RAPT CONSULTING

Acoustic Assessment – 15 Suncroft Street Chisholm, NSW

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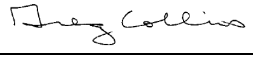
2224563_240430	0	30 April 2024	Gregory Collins-MAAS	

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1. Introduction

1.1 Background

RAPT Consulting has been engaged to undertake an acoustic assessment to inform a Review of Environmental Factors (REF) for the proposed sports field development at 15 Suncroft Street Chisholm NSW. Details regarding the proposed facilities include:

- TN18 is a sporting facility with two football fields and a cricket oval. Operating times will be Monday to Friday 7am to 10pm, Saturday and Sundays 7am to 10pm
- Community events on the field will include family functions, community fun days, presentations. Operating during the above hours.
- Types of uses include Rugby League, Football, Cricket, school activities, community use, fitness groups
- depending on the type of booking numbers will range 10 for small fitness groups up to 500 for sports including spectators

The site and surrounding area is shown in Figure 1-1 and concept plan is shown in Figure 1-2.

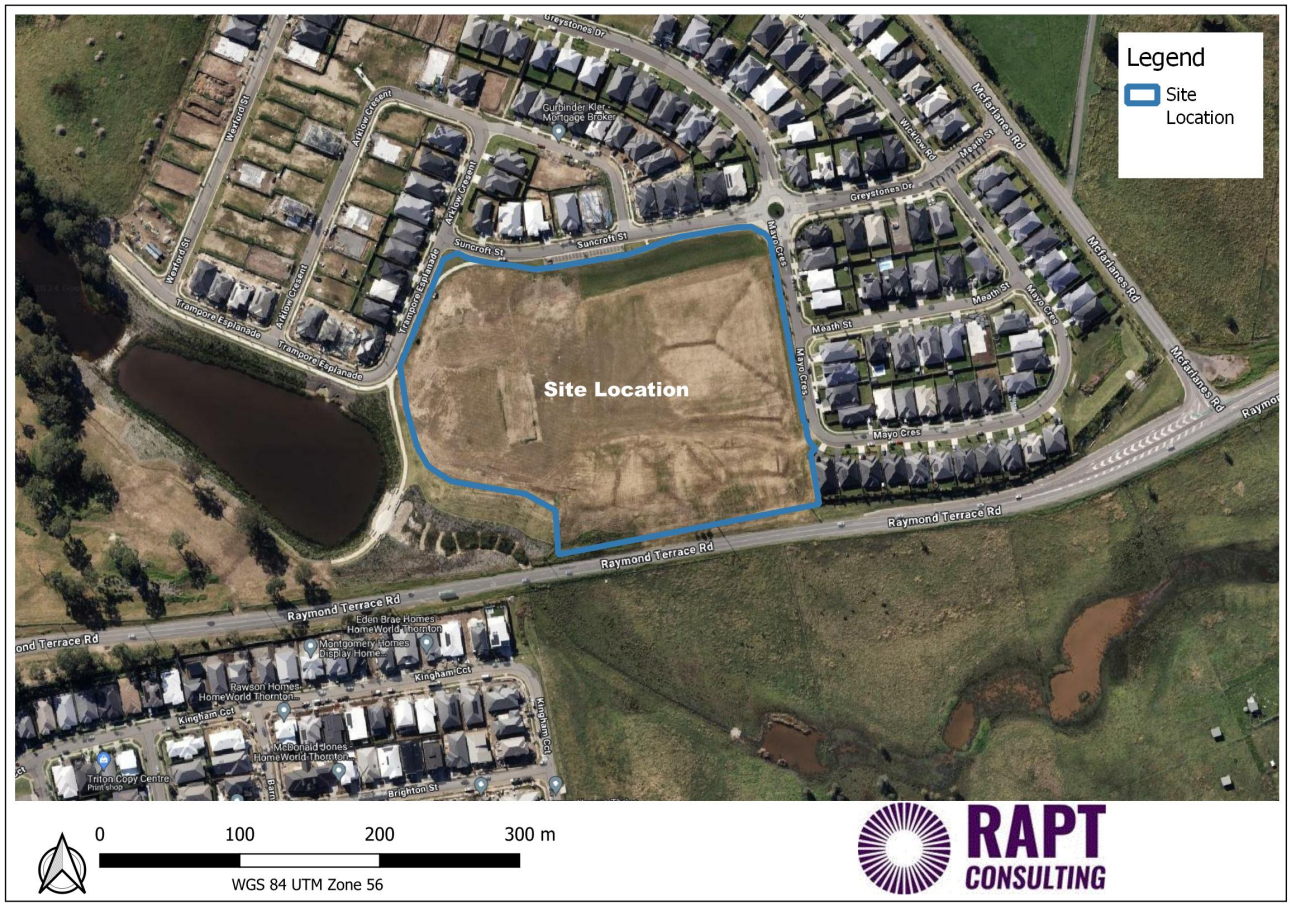


Figure 1-1 Site and Surrounding Area

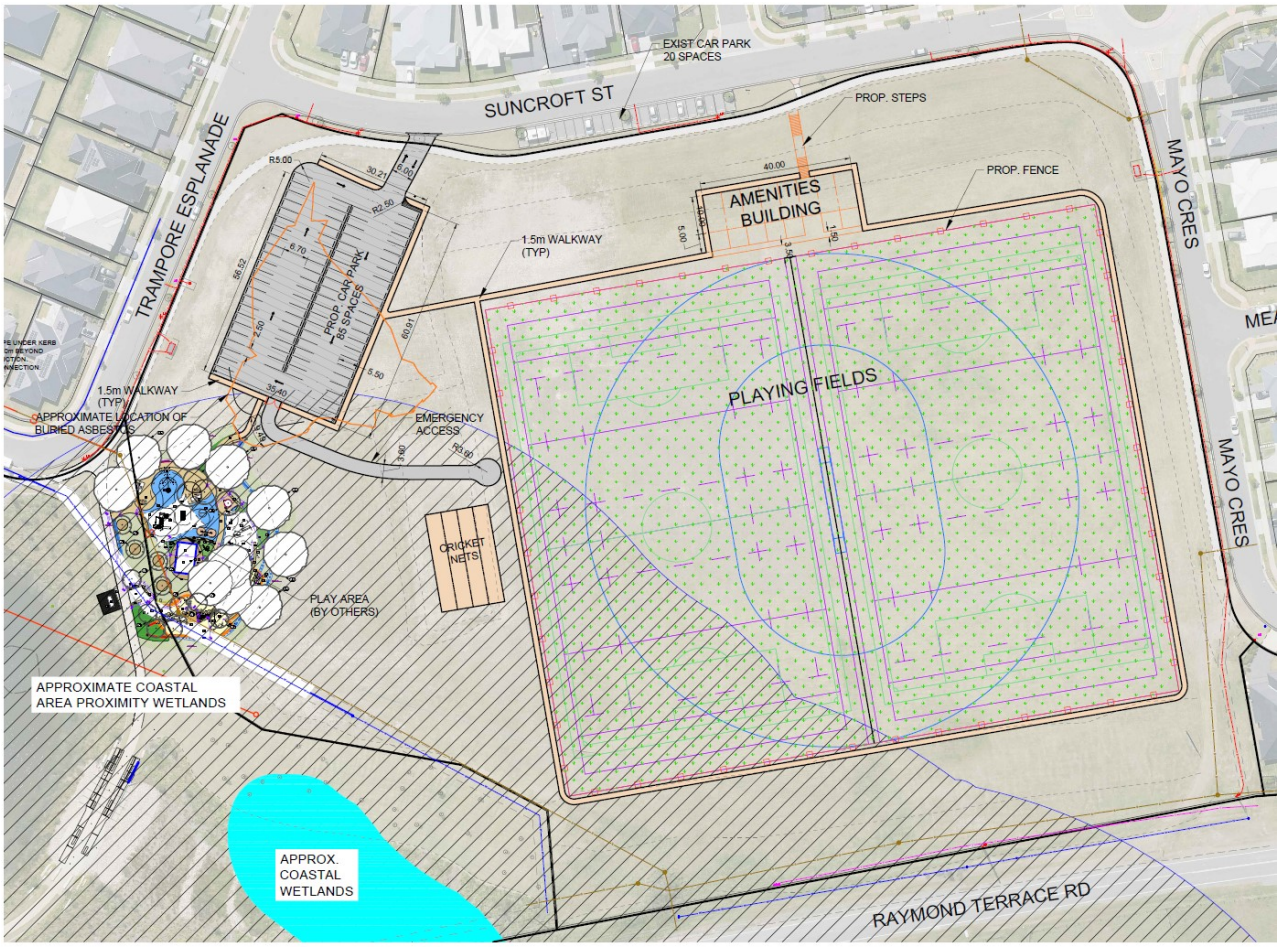


Figure 1-2 Site Concept Plan (Source: deWitt Consulting)

