
Warehouse 4							
Large Trucks	Access routes	108[2]	25	Entry and exist via Foundation Pl (100%)	1	1	1
	Loading docks		5				
Light Vehicles	Car park	96[3]	20	Foundation Pl (100%)	2	2	2
Warehouse 5							
Large Trucks	Access routes	108[2]	25	Entry via Foundation Pl (70%) and Clunies Ross (30%), exist via Clunies Ross Street (100%)	2	2	1
	Loading docks		5				
Light Vehicles	Car park	96[3]	20	Clunies Ross Street (100%)	4	4	3
Warehouse 6							
Large Trucks	Access routes	108[2]	25	Entry via Foundation Pl (100%), exit via Clunies Ross (100%)	1	1	1
	Loading docks		5				
Light Vehicles	Car park	96[3]	20	Foundation Pl (100%)	3	3	3
Warehouse 7							
Large Trucks	Access routes	108[2]	25	Entry and exit via Foundation Pl (70%) and Clunies Ross (30%)	2	1	1
	Loading docks		5				
Light Vehicles	Car park	96[3]	20	Foundation Pl (70%) and Clunies Ross (30%)	10	5	25

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.

Figure 3 Truck Routes

Figure 4 Light Vehicle Routes

Loading Docks

Details of the loading dock noise sources are shown in **Table 11**. The various sources have been modelled in the loading docks and hardstands as shown in **Figure 5**.

Table 11 Typical Loading Dock Noise Sources – All Warehouses

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
Electric Forklift	84[3]	900 seconds	1.0

Note 1: 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: SWL based on measurements.

Figure 5 Loading Dock Locations

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 development includes air-conditioning equipment serving the office buildings for each warehouse and roof fans. Compressors and condensers would be required within the Warehouse 7 plant room.

The details of the mechanical plant are based on preliminary data and are shown in **Table 12**. The assumed hours of operational of the various items are shown in table. The locations of the sources are shown in **Figure 6**.

Table 12 Mechanical Plant

Noise Source	Sound Power Level (dBA)	Location
Air-conditioning equipment	78	Office and dock offices for all warehouses (see **Figure 6**). Air-conditioning operational hours are: - Warehouse 1 to 6: 7am to 6pm - Warehouse 7: 24/7
Compressor	88 (two compressors)	Within Warehouse 7 plant room, assumes facade is precast concrete. Compressor operational hours for Warehouse 7 are 24/7.
Condenser	100	Roof of Warehouse 7 plant room. Condenser operational hours for Warehouse 7 are potentially 24/7.
Warehouse roof fans	98	Roof of all warehouses and roof of Warehouse 7 plant room (see **Figure 6**). Roof fans may operate at any time so have been assumed to be 24/7 at all warehouses.

Figure 6 Modelled Source Locations

4.1.2 Noise Sources with Potential for Sleep Disturbance

As the development would 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 13**.

Table 13 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 each operational loading dock.

4.1.3 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 entrances 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 Prospect Highway from the west, via Foundation Place, and Clunies Ross Street from the east. The potential noise impacts from additional traffic have been assessed based on traffic data shown in **Table 14**.

Table 14 Traffic Volumes – All Warehouses

Road	Existing Traffic volumes				Development Related Traffic Volumes			
	Daytime (7am to 10pm)		Night-time (10pm to 7am)		Daytime (7am to 10pm)		Night-time (10pm to 7am)	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
Prospect Hwy	24,231	5,020	1,547	320	435	109	77	19
Clunies Ross Street[1]	5,757	240	1,016	15	219	55	39	10

Note 1: Traffic volumes have been split equally between the various site entrances/roundabouts.

