RAPT CONSULTING

Acoustic Assessment – Service Centre Gunnedah, NSW.

Prepared for
NGH

September 2023

Relationships Attention Professional Trust

Document Details

Acoustic Assessment – Service Centre Gunnedah, NSW

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1. Introduction

1.1 Background

RAPT Consulting has been engaged to undertake an acoustic assessment NGH to inform a Development Application (DA) for a service centre at Gunnedah, NSW. The proposal seeks to amend the Gunnedah LEP to amend Schedule 1, to add an additional permitted use for the land at 127-141 Lochrey Road, Gunnedah.

The subject land is legally described as Lot 1 DP 841781 and located at the intersection of the Oxley Highway and Kamilaroi Highway (and is divided by the Oxley Highway). The Site and surrounding area is shown in Figure 1-1 and a concept site layout is shown in Figure 1-2.

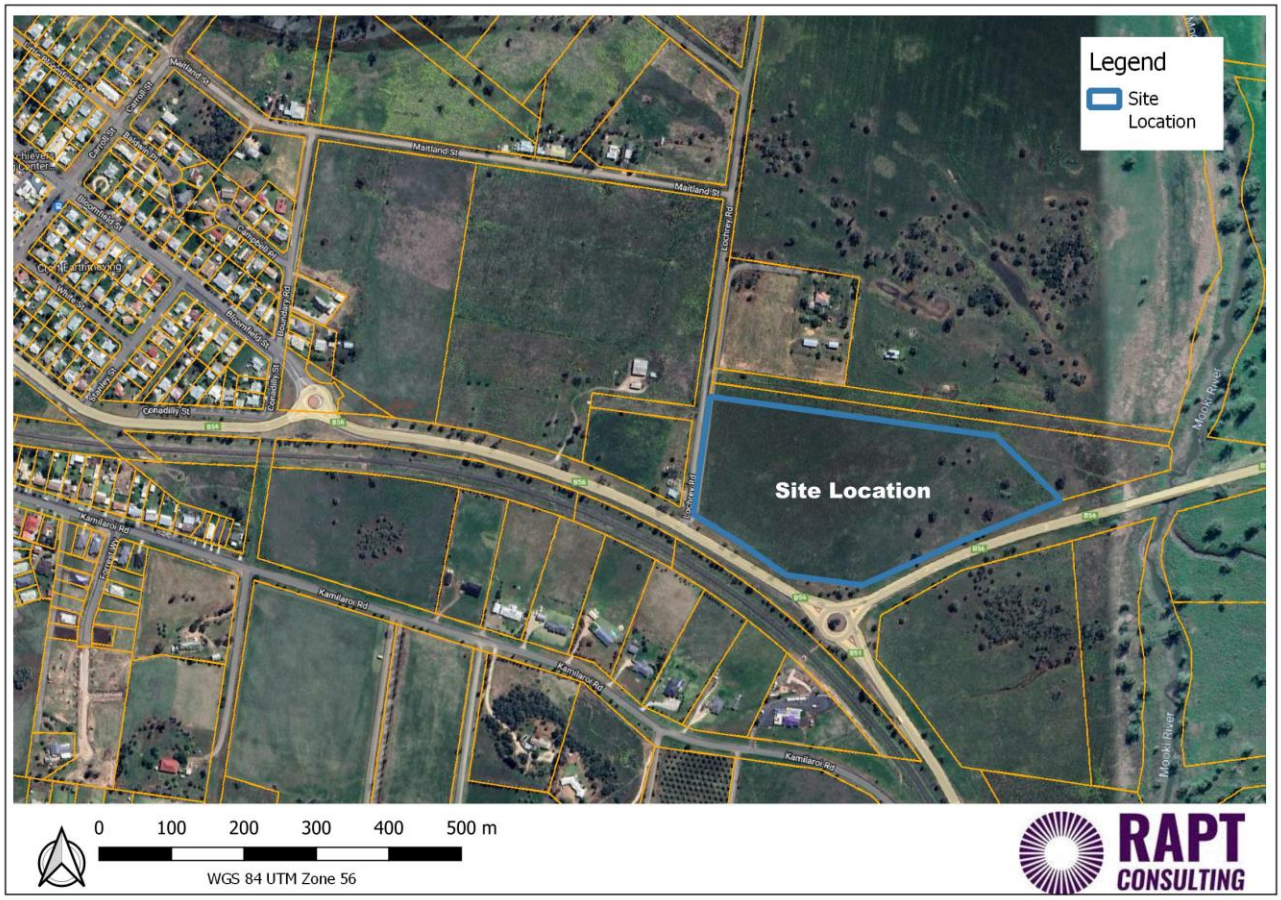


Figure 1-1 Site and Surrounding Area

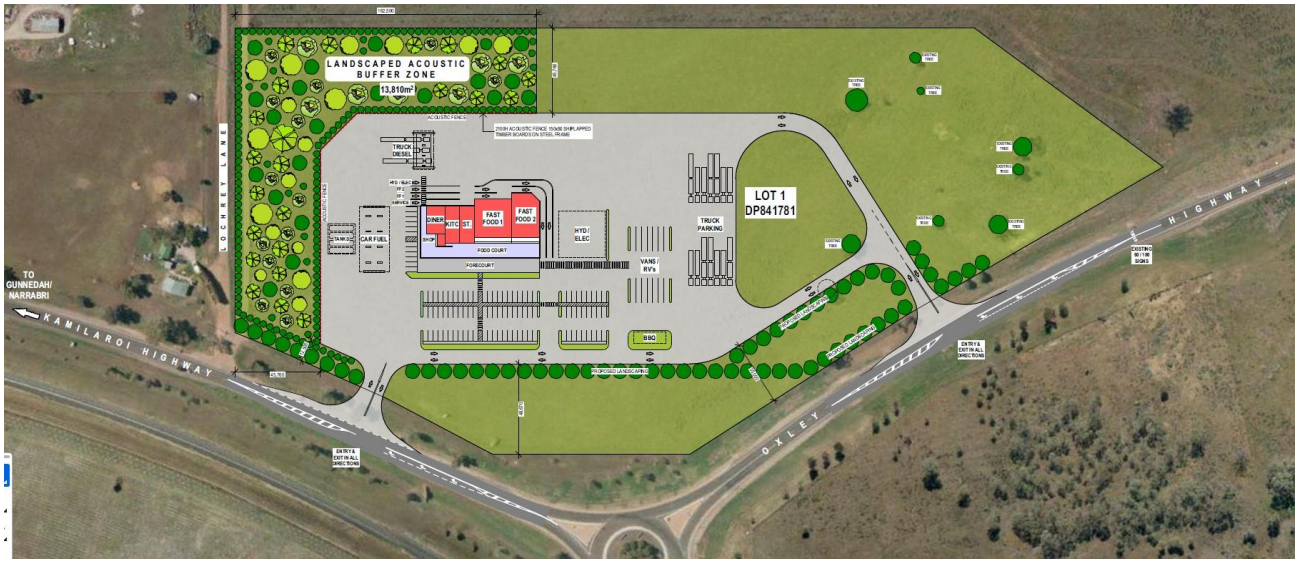


Figure 1-2 Conceptual Site Layout (Source: Hill Lockart Architects)

1.2 Assessment Objectives

This acoustic assessment considers the potential impacts of the operation of the proposal. The purpose is to assess potential noise and vibration from the project and to recommend mitigation measures where required.

1.3 Scope

The acoustic assessment scope of work included:

- Initial desk top review to identify noise sensitive receptors from aerial photography
- Undertake noise measurements to determine ambient and background noise levels
- Establish project noise goals for the operation of the proposed project
- Identify the likely principal noise sources during construction and operation and their associated noise levels
- assessment of potential noise, vibration and sleep disturbance impacts associated with construction and operation aspects of the project
- provide recommendations for feasible and reasonable noise and vibration mitigation and management measures, where noise or vibration objectives may be exceeded.

1.4 Relevant Guidelines

The relevant policies and guidelines for noise and vibration assessments in NSW that have been considered during the preparation of this assessment include:

- Assessing Vibration: A Technical Guideline, Department of Environment and Conservation (DEC), 2006
- British Standard BS7385.2 - 1993 Evaluation and Measurement for Vibration in Buildings, Part 2 - Guide to damage levels from ground borne vibration 1993
- DIN 4150: Part 3-1999 Structural vibration – Effects of vibration on structures 1999
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011
- Noise Policy for Industry (NPfI), Environment Protection Authority (EPA), 2017.
- Interim Construction Noise Guideline (ICNG) (NSW DECC, 2009)

1.5 Limitations

The purpose of the report is to provide an independent acoustic assessment for the proposal.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the acoustic assessment represent the findings apparent at the date and time of the assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be assessed and all uncertainty concerning the conditions of the ambient environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for acoustics, noise were referred to. This work has been conducted in good faith with RAPT Consulting's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Existing Environment

2.1 Receptors

The area surrounding the site is zoned R2 Low Density Residential, R3 Medium Density Residential, R5 Large Lot Residential, RU1 Primary Production and SP2 Infrastructure. A map showing the land use zonings in the vicinity of the proposal are shown in Figure 2-1.