1.2 Assessment Objectives

The purpose of this acoustic assessment considers onsite noise generation and to provide input regarding acoustic issues to consider where they may occur.

The outcomes of this assessment include recommendations for potential noise mitigation and management measures designed to achieve an acceptable noise amenity for residential (dwelling) occupants and other sensitive receivers surrounding the proposal site where applicable.

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
- Noise data was assessed and filtered to remove invalid data due to extraneous noise or adverse weather conditions
- Project noise trigger levels were established for the development with consideration NSW publications Noise Policy for Industry (NPfI) and Noise Guide for Local Government (NGLG)
- Calculations were undertaken to ascertain the noise contribution to the overall ambient noise environment and assess against established project noise trigger levels.
- assessment of potential noise impacts associated with operation aspects of the project
- provide recommendations for feasible and reasonable noise mitigation and management measures, where noise objectives may be exceeded.

1.4 Relevant Guidelines

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

- Noise Policy for Industry (NPfI) (NSW EPA, 2017)
- Noise Guide for Local Government (NGLG) (NSW EPA, 2023)
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011
- Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change, 2009
- AS 1055.1 Acoustics – Description and measurement of environmental noise.

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 noise 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 and vibration 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

Nearest receptors to the proposal assessed in this acoustic assessment are identified in Table 2-1 and Figure 2-1. Other receptors are located in these areas however the locations selected are considered representative of the localised noise environment in the vicinity of the locations selected.

Table 2-1 Nearest Receptors to Study Area

Receiver ID	Location	Receptor Type	Easting	Northing
R1	4 Suncroft Street	Residential	374190	6374466
R2	10 Suncroft Street	Residential	374142	6374456
R3	16 Suncroft Street	Residential	374083	6374447
R4	20 Suncroft Street	Residential	374018	6374446
R5	9 Arklow Crescent	Residential	373981	6374430
R6	5 Arklow Crescent	Residential	373965	6374399
R7	2 Trampore Esplanade	Residential	373953	6374361
R8	65 Kingham Cct	Residential	374036	6374179
R9	28 Mayo Crescent	Residential	374266	6374327
R10	34 Mayo Crescent	Residential	374256	6374396
R11	11 Greystones Drive	Residential	374250	6374442