5 Assessment of Impacts

5.1 Operational Noise Assessment

5.1.1 Predicted Unmitigated Noise Levels

A summary of the noise assessment at the receivers surrounding the development is shown in **Table 15**. Impacts have been predicted at all floors of the nearest receivers. The predicted worst-case levels are compared to the relevant criteria to determine the potential impact from the development. Noise contours of the operational noise impacts are in **Appendix B.**

The full development has been modelled and the potential noise emissions from the entire site have been predicted. The discussion below focuses on evaluating the impacts at receivers in the East 1 Residential area (see **Figure 1**) as these receivers are adjacent the entrance to Warehouse 2 and the most potentially impacted by operation of this warehouse. Reasonable assumptions have been made regarding the likely noise sources at the other warehouses based on the currently available information. This report will be updated at a later stage to assess the impacts adjacent to the remaining warehouses when design information for the wider site is confirmed.

Table 15 Operational Noise Assessment – Unmitigated

Warehouse	Receiver Location	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
			Noise Criteria	**Predicted**	**Exceedance**	
Warehouse 2 alone	East 1 Residential	Day	57	52	-	Yes
		Evening	53	52	-	Yes
		Night	48	52	4	**No**
	West Industrial	When in use	68	56	-	Yes
All Warehouses	East 1 Residential	Day	57	56	-	Yes
		Evening	53	55	2	**No**
		Night	48	55	7	**No**
	West Industrial	When in use	68	66	-	Yes

The above assessment indicates that noise from the operation of Warehouse 2 alone is predicted to comply with the PNTLs at receivers in the East 1 Residential area during the daytime and evening. Noise levels during operation of the entire development are predicted to comply in the East 1 Residential area during the daytime only.

A relatively minor exceedance of 2 dB is predicted in the evening in the East 1 Residential area during operation of the entire development. Night-time exceedances of 4 dB during operation of Warehouse 2 alone and 7 dB during operation of the entire development are predicted in the East 1 Residential area.

Noise levels in the West Industrial area are predicted to comply during operation of Warehouse 2 alone and the entire development.

The predicted exceedances are caused by a combination of noise from the roof mounted fans, noise from the various loading docks and on-site truck movements.

5.1.2 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 6.1**. In summary, the following measures have been applied to reduce noise emissions:

- Lower noise output roof mounted fans for all warehouses.
- The majority of trucks would access the site from the west, via Foundation Place. Around 70% of trucks are expected to use this route with only 30% accessing via Clunies Ross Street.
- Absorptive materials to be used in construction elements of Warehouse 2 and 3 loading docks.
- A driver code of conduct will be produced (required as part Consent Condition B34(d)). This will promote awareness of the proximity of residential receivers to the site and the need to minimise noise emissions from trucks, where possible.
- Use of broadband and/or ambient noise sensing reversing alarms to minimise potentially annoyance.
- Roller doors will be kept closed when un/loading is not occurring.
- It is noted that an existing 4.8 to 5.4 m noise barrier already provides noise mitigation to residential receivers in the East 1 Residential area

A summary of the predicted impacts in the mitigated scenario is shown in **Table 16**.

Table 16 Operational Noise Assessment – Mitigated

Warehouse	Receiver Location	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)			Compliance
			Noise Criteria	Predicted	Exceedance	
Warehouse 2 alone	East 1 Residential	Day	57	46	-	Yes
		Evening	53	46	-	Yes
		Night	48	46	-	Yes
	West Industrial	When in use	68	56	-	Yes
All Warehouses	East 1 Residential	Day	57	52	-	Yes
		Evening	53	48	-	Yes
		Night	48	48	-	Yes
	West Industrial	When in use	68	66	-	Yes

The above assessment indicates that the proposed mitigation is expected to reduce noise levels at receivers in the East 1 Residential area to comply with the Project Noise Trigger Levels.

5.1.3 Sleep Disturbance

The predicted maximum noise levels at the nearest residential receivers during the night-time are shown in **Table 17**. These include the mitigation measures specified in **Section 5.1.2**.