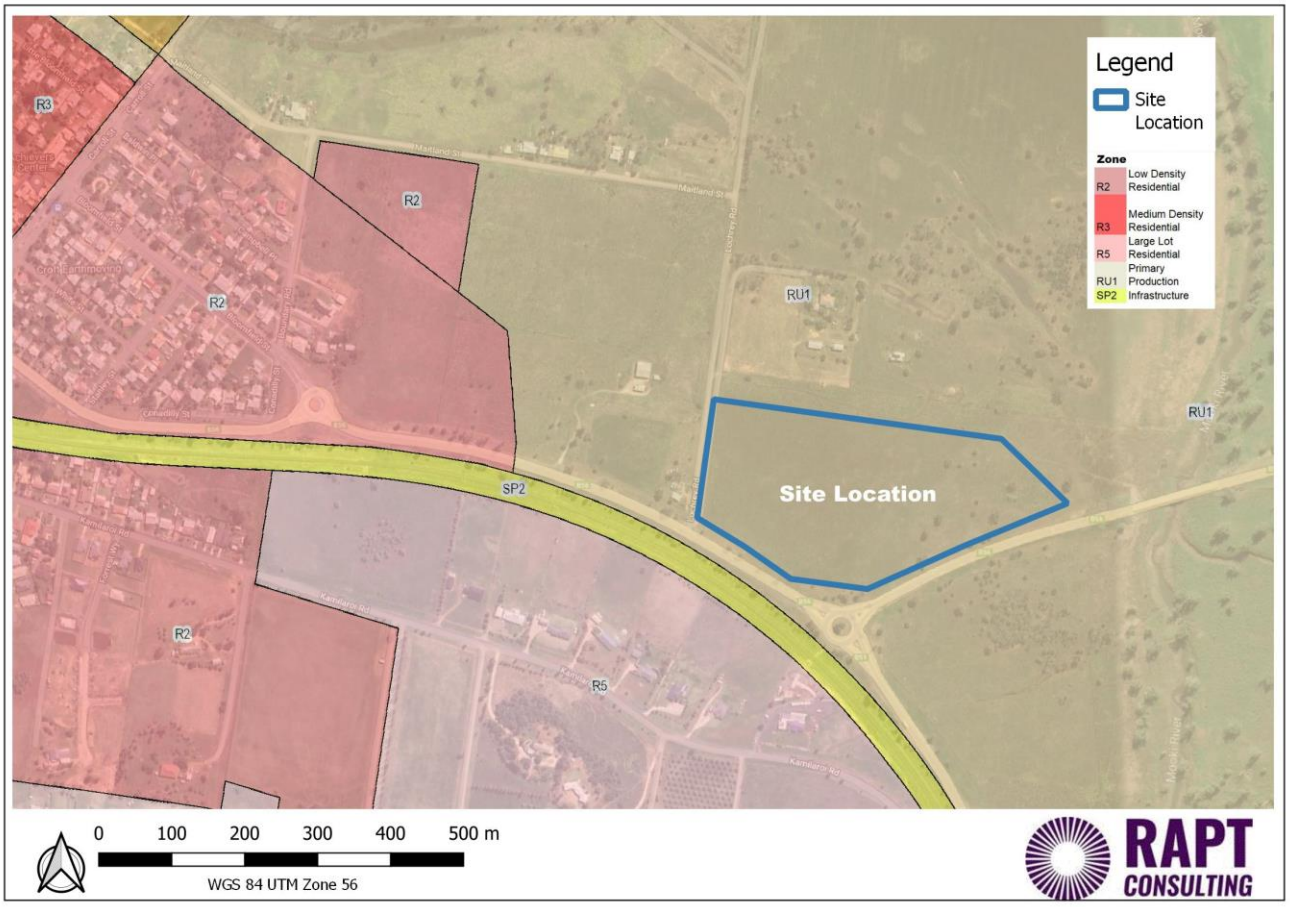


Figure 2-1 Land Use Zonings

Closest receptors to the proposal assessed in this acoustic assessment are identified in Table 2-1 and Figure 2-2.

Table 2-1 Nearest Receptors to Study Area

Receiver ID	Address	Receptor Type	Easting	Northing
R1	88 Conadilly Street	Residential	239700	6568640
R2	102-125 Lochrey Road	Residential	239878	6568881
R3	248 Maitland Street	Residential	239605	6569087
R4	242 Maitland Street	Residential	239529	6569094
R5	240 Maitland Street	Residential	239487	6569099
R6	17 Boundary Road	Residential	239215	6568877
R7	15 Boundary Road	Residential	239216	6568828
R8	2 Boundary Road	Residential	239124	6568760
R9	54 Kamilaroi Road	Residential	239095	6568569
R10	72 Kamilaroi Road	Residential	239417	6568520
R11	76 Kamilaroi Road	Residential	239474	6568493
R12	90 Kamilaroi Road	Residential	239540	6568476
R13	82-84 Kamilaroi Road	Residential	239605	6568459
R14	86-88 Kamilaroi Road	Residential	239662	6568417
R15	90-92 Kamilaroi Road	Residential	239712	6568387
R16	94-98 Kamilaroi Road	Residential	239766	6568361
R17	100-108 Kamilaroi Road	Residential	239842	6568345

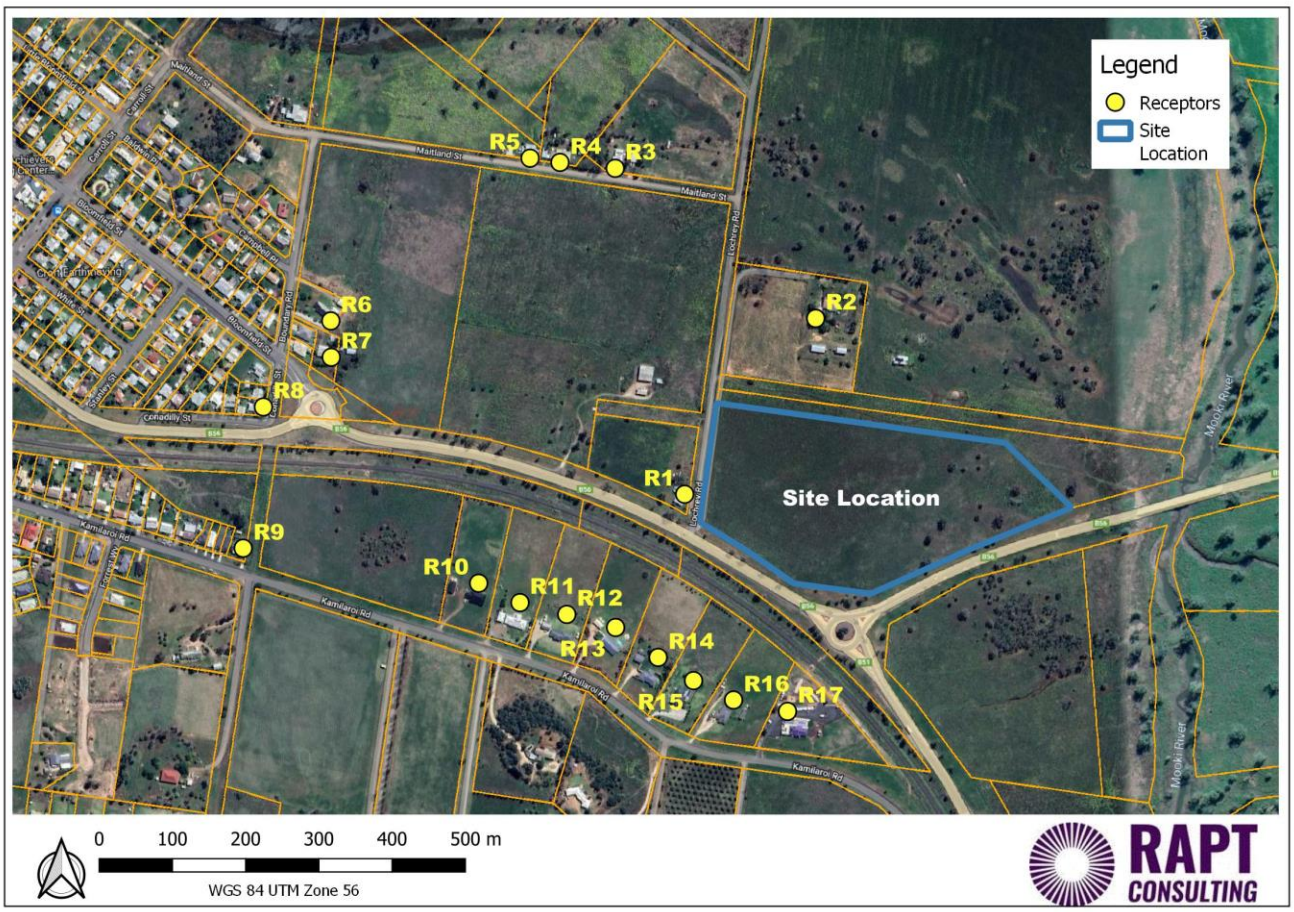


Figure 2-2 Receptors Surrounding The Proposal Site

2.2 Background and Ambient Noise

To establish background and ambient noise levels, noise monitoring was undertaken by RAPT Consulting from 23 March to 30 March 2022 at 88 Conadilly Street and from 6 May to 12 May 2022 at 419 Conadilly Street. Site observations noted the locations were considered indicative of the local ambient noise environment and also presented as secure locations whereby minimising the risk of theft or vandalism to the monitoring equipment. Additionally, they are considered as acceptable locations for determination of the background noise with consideration to the NSW Environment Protection Authority's (EPA's) – Noise Policy for Industry (NPfI). During site visits it was noted that Conadilly Street road traffic, distant road traffic, rail noise and natural wildlife, primarily described the ambient noise environment and is indicative of a sub-urban noise environment.