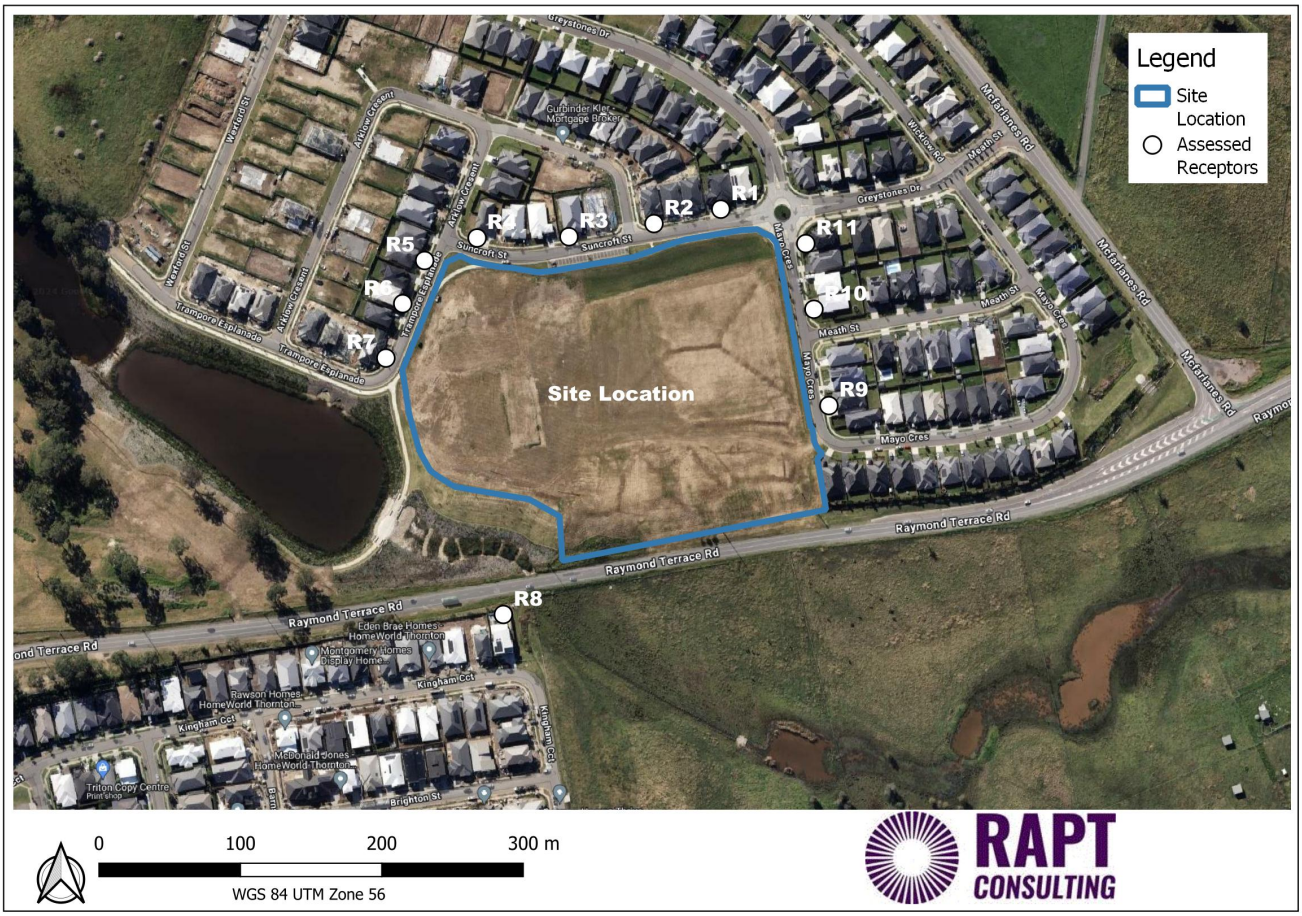


Figure 2-1 Nearest Receptors to Study Area

2.2 Background and Ambient Noise

To establish background and ambient noise levels, noise monitoring was undertaken by RAPT Consulting from 21 to 27 March 2024 at R3 16 Suncroft Street.

Site observations noted the location was considered indicative of the local ambient noise environment and also presented as secure location whereby minimising the risk of theft or vandalism to the monitoring equipment. Additionally, it is considered as an acceptable location 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 existing road traffic, distant road traffic from Raymond Terrace Road and natural wildlife primarily described the ambient noise environment and is indicative of an Sub-Urban noise environment.

The monitoring locations are shown in Figures 2-2 – 2-3.