Table 17 Sleep Disturbance Assessment

Warehouse	Receiver Location	Source	Maximum Noise Level LAmax (dBA)			Below Screening Level
			Sleep Dist. Screening Level	**Predicted**	**Exceedance**	
Warehouse 2 alone	East 1 Residential	Truck Movement	59	55	-	Yes
		Airbrake (Warehouse 2)		63	4	**No**
		Truck Reversing Alarm		55	-	Yes
		Forklift Reversing Alarm		49	-	Yes
		Roller Door		36	-	Yes
All Warehouses	East 1 Residential	Truck Movement	59	55	-	Yes
		Airbrake (Warehouse 2)		63	4	**No**
		Truck Reversing Alarm		55	-	Yes
		Forklift Reversing Alarm		49	-	Yes
		Roller Door		36	-	Yes

The above shows that maximum noise levels are generally expected to comply with the sleep disturbance screening level at receivers in the East 1 Residential area. Exceedances are, however, predicted at receivers opposite the entrance to Warehouse 2 when truck airbrakes are used at loading docks of this warehouse.

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

5.1.3.1 Detailed Maximum Noise Level Assessment

The detailed maximum noise levels assessment is summarised in **Table 18**. The only source predicted to have exceedances of the sleep disturbance screening level is truck airbrakes in the loading dock of Warehouse 2.

Table 18 Detailed Maximum Noise Level Assessment

Source	Maximum Noise Level L_{Amax} (dBA)					Comments
	External Sleep Disturbance Goals (dBA)		Development Related Maximum Noise Events		Existing Maximum Noise Levels	
	Awakening Response[1]	Good Sleep	Predicted	Frequency of Occurrence		
East 1 Residential Area (receivers adjacent WH2 entrance)						
Truck airbrakes at WH2	65	Around 55 (should not occur more than 10 to 15 times per night)	59-63	<10 events	Unknown – not reported in the DA NIA	**Awakening Response:** maximum noise levels predicted to be below the 'awakening response' level. **Good Sleep:** around 10 trucks are expected on Clunies Ross Street during the night-time period (see **Table 14**). These would be split between all warehouses. Maximum noise events from truck airbrakes at Warehouse 2 are, therefore, not expected adversely affect 'good sleep' (ie they wouldn't occur more than 10-15 times per night). **Existing maximum noise levels:** the residential receivers adjacent to Warehouse 2 were also adjacent to the entrance of the previous industrial facility which operated 24/7. Development related maximum noise levels are likely to be similar in magnitude to the maximum levels from the previous use of the site.

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 (from enHealth studies) 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.

The above indicates that the predicted sleep disturbance exceedances are unlikely to result in awakenings or adversely affected good sleep. The development related maximum noise levels are also likely to be similar to maximum events from the previous industrial use of the site. The exceedances are, therefore, considered of relatively low significance and do not warrant any specific mitigation measures.

5.1.4 Off-site Traffic Assessment

The results of the off-site traffic assessment are shown in **Table 19**. The assessment has been completed at the sensitive receivers adjacent to Clunies Ross Street and Prospect Highway.

Table 19 Traffic Noise Assessment

Location	Road	RNP Increase Criterion (dB)	Predicted Increase (dB)	
			Day	Night
East 1 Residential	Clunies Ross Street	2.0	<1.0	<1.0
East 2 Residential	Clunies Ross Street		1.0	1.5
East 3 Residential	Clunies Ross Street		<1.0	<1.0
West	Prospect Highway		<1.0	<1.0

The above assessment shows that the increase in noise from vehicle movements on the surrounding roads at the nearest receivers 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.

It is noted that the assessment predicts the potential increase in road traffic noise by comparing the existing situation with the existing situation plus development related traffic. A significant proportion of the existing traffic volumes on Clunies Ross Street would be associated with the previous use of the site which is replaced by the subject development (and not in addition too). This means that the actual increase would likely be lower than predicted above.