The monitoring locations are shown in Figure 2-3.

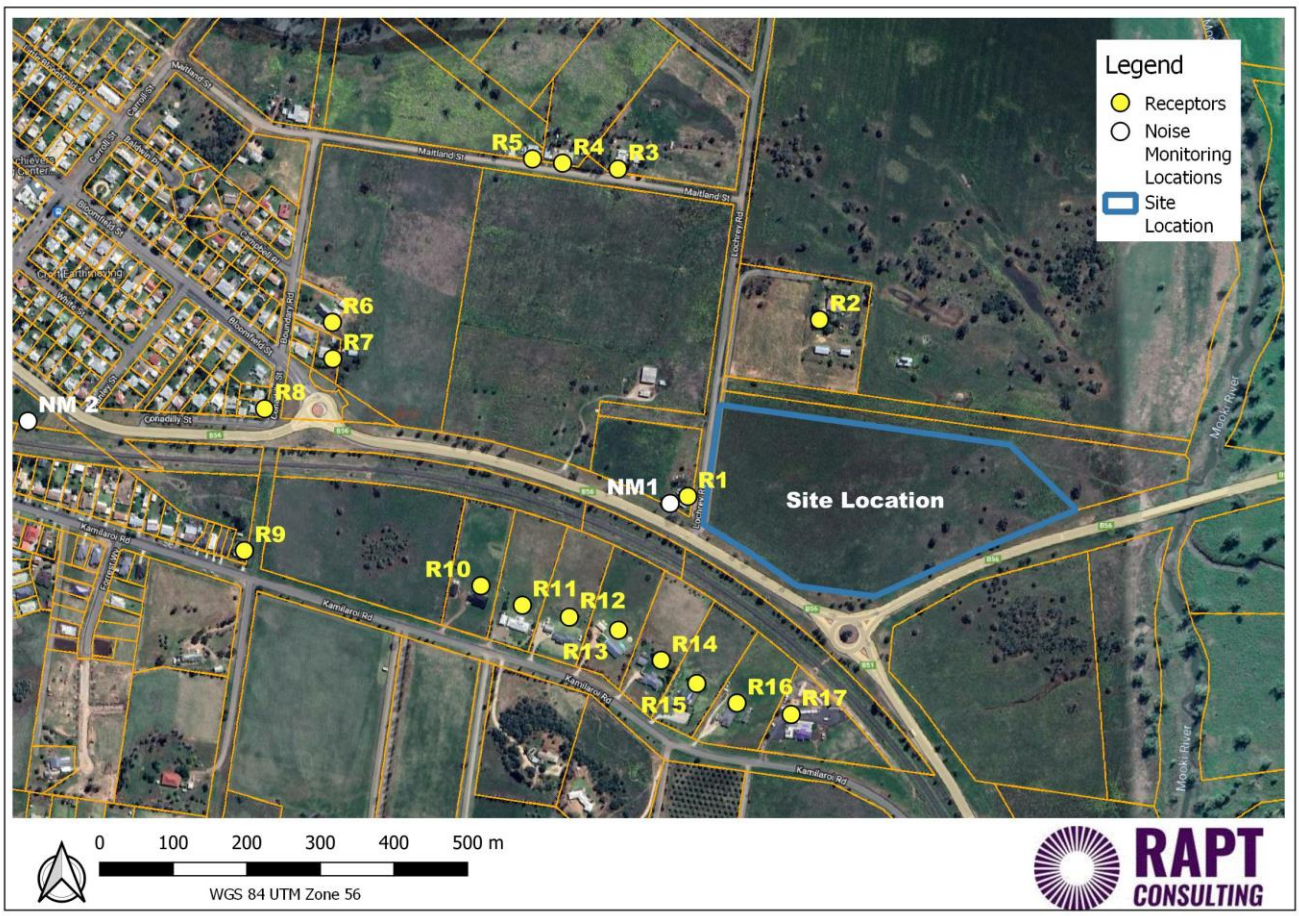


Figure 2-3 Monitoring Locations.

Monitoring was undertaken using a RION NL-42 noise loggers with Type 2 Precision. These loggers are capable of measuring continuous sound pressure levels and are able to record L_{Amin}, L_{A90}, L_{A10}, L_{Amax} and L_{Aeq} noise descriptors. The instruments were programmed to accumulate environmental noise data continuously over sampling periods of 15 minutes for the entire monitoring period.

The noise surveys were conducted with consideration to the procedures described in Australian Standard AS 1055:2018, “Acoustics – Description and Measurement of Environmental Noise” and the NSW Noise Policy for Industry (NPfI). Calibration was checked before and after each measurement and no significant drift occurred. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics – Sound level meters – Specifications.

The L_{A90} descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90 percent of the time over a relevant period of measurement. In line with the procedures described in the EPA’s NPfI, the assessment background level (ABL) is established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABL’s determined over the entire monitoring duration. The RBL is representative of the average minimum background sound level, or simply the background level.

The L_{Aeq} is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average.

Weather information for the unattended noise logging was obtained from the Bureau of Meteorology Orange Airport AWS for the monitoring period and any data adversely affected by rain, wind (more than 5 m/s as per NPfI) or extraneous noise were discarded.

The RBL and ambient LAeq levels are provided in Table 2-2 below.

Table 2-2 Background and Ambient Noise Monitoring Results

	Rating background level, L_{A90}, dB(A)			Ambient noise levels, L_{Aeq} dB(A)		
Monitoring Location	**Day[1]**	**Evening[1]**	**Night[1]**	**Day[1]**	**Evening[1]**	**Night[1]**
88 Conadilly Street	42	42	42[3] (44)	59	58	57
419 Conadilly Street	40	31	30[2] (26)	64	62	62

Note 1 Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays
Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays
Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 Sundays & Public Holidays

Note 2 Table 2.1 of the NPfI specifies a minimum assumed rating background noise level of 35dB(A) for day and 30 dB(A) for evening and night-time. Number in brackets (XX) represents actual measured RBL determined for assessment period.

Note 3 As per the NPfI, project intrusiveness noise level for evening be set at no greater than the project intrusiveness noise level for daytime. The project intrusiveness noise level for night-time should be no greater than the project intrusiveness noise level for day or evening. Number in brackets (XX) represents actual measured RBL determined for assessment period.

3. Noise and Vibration Objectives

3.1 Construction Noise

Construction noise is assessed with consideration to DECCW Interim Construction Noise Guidelines (ICNG) (July 2009). The ICNG is a non-mandatory guideline that is usually referred to by local councils and other NSW government entities when construction / demolition works require development approval. The ICNG recommend standard hours for construction activity as detailed in Table 3-1.

Table 3-1 ICNG Recommended Construction Hours

Work type	Recommended standard hours of work
Normal construction	Monday to Friday: 7 am to 6 pm. Saturday: 8 am to 1 pm. No work on Sundays or Public Holidays.
Blasting	Monday to Friday: 9 am to 5 pm. Saturday: 9 am to 1 pm. No work on Sundays or Public Holidays.

The ICNG provides noise management levels for construction noise at residential and other potentially sensitive receivers. These management levels are to be calculated based on the adopted rating background level (RBL) at nearby locations, as shown in Table 3-2.

Table 3-2 ICNG Noise Guidelines at Receivers

Period	Management Level $L_{Aeq(15\ min)}$
Residential Recommended standard hours	Noise affected level: RBL + 10 Highly noise affected level: 75 dB(A)
Residential Outside recommended standard hours	Noise affected level: RBL + 5
Classrooms at schools and other educational institutions	Internal Noise Level 45 dB(A) (applies when properties are being used) Outdoor Noise Level 55 dB(A) (assumes 10dB(A) loss through an open window
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	65 dB(A)
Offices, retail outlets (external)	70 dB(A)
industrial premises (external)	75 dB(A)

The above levels apply at the boundary of the most affected residences / offices or within 30 m from the residence where the property boundary is more than 30 m from the residence.

The *noise affected level* represents the point above which there may be some community reaction to noise. Where the *noise affected level* is exceeded all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents should be informed of the nature of the works, expected noise levels, duration of works and a method of contact. The *noise affected level* is the background noise level plus 10 dB(A) during recommended standard hours and the background noise level plus 5 dB(A) outside of recommended standard hours.

The *highly noise affected level* represents the point above which there may be strong community reaction to noise and is set at 75 dB(A). Where noise is above this level, the relevant authority may require respite periods by restricting the hours when the subject noisy activities can occur, considering:

- Times identified by the community when they are less sensitive to noise (such as 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.

It is understood construction is planned for standard hours. Based on the above and the RBL's determined from site monitoring, construction noise management levels (NML's) have been conservatively derived based on monitoring from 419 Conadilly Street, as shown in Table 3-3.