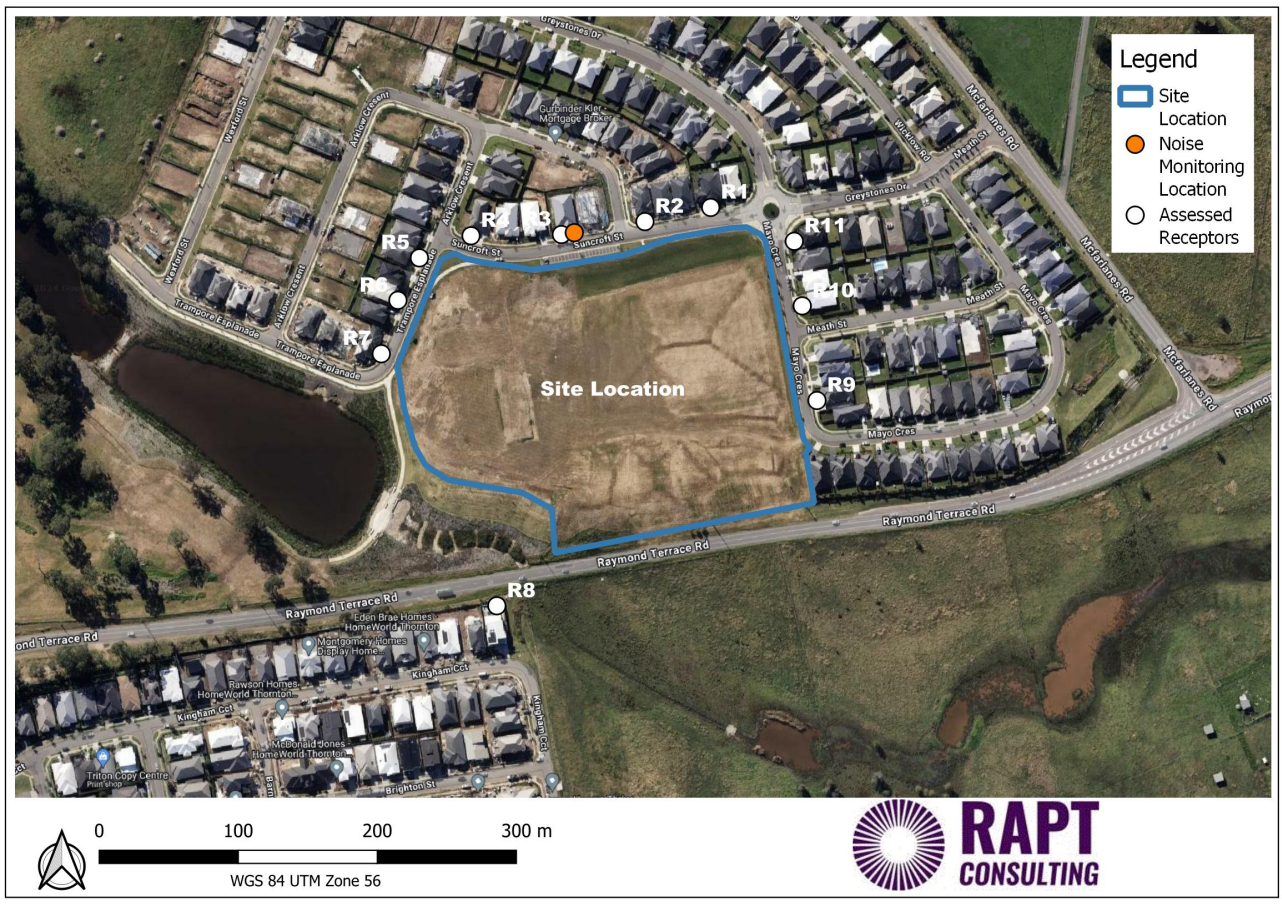


Figure 2-2 Noise Monitoring Location

Figure 2-3 Noise Monitoring Location

Monitoring was undertaken using a RION NL-42 noise logger 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 instrument was 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.

Logged data was reviewed and filtered to exclude any extraneous data during the monitoring period. Weather information for the unattended noise logging was obtained from the Bureau of Meteorology Williamtown all weather station for the monitoring period and any data adversely affected by rain, wind (more than 5 m/s as per NPfI) were discarded.