6 Mitigation and Management Measures

6.1 Operational Noise – 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 20**.

Table 20 Feasible and Reasonable Mitigation Options

Mitigation Option	Noise Impact/Benefit	Comments	Reasonable and Feasible to Apply
Source Control			
Roof mounted fans	The roof mounted fans contribute to the predicted exceedances. Reduction in SWL provides substantial noise benefit	Roof fans SWL reduced from 98 dBA to 78 dBA.	Yes
Limit truck volumes, particularly during the night-time	Noise from trucks on site roads and in loading docks contributes to the predicted exceedances	The majority of trucks would access the site from the west, via Foundation Place. Around 70% of trucks are expected to use this route with only 30% accessing via Clunies Ross Street.	Yes
		The truck volumes used in this assessment are needed to meet tenant's requirements. Changes to internal truck routes and/or numbers not considered feasible.	No
Absorption used in loading dock	Reduce noise emissions from the site	Absorptive materials to be used in construction elements of Warehouse 2 and 3 loading docks.	Yes
Broadband and/or ambient sensing reversing alarms	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
Noise from abnormal heavy vehicle events	Minimise noise emissions the potential annoying characteristics	A driver code of conduct (required as part Consent Condition B34(d)) will be produced. This will promote awareness of the proximity of residential receivers to the site and the need to minimise noise emissions from trucks, where possible.	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).	An existing 4.8 to 5.4 m noise barrier already provides noise mitigation to residential receivers in the East 1 Residential area.	-

7 Conclusion

SLR has been engaged to assess the potential operational noise emissions from the Elevation at Greystanes development. The site is being developed to offer modern, high-quality warehousing, distribution and logistics facilities with associated ancillary offices, internal roads and carparking, landscaping and a small cafe. The development, comprising of seven warehouse buildings, will allow a range of potential industrial uses, each consistent with the land use zoning approved under the WSEA SEPP. These may include but not be limited to, logistic and distribution centres, depots, food and drink premises, freight transport facilities and hardware and building supplies.

This report assesses the potential impacts from the entire Elevation at Greystanes development but is focused on evaluating the impacts at receivers adjacent to Warehouse 2. This report will be updated at a later stage to assess the impacts adjacent to the remaining warehouses when design information for the wider site is confirmed.

Operational noise levels are generally expected to comply with the trigger levels with the inclusion of the specified mitigation measures.

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

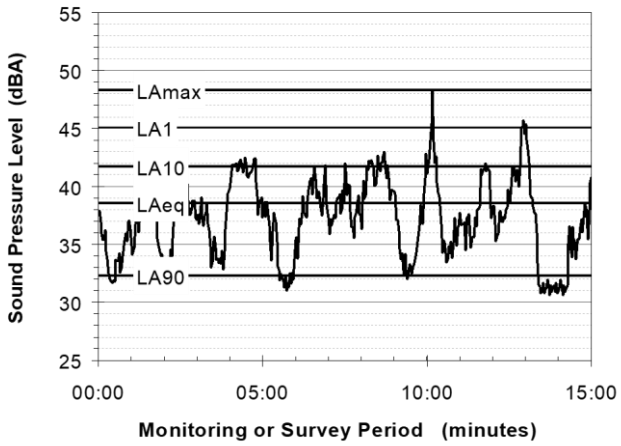
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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

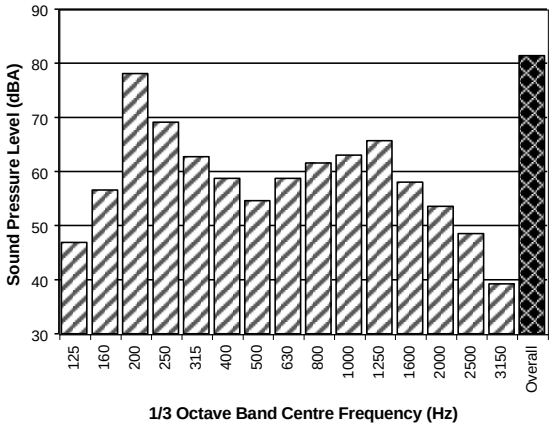
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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

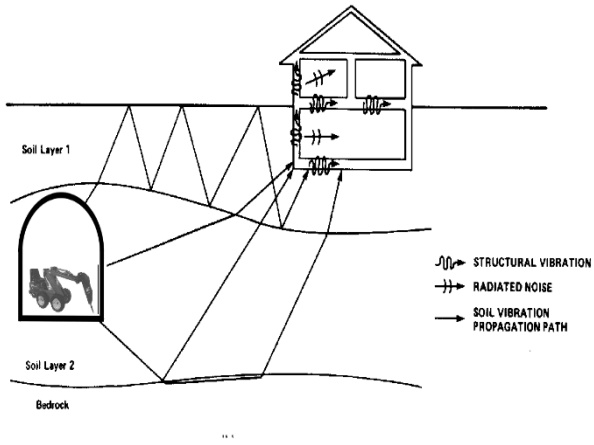
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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