Table 3-3 ICNG NML's Leq(15min) dB(A)

Receiver	Within Recommended Standard Hours
Residential	50

3.2 Vibration Guidelines

3.2.1 Human Exposure

Vibration goals the were sourced from the DECCW's *Assessing Vibration: a technical guideline*, which is based on guidelines contained in British Standard (BS) 6472–1992, *Evaluation of human exposure to vibration in buildings (1–80 Hz).*

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities

- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

The preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 3-4 for the applicable receivers.

Table 3-4 Preferred and Maximum Levels for Human Comfort

Location	Assessment Period[4]	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Impulsive vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14

Note 4 Daytime is 7:00am to 10:00pm and Night-time is 10:00pm to 7:00am

The acceptable vibration dose values (VDV) for intermittent vibration are defined in Table 2.4 of the guideline and are reproduced in Table 3-5 for the applicable receiver type.

Table 3-5 Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)

Location	Daytime [5]		Night-time [5]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[6]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Note 5 Daytime is 7:00 to 22:00 and night-time is 22:00 to 7:00: and
Note 6 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be needed to assess intermittent values against the continuous or impulsive criteria for critical areas.

3.2.2 Building Damage

Currently, there is no Australian Standard that sets the criteria for the assessment of building damage caused by vibration. Guidance of limiting vibration values is attained from reference to the following International Standards and Guidelines:

- British Standard BS7385.2 - 1993 *Evaluation and Measurement for Vibration in Buildings*, Part 2 - Guide to damage levels from ground borne vibration

- German Standard DIN 4150-3: 1999-02 Structural Vibration – Part 3: *Effects of vibration on structures*.

The recommended Peak Particle Velocity (PPV) guidelines for the possibility of vibration induced building damage are derived from the minimum vibration levels above which any damage may occur are presented in Table 3-6 for DIN 4150-3: 1999-02 and Table 3-7 for BS7385.2 – 1993.

Table 3-6 DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz[6]	
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20-40	40-50	40
Dwellings and buildings of similar design and/or occupancy	5	5-15	15-20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 of table 5-7 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note 7 At frequencies above 100Hz, the values given in this column may be used as minimum values

Table 3-7 BS7385.2 Transient Vibration Guideline Values for Potential building - Cosmetic Damage

Building Type[9]	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz[8]	15 Hz and above[8]
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
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 8 Values referred to are at the base of the building: and
Note 9 For transient vibration effecting unreinforced or light framed structures at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

Unlike noise which travels through air, the transmission of vibration is highly dependent on substratum conditions between the source/s and receiver. Also dissimilar to noise travelling through air, vibration levels diminish quickly over distance, thus an adverse impact from vibration on the broader community is not typically expected. Vibration during works is considered an intermittent source associated with two main types of impact: disturbance at receivers and potential architectural/structural damage to buildings. Generally, if disturbance issues are controlled, there is limited potential for structural damage to buildings.

Ground Vibration – Minimum Working Distances from Sensitive Receivers

While this is not a transport (roads or rail) project, The Transport for NSW Construction Noise and Vibration Strategy (CNVS) provides guidance for minimum working distances. As a guide, minimum working distances from sensitive receivers for typical items of vibration intensive plant are listed in Table 20 of the CNVS. The minimum distances are quoted for both “cosmetic” damage (refer BS 7385) and human comfort (refer OH&E’s Assessing Vibration - a technical guideline). DIN 4150 has criteria of particular reference for heritage structures. Table 3-8 provides the recommended minimum safe working distances for vibration intensive plant from sensitive receivers.

Table 3-8 Recommended Minimum Safe Working Distances for Vibration Intensive Plant from Sensitive Receiver

Plant Item	Rating / Description	Minimum Distance Cosmetic Damage		Minimum Distance Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1-2 tonne)	5m	11m	15m to 20m
	<100 kN (2-4 tonne)	6m	13m	20m
	<200 kN (4-6 tonne)	12m	15m	40m
	<300kN (7-13 tonne)	15m	31m	100m
	>300kN (13-18 tonne)	20m	40m	100m
	>300kN (>18 tonne)	25m	50m	100m
Small Hydraulic Hammer	300kg (5 to 12 t excavator)	2m	5m	7m
Medium Hydraulic Hammer	900kg (12 to 18 t excavator)	7m	15m	23m
Large Hydraulic Hammer	1600kg (18 to 34 t excavator)	22m	44m	73m
Vibratory Pile Driver	Sheet Piles	2m to 20m	5m to 40m	20m
Pile Boring	≤ 800mm	2m (nominal)	5m	4m
Jack Hammer	Hand Held	1m (nominal)	3m	2m

While significant vibration generating activities are not expected as part of the proposal, during construction it is recommend if any of the above activities are planned, they be limited to vibratory roller <100 kN (2-4 tonne), and medium hydraulic hammer 900kg (12 to 18 t excavator).

3.3 Operational Noise – NSW Noise Policy for Industry

The NPfI provides guidance on the assessment of operational noise impacts associated with the projects operation. The NPfI assessment procedure has two components:

- Controlling intrusive noise impacts in the short-term for residences
- Maintaining noise level amenity for residences and other land uses.

Project Intrusiveness Noise Levels

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor) does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). The project intrusiveness noise level, which is only applicable to residential receivers, is determined as follows:

$L_{Aeq,15minute}$ Intrusiveness noise level = Rating Background Level ('RBL') plus 5 dB(A)

For conservatism RBL's taken from 419 Conadilly Street have been utilised. Based on the measured and adopted noise levels outlined in Table 2-2, The intrusiveness noise levels for residential receivers are provided in Table 3-9.

Table 3-9 Intrusiveness Noise Levels

Period	RBL. L_{A90}, dB(A)	Intrusiveness noise level (RBL + 5), dB(A)
Day	40	45
Evening	31	36
Night	30	35

Amenity Noise Levels

The project amenity noise levels for different time periods of day are determined with consideration to Section 2.4 of the NPfI. The NPfI recommends amenity noise levels ($L_{Aeq,period}$) for various receivers including residential, commercial, industrial receivers and sensitive receivers such as schools, hotels, hospitals, churches and parks. These "recommended" amenity noise levels represent the objective for total industrial noise experienced at a receiver location. However, when assessing a single industrial development and its impact on an area, "project" amenity noise levels apply.

The NPfI recommended amenity noise levels are shown in 3-10 below.

Table 3-10 NPfI Recommended Amenity Noise Levels

Type of Receiver	Noise Amenity Area	Time of Day[10, 11]	Recommended amenity noise level, LAeq, dB(A)[12, 13]
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom (internal)	All	Noisiest 1-hour period when in use	35[14]
Hospital ward	All		
- Internal		Noisiest 1-hour	35
- External		Noisiest 1-hour	50
Place of worship (internal)	All	When in use	40
Passive recreation (e.g. national park)	All	When in use	50
Active recreation (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	When in use	Add 5 dB(A) to recommended noise amenity area

Note 10 Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am.

Note 11 On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.

Note 12 The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

Note 13 The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated

Note 14 In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable LAeq noise level may be increased to 40 dB LAeq(1hr)

High Traffic

The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the LAeq noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the LAeq, period(traffic) minus 15 dB(A).

This high traffic project amenity noise level may be applied only if all the following apply:

- traffic noise is identified as the dominant noise source at the site
- the existing traffic noise level is 10 dB or more above the recommended amenity noise level for the area
- it is highly unlikely traffic noise levels will decrease in the future.

In this case based on noise measurements and attended observations when comparing to the above critieria, the high traffic application does not apply.

To ensure that the total industrial noise level (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level that applies for each new industrial noise source is determined as follows:

Project amenity noise level = Recommended amenity noise level (

Table *3-10*) – 5dB(A)

Additionally, given that the intrusiveness noise level is based on a 15-minute assessment period and the project amenity noise level is based on day, evening and night assessment periods, the NPfI provides the following guidance on adjusting the $L_{Aeq,(period)}$ level to a representative $L_{Aeq,15minute}$ level in order to standardise the time periods.

$L_{Aeq(15minute)} = L_{Aeq(period)} + 3dB(A)$

The project amenity noise levels ($L_{Aeq,15min}$) for sub-urban residences and other receptors applied for this project are shown in Table 3-11.

Table 3-11 Project Amenity Noise Levels

Type of Receiver	Noise Amenity Area	Time of Day	Recommended Noise Level, dB(A)	
			$L_{Aeq,\ Period}$	$L_{Aeq,\ 15min}$
Residence	Sub-Urban	Day	55 – 5 = 50	50 + 3 = 53
		Evening	45 – 5 = 40	40 + 3 = 43
		Night	40 – 5 = 35	35 + 3 = 38
Active Recreation Area (e.g. school playground, golf course)	All	When in use	55 – 5 = 50	50 + 3 = 53
School Classroom (Internal)	All	Noisiest 1 hour when in use	35 – 5 = 30	30 + 3 = 33

Project Noise Trigger Levels

The project noise trigger level is the lower of the intrusiveness and the amenity noise levels. Table *3-12* 3-12 presents the project noise trigger levels for the day, evening, and night-time periods.