The RBL and ambient LAeq levels are provided in Table 2-1 below.

Table 2-2 Background and Ambient Noise Monitoring Results

Location	Rating background level, L_{A90}, dB(A)			Ambient noise levels, L_{Aeq} dB(A)		
	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
R3 16 Suncroft Street	38	38 (40)[2]	34	54	52	48

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 As outlined in the NPfI, the evening or night criteria or management levels are set no louder than that daytime or evening levels. Number in brackets (XX) represents actual measured RBL determined for assessment period.

3. Noise 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 derived, as shown in Table 3-3.

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

Receiver	Within Recommended Standard Hours
Residential	48

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[2]	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 2 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 [3]		Night-time [3]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[4]	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 3 Daytime is 7:00 to 22:00 and night-time is 22:00 to 7:00: and
Note 4 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[5]	
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 5 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[7]	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz[6]	15 Hz and above[6]
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 6 Values referred to are at the base of the building: and
Note 7 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

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. While this is not a transport project, 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

Given the distances between expected construction works and nearest receptors, the risk of vibration impacts is very low. Additionally, 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, the contractor use the above table as a guide for when selecting equipment.

3.3 Noise Guide for Local Government

Section 2.4 of the NGLG provides guidance for Outdoor Entertainment Activities. However there is no specific guidance for a training or sporting facility. Section 2.4 of the NGLG does offer the following:

It may not be possible or appropriate to manage noise through a general noise limit for outdoor entertainment events in all circumstances. The appropriate noise limit (if indeed a noise limit is necessary) will depend on the particular circumstances of the venue and the type of entertainment event. Unless the venue is very remote, it is unlikely that a noise limits to prevent annoyance at every neighbouring residence is possible. However, setting a noise limit can prevent the noise levels emitted from an event from being any higher than necessary. Noise limits will need to be site-specific and reflect what is achievable in practice, without overly restricting the ability of an event to proceed. These considerations have to be balanced against the reasonable expectations of residents not to be subjected to 'offensive noise'.

In the absence of specific noise 'goals' for this circumstance, the NPfI will be referred to as a 'yardstick'.

3.4 Operational Noise – NSW Noise Policy for Industry

The NPfI doesn't contain specific procedures for the assessment of noise emissions from training or sporting facilities. However, it is provided as a guide for ascertaining potential noise impacts and applicable criteria.

The New South Wales *Noise Policy for Industry* (NPfI) provides guidance on the assessment of operational noise impacts. The guidelines include both intrusive and amenity criteria that are designed to protect receivers from noise significantly louder than the background level and to limit the total noise level from all sources near a receiver.

Intrusive noise levels set by the NPfI control the relative audibility of operational noise compared to the background level. Amenity criteria limit the total level of extraneous noise. Both sets of criteria are calculated and the lower of the two in each time period normally apply. Intrusive criteria are simply 5 decibels above the measured (or adopted) background level with a minimum of 40 dB(A) for daytime and 35 dB(A) for evening and night time.

Amenity noise levels are determined based on the overall acoustic characteristics of the receiver area and the existing level of noise excluding other noises such as traffic and insects. Residential receiver areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses, the existing level of noise from industry, commerce, and road traffic. Project amenity noise levels are the recommended amenity noise level (Table 2.1 of the NPfI) minus 5 dB(A) and plus 3 dB(A) to convert from a period level to a 15-minute level. The project noise trigger level is the lower value between the intrusive and the amenity noise levels.

The NPfI noise criteria are planning levels and are not mandatory limits required by legislation however the noise criteria assist the regulatory authorities to establish licensing conditions. Where noise criteria are predicted to be exceeded, feasible and reasonable noise mitigation strategies should be considered. In circumstances where noise criteria cannot be achieved negotiation is required to evaluate the economic, social and environmental costs and benefits of the development against the noise impacts.