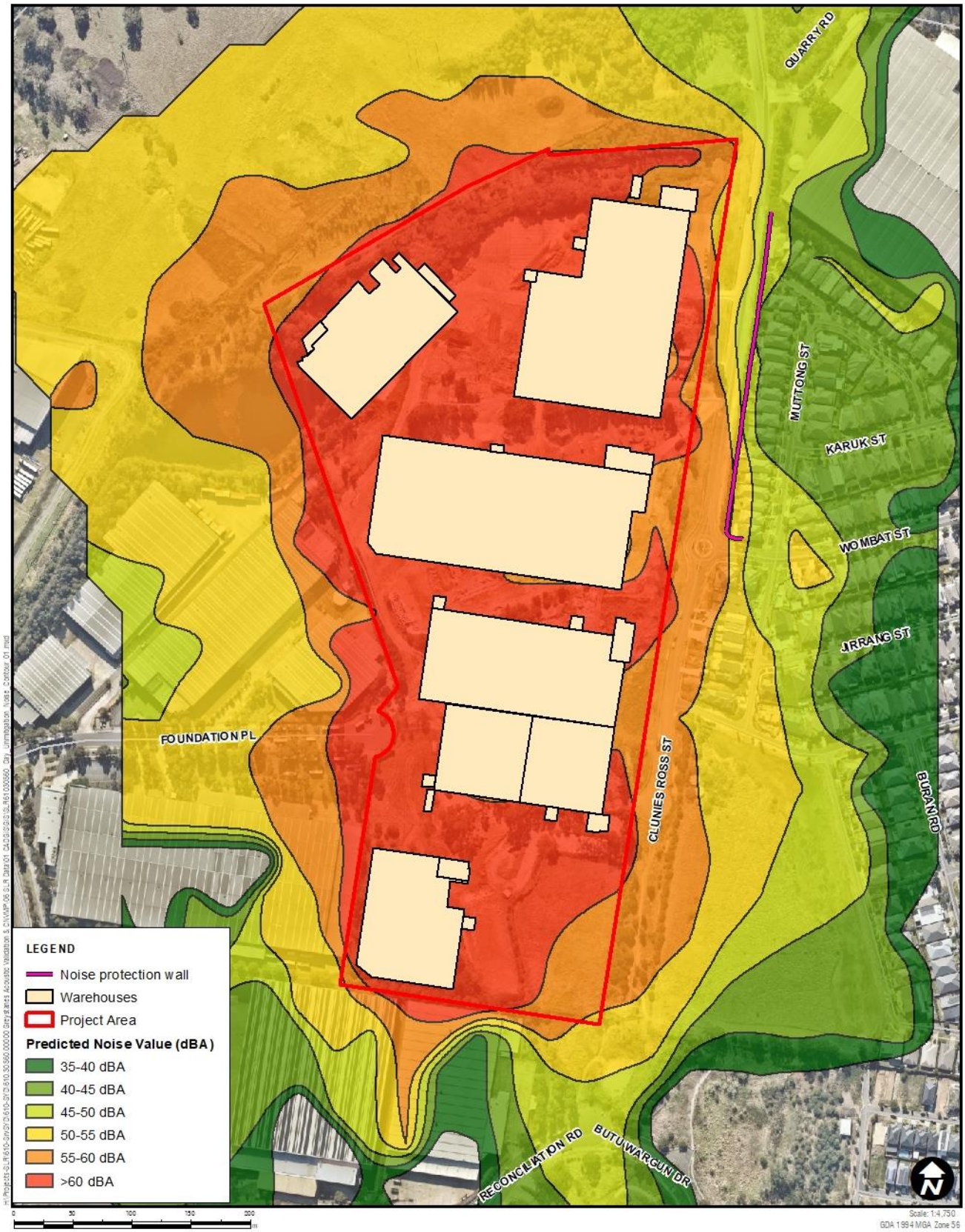


The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect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