Table 3-12 Project Noise Trigger Levels

Type of receiver	Assessment period	Intrusiveness noise levels, $L_{Aeq,15min}$, dB(A)	Amenity noise levels, $L_{Aeq,15min}$, dB(A)	Project noise trigger levels, $L_{Aeq,15min}$, dB(A)
Residential Sub-Urban	Day	45	53	**45**
	Evening	36	43	**36**
	Night	35	38	**35**
Active Recreation Area (e.g. school playground, golf course)	When in use	-	53	**53**
School Classroom (External)[15]	When in Use	-	43	**43**

Note 15 Conversion of trigger levels from internal to external for school classroom and assumes 10dB(A) loss from outside to inside through open window.

Maximum Noise Level Assessment

The NPfI requires the potential for sleep disturbance to be assessed by considering maximum noise levels events during the night-time period.

Where the subject development/premises night-time noise levels at a residential location exceed the following screening levels a detailed maximum noise level event assessment should be undertaken:

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

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.

Based on the adopted background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are provided in Table 3-13.

Table 3-13 Night-Time Sleep Disturbance Screening Levels

Receiver type	Assessment Level $L_{Aeq,15min}$, dB(A)	Assessment Level L_{AFmax}, dB(A)
Residential	40	52

The RNP (DECCW 2011) provides additional information on sleep disturbance and concludes that:

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

The above references identify that internal noise levels of 50 to 55 dB(A), are unlikely to cause awakenings. On the assumption that there is a 10 dB(A) outside-to-inside noise loss through an open window (see Section 2.6 of the NPfI, p15), this indicates that external noise levels of LAmax 60 to 65 dB(A) are unlikely to cause awakening reactions.

3.4 NSW Road Noise Policy (RNP)

The NSW Road Noise Policy (RNP) recommends various criteria for different road and residential developments and uses. Although it is not mandatory to achieve the noise assessment criteria in the RNP, proponents will need to provide justification if it is not considered feasible or reasonable to achieve them. Based on the definitions in the RNP, Conadilly Road is considered to be a sub arterial / arterial road. Based on this, the following noise goals for residences taken from Table 3 of the RNP are provided in Table 3-14 Below.

Table 3-14 Road Noise Policy Goals

Road Category	Day	Night
Existing residences affected by additional traffic on existing sub-arterial / arterial roads generated by land use development	60 $L_{Aeq(15hr)}$ External	55 $L_{Aeq(9hr)}$ External

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

4. Assessment of Potential Impacts

4.1 Construction Noise

Construction can occur in the vicinity of residences or other sensitive land uses and be variable in times of occurrence. These aspects of construction can exacerbate noise levels and their effects. Construction noise by its nature is temporary, may not be amenable to purpose-built noise control measures applied to industrial processes, and may move as construction progresses. With these constraints in mind, the ICNG was developed to focus on applying a range of work practices most suited to minimise construction noise impacts, rather than focusing only on achieving numeric noise levels. While some noise from construction sites is inevitable, the aim of the Guideline is to protect much of residences and other sensitive land uses from noise pollution most of the time.

While it is unknown at this stage what specific plant and equipment are planned to be used, generally the typical construction activity on the proposal will be in the form of construction of the office building. Other equipment may be used however it is anticipated that they would produce similar noise emissions. Therefore, an assumed construction sequence would be:

- Excavation/Site preparation.
- Building of site facilities.

Table 4-1 provides general plant and machinery data that has been used to predict noise levels at the neighbouring properties. The noisiest data has been chosen for each piece of plant/machinery to present a worst-case scenario.

Table 4-1 Plant and Equipment Noise Levels

Plant Item	Activity Noise Level L_{Aeq} @ 10m	DEFRA Construction Noise Database	Anticipated Usage %[16]
Excavation			
Dozer	80	Table 2 Ref 10	50
Tracked Excavator	79	Table 2 Ref 14	50
Articulated Dump Truck	74	Table 2 Ref 32	50
Roller	73	Table 2 Ref 38	50
Building			
Concrete Pump & Cement Mixer	67	Table 4 Ref 24	50
Poker Vibrator	69	Table 4 Ref 34	50
Mobile Telescopic Crane	67	Table 4 Ref 36	50
Diesel Generator	61	Table 4 Ref 75	90

Note 16The sound power levels for the individual plant items are worst-case levels representative of the equipment operating at maximum capacity. In practice, not all plant items would operate at maximum capacity at the same time and therefore the estimated usage has been adjusted to reflect this. This adjustment is consistent with RAPT Consulting experience on similar projects.

Construction Operations

Acoustic modelling was undertaken using Soft Noise "Predictor" to predict the effects of construction noise. Predictor is a computer program for the calculation, assessment and prognosis of noise propagation. Predictor calculates environmental noise propagation according to ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors". Terrain topography, ground absorption, atmospheric absorption and relevant shielding objects are taken into account in the calculations.

Enhancing Weather Conditions

Fact Sheet D of the NPfI provides guidance for accounting for noise-enhancing weather conditions. Two options are available to consider meteorological effects:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night. Or

2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all

assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the provisions in this policy. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.

As a detailed analysis of the significance of noise enhancing conditions has not been undertaken, option 1 has been utilised. Table D1 from the NPfI is reproduced in Table 4-2 and shows the noise enhancing meteorological conditions that have been adopted for this assessment

Table 4-2Noise Enhancing Meteorological Conditions

Meteorological Conditions	Meteorological Parameters
Noise-enhancing meteorological conditions	Daytime/evening: stability category D with light winds (up to 3 m/s at 10 m AGL). Night-time: stability category F with winds up to 2 m/s at 10 m AGL.

Note 17 m/s = metres per second; m = metres; AGL = above ground level; where a range of conditions is nominated, the meteorological condition delivering the highest-predicted noise level should be adopted for assessment purposes. However, feasible and reasonable noise limits in consents and licences derived from this process would apply under the full range of meteorological conditions nominated under standard or noise-enhancing conditions as relevant. All wind speeds are referenced to 10 m AGL. Stability categories are based on the Pasquill–Gifford stability classification scheme.

Other Key assumptions in the model include:

- topographical information was obtained from NSW Government Spatial Services
- all cleared areas were modelled considering a conservative ground factor of 0.8 to account for grassed areas
- all residential receivers were modelled at 1.5 metres above the ground surface

Construction noise levels have been predicted based on the potential construction noise levels provided in Table 4-1. These noise levels represent different equipment noise levels and give an idea how noise levels may change across the proposal area with different activities being undertaken.

The magnitude of off-site noise impact associated with construction would be dependent upon several factors:

- The intensity of construction activities
- The location of construction activities
- The type of equipment used
- Intervening terrain; and
- The prevailing weather conditions.

In addition, construction machinery would likely move about the study area, variously altering the directivity of the noise source with respect to individual receivers and their distances.

Noise levels at sensitive receivers can be significantly lower than the worst-case scenario when the construction works move to a more distant location in the work area. An example of this is shown in Figure 4-1.

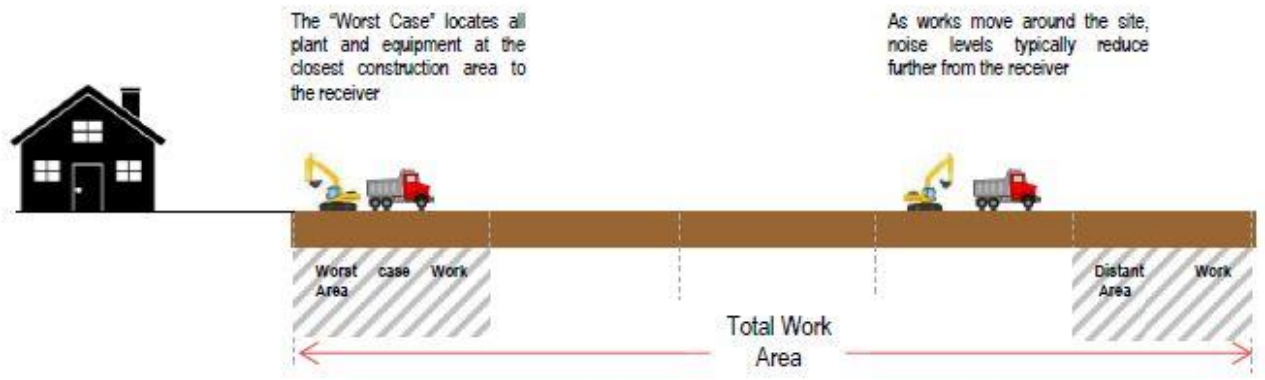


Figure 4-1 Example of Differing Work Areas

During any given period, the machinery items to be used in the study area would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time. Finally, certain types of construction machinery would be present in the study area for only brief periods during construction. Therefore, the modelled construction noise results are considered to represent a worst-case scenario. Two scenarios were assessed, one for the car wash area and one for the building area. These scenarios also demonstrate how received noise levels can change due to location of construction activity.

Construction Noise Impact Assessment Results

Noise levels were predicted to each assessed receptor assuming receiver heights of 1.5m above ground level for typical construction activities. Table 4-3 summarises the maximum predicted noise level from each of the construction scenarios at identified residential receptors. Predicted exceedances of NML's are highlighted in RED.