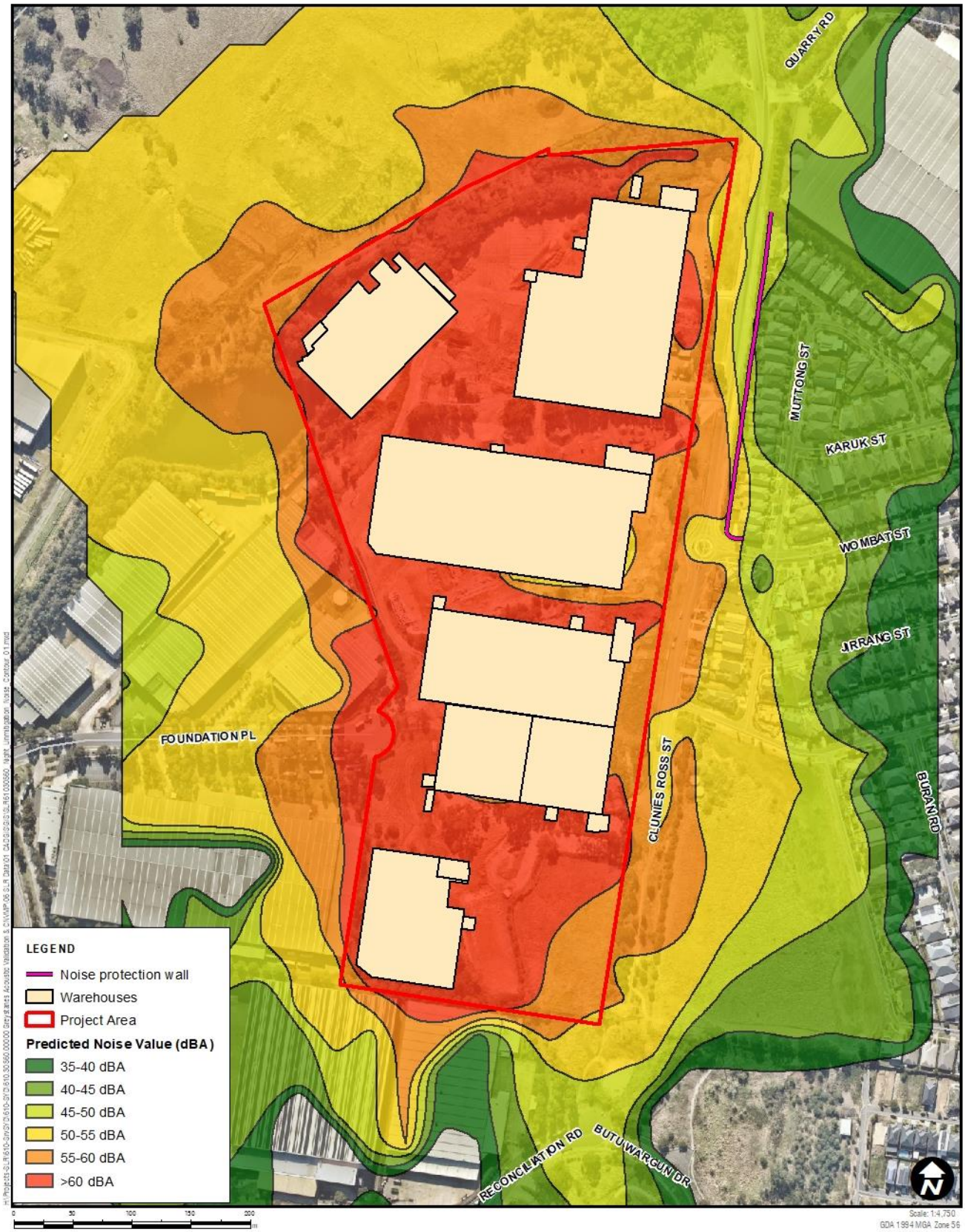
APPENDIX B

Operational Noise Contours