Table 4-3 Predicted Construction Noise Levels dB(A) Leq(15min)

Receiver	Excavation East	Excavation West	Building East	Building West	Standard Hours NML	Highly Affected Noise Level
R1	48	58	37	47	50	75

Receiver	Excavation East	Excavation West	Building East	Building West	Standard Hours NML	Highly Affected Noise Level
R2	45	46	35	36	50	75
R3	31	34	21	23	50	75
R4	30	33	20	22	50	75
R5	30	33	19	22	50	75
R6	28	31	17	20	50	75
R7	28	31	17	20	50	75
R8	30	33	20	22	50	75
R9	30	33	19	22	50	75
R10	38	46	27	35	50	75
R11	39	47	28	36	50	75
R12	45	48	34	38	50	75
R13	46	50	35	39	50	75
R14	47	49	36	34	50	75
R15	47	44	37	34	50	75

Receiver	Excavation East	Excavation West	Building East	Building West	Standard Hours NML	Highly Affected Noise Level
R16	43	49	32	33	50	75
R17	44	48	33	33	50	75

The results of the construction assessment indicate compliance with NML's can be achieved in all situations with the exception of excavation east works modelling scenarios suggest there could be exceedances at R10 – R15 for excavation works west at R1. The highly affected noise level is expected to be complied with in all situations.

While NML's can be achieved in most cases, there is a risk for NML's to be exceeded depending on work activities and locations. With this in mind it is recommended a construction noise management plan be implemented as part of the proposal to minimise the risk of adverse noise emanating upon the community.

Modelled scenarios are shown in Figures 4-2 – 4-5.

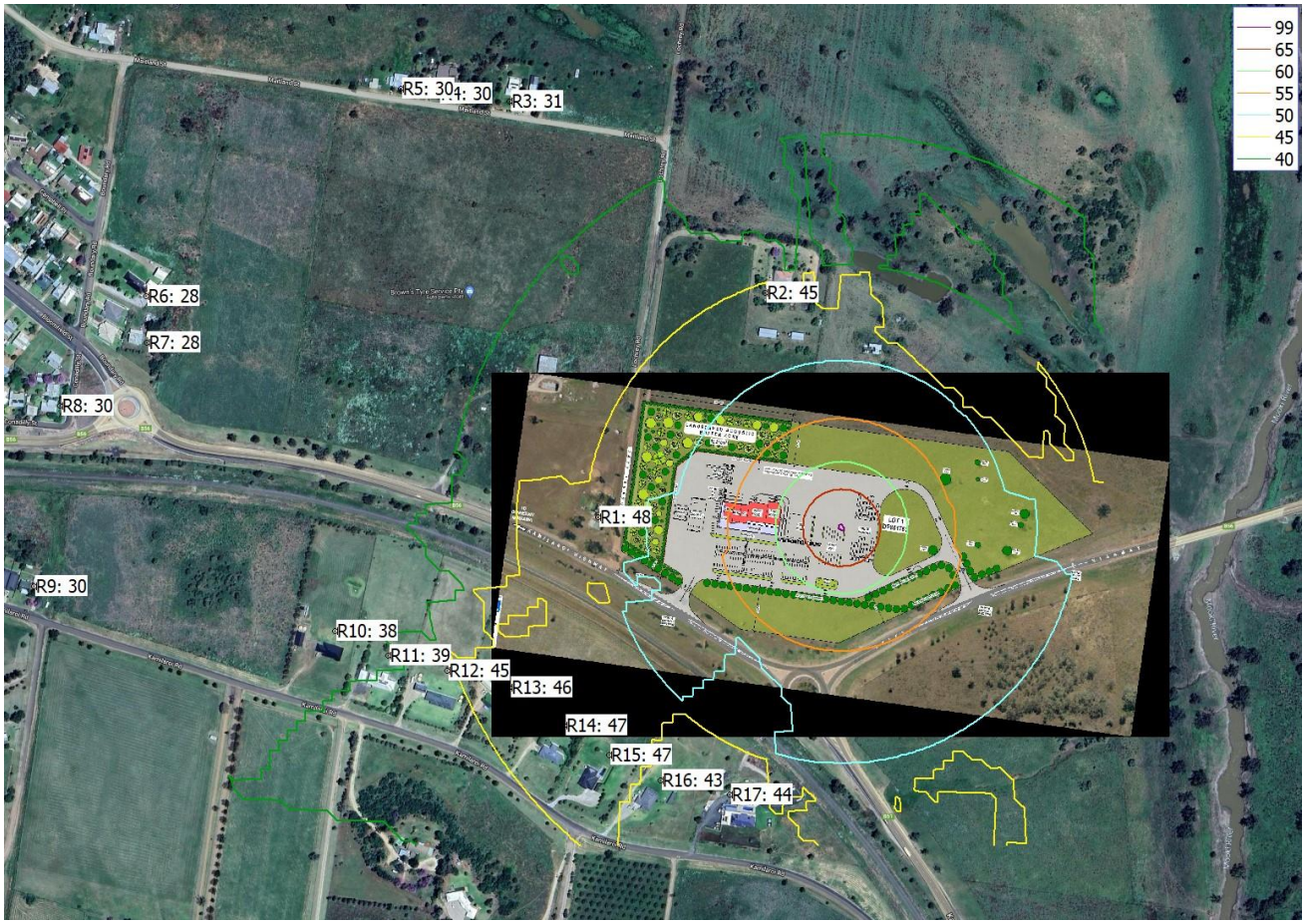


Figure 4-2 Excavation East dB(A) Leq(15min)

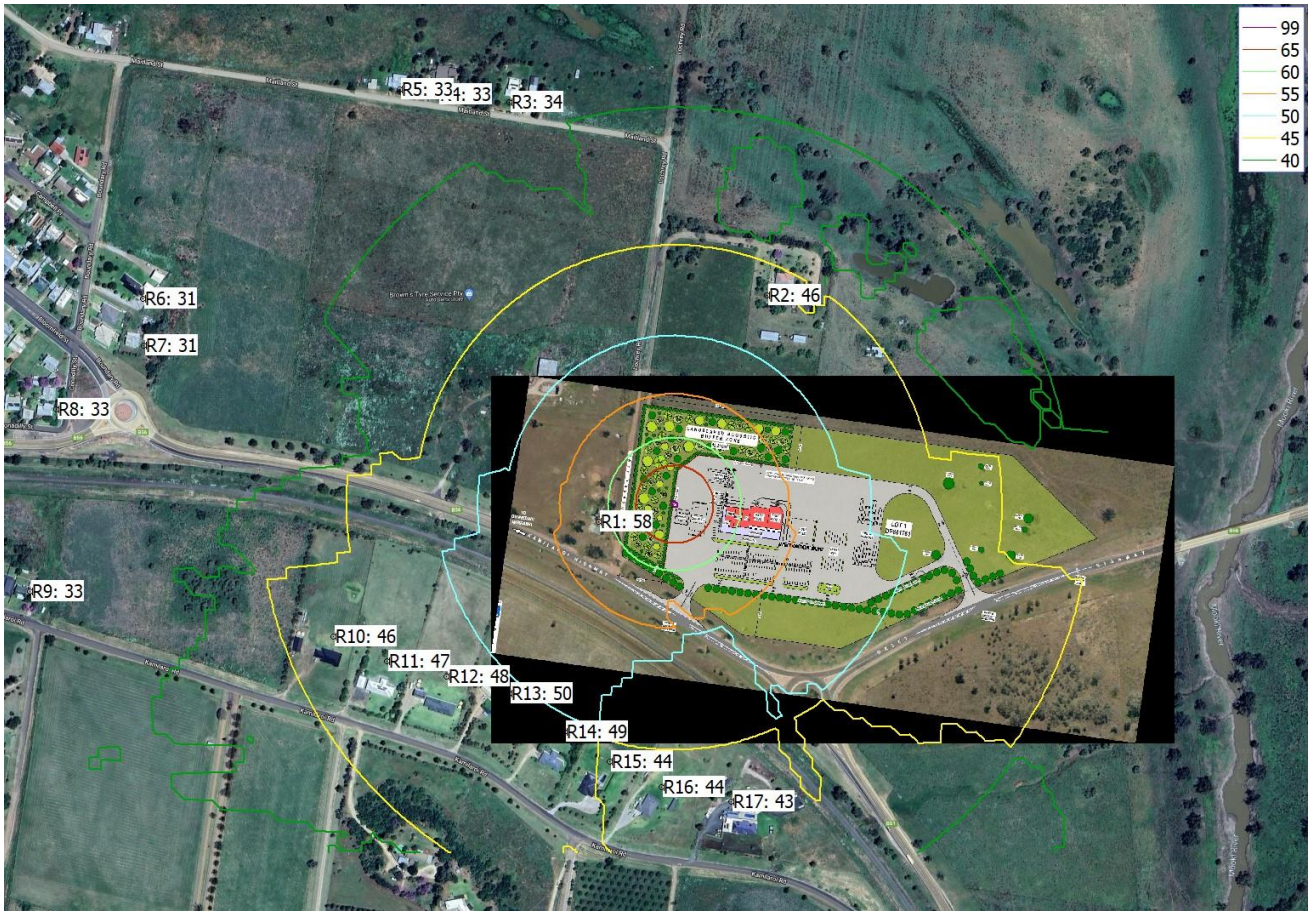


Figure 4-3 Excavation West dB(A) Leq(15min)

Figure 4-4 Building East dB(A) Leq(15min)

Figure 4-5 building West dB(A) Leq(15min)

4.2 Construction Noise Management Plan

A Construction Noise Management Plan (CNMP) could be prepared prior to the commencement of works and implemented through all phases of the proposed construction works. The CNMP would provide the framework for the management of all potential noise impacts resulting from the construction works and would detail the environmental mitigation measures to be implemented throughout the construction works.