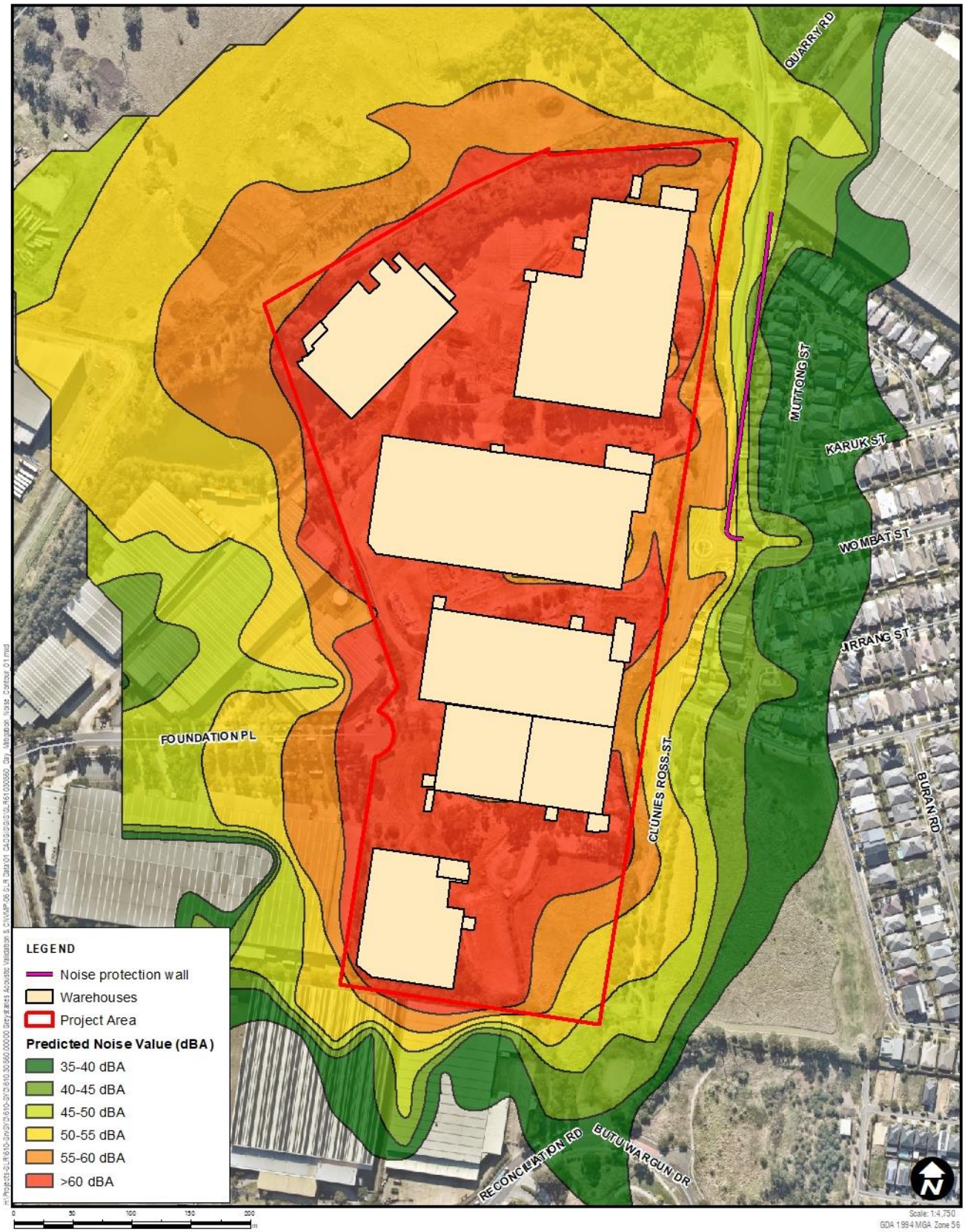
Site Operations – Day (Unmitigated)



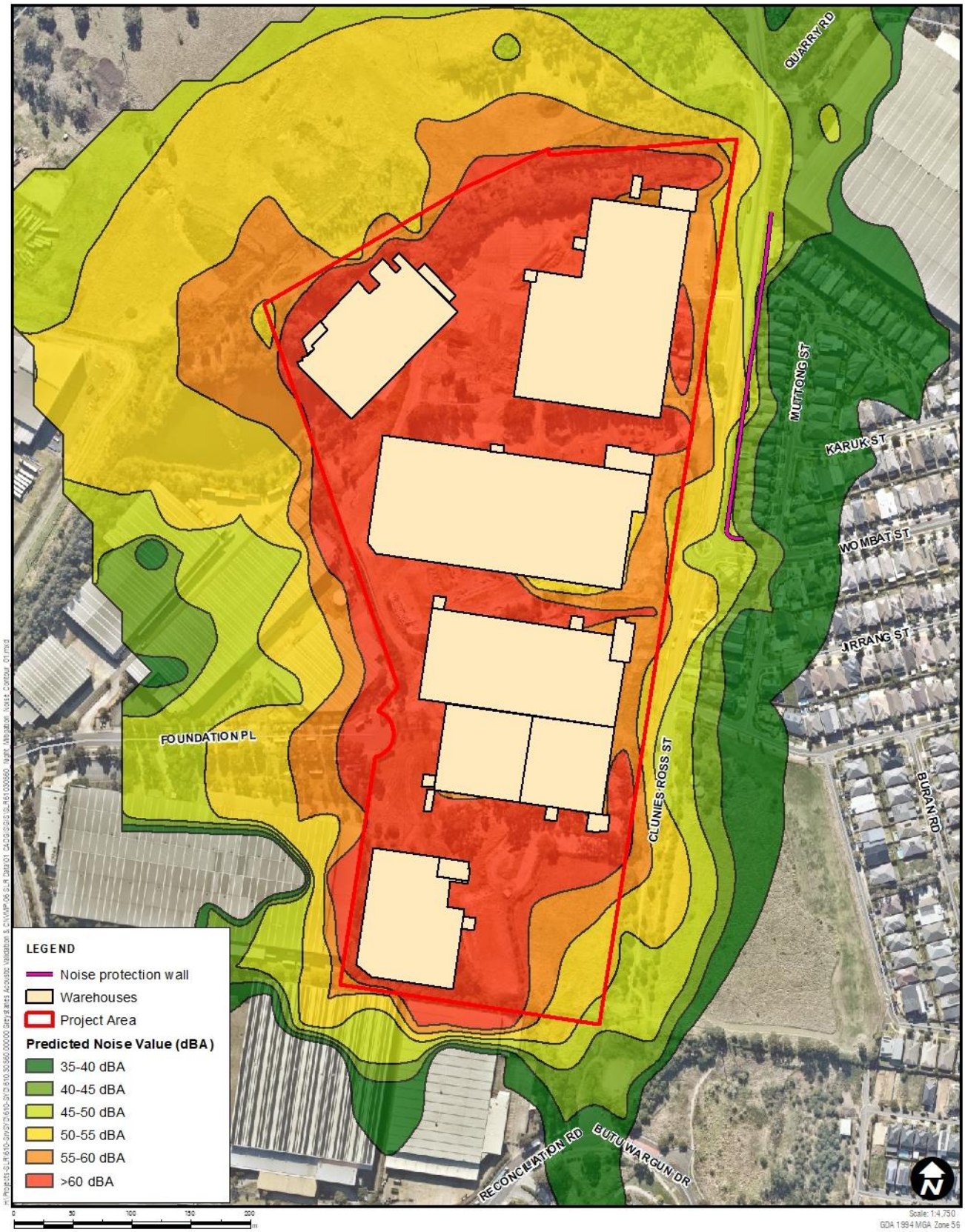
Site Operations – Night (Unmitigated)



Site Operations – Day (Mitigated)



Site Operations – Night (Mitigated)



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