4.2.1 Planning and design of construction works

During the detailed planning, scheduling and design of the construction works the following noise management and mitigation measures should be investigated and, as required, implemented prior to the commencement of noise generating works.

Notification before and during construction

- Affected neighbours to the construction works would be advised in advance of the proposed construction period at least 1 week prior to the commencement of works.
- Consultation and communication between the site and neighbours to the site would assist in minimising uncertainty, misconceptions and adverse reactions to noise.
- All site workers (including subcontractors and temporary workforce) should be familiar with the potential for noise impacts upon residents and encouraged to take all practical and reasonable measures to minimise noise during their activities.

- The constructor or site supervisor (as appropriate) should provide a community liaison phone number and permanent site contact so that the noise related complaints, if any, can be received and addressed in a timely manner.
- The constructor (as appropriate) should establish contact with the residents and communicate, particularly when noisy activities are planned.

Best practice measures when operating on construction site

- Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.
- Ensure that all construction works scheduled for standard construction hours comply with the start and finish time.
- Where practical, simultaneous operation of dominant noise generating plant should be managed to reduce noise impacts, such as operating at different times or increase the distance between plant and the nearest identified receiver.
- High noise generating activities such as jack hammering should only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block.
- Where possible, reversing beepers on mobile equipment would be replaced with low-pitch tonal beepers (quackers). Alternatives to reversing beepers include the use of spotters and designing the site to reduce the need for reversing may assist in minimising the use of reversing beepers.
- Equipment which is used intermittently should be shut down when not in use.
- All engine covers should be kept close while equipment is operating.
- The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.
- To minimise heavy equipment handling noise, material stockpiles should be located as far as possible from the nearest receptors
- Loading and unloading areas should be located as far as possible from the nearest receptors.
- Where possible, trucks associated with the work area should not be left standing with their engine operating in a street adjacent to a residential area.
- All vehicular movements to and from the site should comply with the appropriate regulatory authority requirement for such activities.

Complaint handling

Noise and vibration monitoring should be undertaken upon receipt of a complaint to identify and quantify the issue and determine options to minimise impacts.

- If valid noise and/or vibration data for an activity is available for the complainant property, from works of a similar severity and location, it is not expected that monitoring will be repeated upon receipt of repeated complaints for these activities, except where vibration levels are believed to be potentially damaging to the building.

- Any noise and/or vibration monitoring should be undertaken by a qualified professional and with consideration to the relevant standards and guidelines. Attended noise and/or vibration monitoring should be undertaken upon receipt of a noise and/or vibration complaint. Monitoring should be undertaken and reported within a timely manner (say 3 to 5 working days). If exceedance is detected, the situation should be reviewed to identify means to reduce the impact to acceptable levels.

4.3 Operational Noise

For the purposes of this assessment, the site has been assessed as having the following key features:

- A total of 12 bowsers including 8 for light vehicle sand 4 four heavy vehicles, which are provided in separate areas

- A convenience store with a floor area of approximately 550sqm associated with the service station that would also sell food, drinks, and general goods

- Two fast food outlets with a total floor area of approximately 840sqm, that would provide drive through facilities along the northern side of the building and approximately 120 internal seats

- Parking areas for trucks, RVs, light vehicles and hydrogen/electric vehicles

- A BBQ facility for use by service centre patrons

Acoustic modelling was also undertaken using Bruel and Kjaer's "Predictor" to predict the effects of site operational noise.

Modelling results are based on available information provided and should only be used as a guide for comparative purposes. Plant layout and building structures were based on information provided at the time of the assessment. Noise model setup are as outlined in section 4.1 and noise enhancing meteorological conditions were utilised as per Table 4-2.

Additionally a 2.1 metre acoustic fence has been assumed as shown in Figures 4-6 – 4-11 as blue consistent with the conceptual site layout provided in Figure 1-2 Acoustic fences are impervious to the ground to the recommended height and are generally constructed from colorbond, lapped and capped timber, bricks, hebel power panel or concrete blocks. No gaps should exist in the fence. There are other options available, and the higher the fence, the greater the density and being as close as possible to the source in question make an acoustic fence more effective. A material surface density of 10 kg/m2 is typically sufficient.

Mechanical Plant

At this stage, the mechanical plant has not been selected for the development. However, it is not uncommon for the mechanical plant not to be selected prior to submitting a development application. Mechanical plant may consist of an air conditioning system, refrigeration and

exhaust fans. A typical range of sound power levels for mechanical plant is given in Table 4-4 below.

Table 4-4 Sound Power Levels of Mechanical Plant

Plant Type	SWL dB(A)
Small (single fan) condenser	65
Medium (double fan) condenser	70
Large (double fan) condenser	80

For conservatism, is has been assumed that 2 large double fan condenser units will be operating as outdoor sources on top of the new service station building / food outlet building.

Drive Through Intercom

A sound power level of 70 SWL dB(A) has been adopted from RAPT Consulting's internal database.

Service Station / Convenience Store and Fast Food Outlet Traffic Generation

Information sourced from the Amber Traffic & Transportation Direction assessment *Gunnedah Highway Service Centre 127-141 Lochrey Road, Gunnedah Traffic and Transport Assessment March 2022* for the project indicates:

- A maximum 174 total trips per evening peak hour for fuel and food outlet stops.
- A maximum of 280 total trips per peak hour for fast food outlet traffic generation.

For the purposes of this assessment the following assumptions have been made when determine the potential traffic generation for the service station and associated convenience store and fast-food outlets:

- The morning peak hour has conservatively been assessed as having the same traffic generation as the evening peak hour
- Given the limited residential land use in the surrounding area it has been assumed that 80% of the vehicle movements for the fast food outlets are associated with vehicles using the service station and are not expected to generate an additional vehicle movement on the road network or at the site access. As such, the fast food outlets are expected to generate 54 vehicle movements in each of the peak hours, and
- The vehicle movements are evenly split between inbound and outbound vehicle movements

Based on the above assumptions the service station and associated convenience store and fast food outlets are expected to generate the following traffic volumes in the morning and evening peak hour.

Table 4-5 Service Station Peak Hour Traffic Generation

	AM Peak	PM Peak
Arriving Trips	114	114
Departing Trips	114	114
Total	228	228

This total number has been converted to 57 trips in a 15 minute period.

A sound power level of 86 SWL dB(A) has been adopted for these vehicle movements on the site for idling and travelling at 10km/hr, 78 SWL dB(A) for a car door opening and closing taken from RAPT Consulting's internal database. Additionally 10% have been assumed to be trucks using the diesel bowsers with a sound power level of 100 SWL dB(A).

All items were modelled operating simultaneously to simulate a reasonable worst case scenario with weather enhancing conditions as previously outlined. The results are provided in Table 4-6. Any predicted exceedances are highlighted in RED.

Table 4-6 Operational Noise Modelling Results dB(A) Leq(15min)

Receiver	Service Station / Food Service Noise Results	Project Noise Trigger Level Day / Evening / Night
R1	38	45 / 36 / 35
R2	36	45 / 36 / 35
R3	25	45 / 36 / 35
R4	23	45 / 36 / 35
R5	22	45 / 36 / 35
R6	21	45 / 36 / 35
R7	21	45 / 36 / 35
R8	23	45 / 36 / 35
R9	23	45 / 36 / 35
R10	31	45 / 36 / 35
R11	33	45 / 36 / 35
R12	34	45 / 36 / 35
R13	36	45 / 36 / 35
R14	37	45 / 36 / 35
R15	37	45 / 36 / 35
R16	37	45 / 36 / 35
R17	37	45 / 36 / 35

As can be seen in Table 4-6, the modelled results suggest compliance can occur during all peak hour situations as peak hour occurs during daytime from 8:00am to 9:00am and 4:30pm – 5:30pm including cumulative operations of the service centre.

The information provided in The Amber Traffic & Transportation Direction assessment indicates the Oxley Highway has a relatively constant level of traffic between 7:00am and 5:00pm and lower traffic volumes outside of these times. Therefore, the peak hour scenarios are considered reasonable worst case and are not expected to occur during evening or night time periods. Even if this did occur the maximum exceedance predicted would be 2 dB(A) for the evening and 3 dB(A) during night which is generally considered imperceptible to barely perceptible to the human ear.

Figures of the operational peak hour results are provided in Figures 4-6.

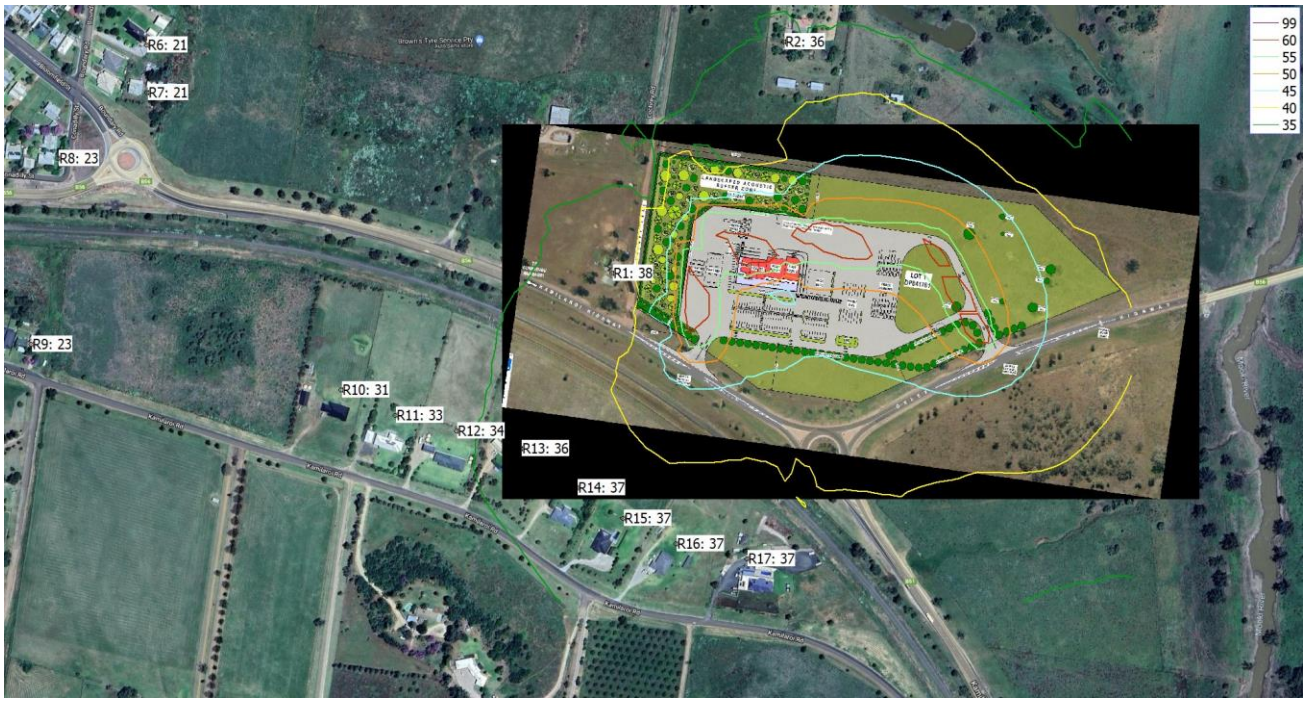


Figure 4-6 Service Centre Operations dB(A) Leq(15min)

An evening and night-time modelling scenario was run by conservatively assuming that half of peak hour traffic movements may occur at the service centre. The results are shown in Table 4-8.

Table 4-7 Off Peak Operations dB(A) Leq(15min)

Receiver	Service Station / Food Service Noise Results	Project Noise Trigger Level Day / Evening / Night
R1	35	45 / 36 / 35
R2	32	45 / 36 / 35
R3	22	45 / 36 / 35
R4	20	45 / 36 / 35
R5	19	45 / 36 / 35
R6	18	45 / 36 / 35
R7	19	45 / 36 / 35
R8	20	45 / 36 / 35
R9	20	45 / 36 / 35
R10	28	45 / 36 / 35
R11	30	45 / 36 / 35
R12	31	45 / 36 / 35
R13	33	45 / 36 / 35
R14	34	45 / 36 / 35
R15	34	45 / 36 / 35
R16	34	45 / 36 / 35
R17	34	45 / 36 / 35

The results for evening and nighttime show compliance with project noise trigger levels.

These are reasonable worst case scenarios with all items outlined above operating simultaneously. In reality, it is highly unlikely for this scenario to occur where all of these items are operating simultaneously at their sound power levels. Therefore, actual noise levels received can be expected to be significantly lower. Based on this assessment compliance can be expected for the development.

As this was a maximum noise level assessment, sleep disturbance noise goals are expected to be met in all situations

While compliance is expected to be achievable for the proposal, it is recommended that the proposal implement an operational noise management plan as part of its operations to deal with the unlikely occurrence of excessive noise emanating from operations.

The evening and night operational modelled results are provided in Figure 4-9.

Figure 4-7 Evening / Night Operational Modelled Results dB(A) Leq(15min)

Road Noise

Traffic information pertaining to the proposal has been sourced from Amber Traffic & Transport Direction.

Peak hour traffic survey information contained within the report is provided in Table 4-9 along with potential additional vehicle trips as a result of the proposal.

Table 4-8 Traffic Information

Road Situation	Peak Hour Traffic	Additional Vehicles	%Change
AM Peak	261	25	11%
PM Peak	261	14	6%

To increase noise levels by 2dB(A) one would have to increase the cumulative traffic volume by 60%, which in this case does not occur. Therefore, compliance is expected.

With consideration to deceleration and acceleration noises, they can differ from the cruising traffic noise that occurs in the absence of traffic control device or entry and exit points from items such as this proposal. However, with our past experience where noise levels from vehicles were measured at an intersection for both free-flowing and stop-and-go conditions, and the levels were measured to fall within 1dB(A) for each scenario. This outcome can be explained by there being relatively quiet periods with very little to no traffic noise generated from stopped or slow moving vehicles at an intersection, while there is generally more noise generated from faster continuous moving vehicles found under free-flowing traffic conditions. Therefore, while accelerating and decelerating may alter the 'character' of noise, it will not significantly alter the absolute level of noise.

5. Conclusion

This acoustic assessment has been undertaken for NGH to inform a Development Application (DA) for a service centre at Gunnedah, NSW.

Construction

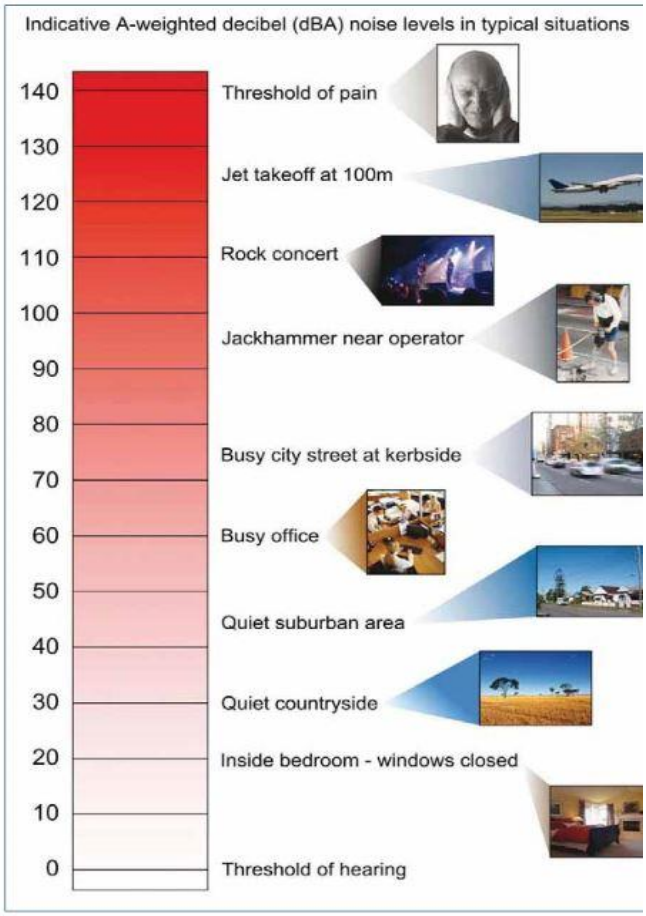
The assessment outlined in this report indicates that construction noise management levels will be complied with in most situations. However, there is the potential for exceedances for some receivers assessed in certain situations. However, the highly noise affected level of 75dB(A) $L_{Aeq(15min)}$ is expected to be complied with. A set of standard mitigation measures for construction noise and vibration have been provided based on anticipated requirements of the proposal. It is believed construction noise can be minimised and managed to be acceptable to the local community through the implementation of a CNMP similar to what has been recommended in this report.

Operation

The results of the assessment indicate the proposal is predicted to comply with established project noise trigger levels.

While compliance is expected to be achievable for the proposal, it is recommended that the proposal implement an operational noise management plan as part of its operations to deal with the unlikely occurrence of excessive noise emanating from operations.

Appendix A: Glossary of Acoustic Terms

Term	Definition
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. The picture below indicates typical noise levels from common noise sources. 
dB(A)	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The sound pressure level that is exceeded for 10% of the measurement period.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The maximum sound level recorded during the measurement period.
Noise sensitive receiver	An area or place potentially affected by noise which includes:

	A residential dwelling. An educational institution, library, childcare centre or kindergarten. A hospital, surgery or other medical institution. An active (e.g. sports field, golf course) or passive (e.g. national park) recreational area. Commercial or industrial premises. A place of worship.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Feasible and Reasonable (Noise Policy for Industry Definition)	**Feasible** mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. Selecting **Reasonable** measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make a judgement, consider the following: Noise impacts Noise mitigation benefits Cost effectiveness of noise mitigation Community views.
Sound power level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in dB(A).