Based on site observations and guidance in the NPfI, Nearest residential receptors are considered Sub-Urban. It is understood the proposal is for daytime and evening operations however target noise levels for day, evening and night time are provided for residences and commercial premises for completeness in Table 3-1.

Table 3-9 Project Noise Trigger Levels dB(A)

	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am
Rating Background Level $L_{A90(Period)}$	38	38	34
Project Intrusive Noise Level, $L_{Aeq(15min)}$	43	43	39
Project Amenity Noise Level (Sub-Urban), $L_{Aeq(Period)}$	50	40	35
Project Amenity Noise Level $L_{Aeq(15min)}$	53	43	38
Project Trigger Level Residential $L_{Aeq(15min)}$	**43**	**43**	**38**
Commercial Premises (When in use) $L_{Aeq(15min)}$	**63**	**63**	**63**

4. Acoustic Assessment

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 %[8]
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 8The 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 Bruel and Kjaer's "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". The method predicts the sound pressure level under meteorological conditions favourable to propagation from sources of known sound emission. These conditions are for downwind propagation or equivalently under a well-developed moderate ground based temperature inversion. Terrain topography, ground absorption, atmospheric absorption and relevant shielding objects are taken into account in the calculations.

Other Key assumptions in the model include:

- topographical information was obtained from NSW Government Spatial Services
- all areas were modelled considering a conservative ground factor of 0.8
- 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.

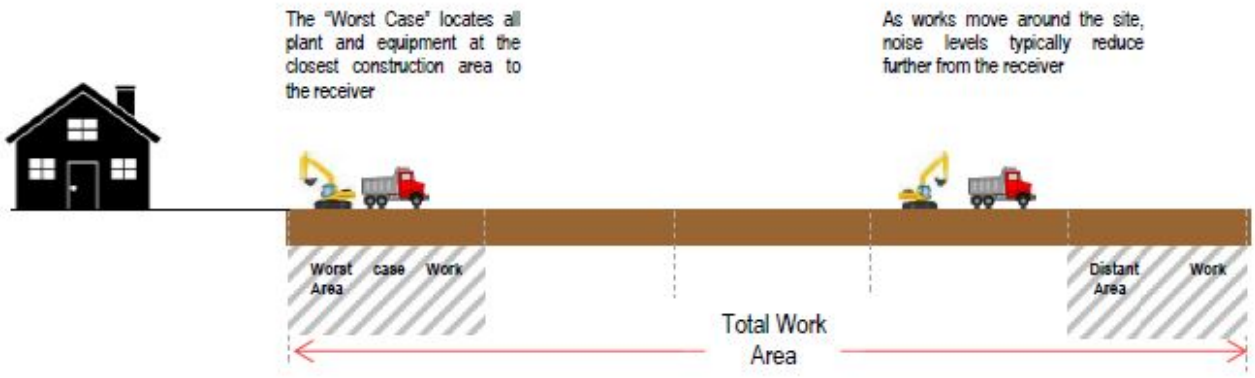


Figure 4-1 Example of Differing Work Areas

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 reasonable worst-case scenario. Two scenarios were assessed, one for the west and one for the east of the site. 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 4-2 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 4-2 Predicted Construction Noise Levels dB(A) Leq(15min)

Receiver	Excavation West	Excavation East	Building West	Building East	Standard Hours NML	Highly Affected Noise Level
R1	45	59	35	49	48	75
R2	51	59	41	48	48	75
R3	57	53	47	42	48	75
R4	62	37	50	27	48	75
R5	62	42	50	31	48	75
R6	64	41	53	30	48	75
R7	60	35	50	25	48	75
R8	50	45	40	34	48	75
R9	45	59	35	49	48	75
R10	43	65	33	54	48	75
R11	46	61	36	51	48	75

The results of the construction noise assessment indicate construction works have the potential to exceed NML's depending on work activity and location. However, the Highly affected noise level is expected to be complied with in all sitiuations.

With this in mind, it is recommended a construction noise management plan be implemented as part of the proposal to minimise noise emanating upon the community.

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

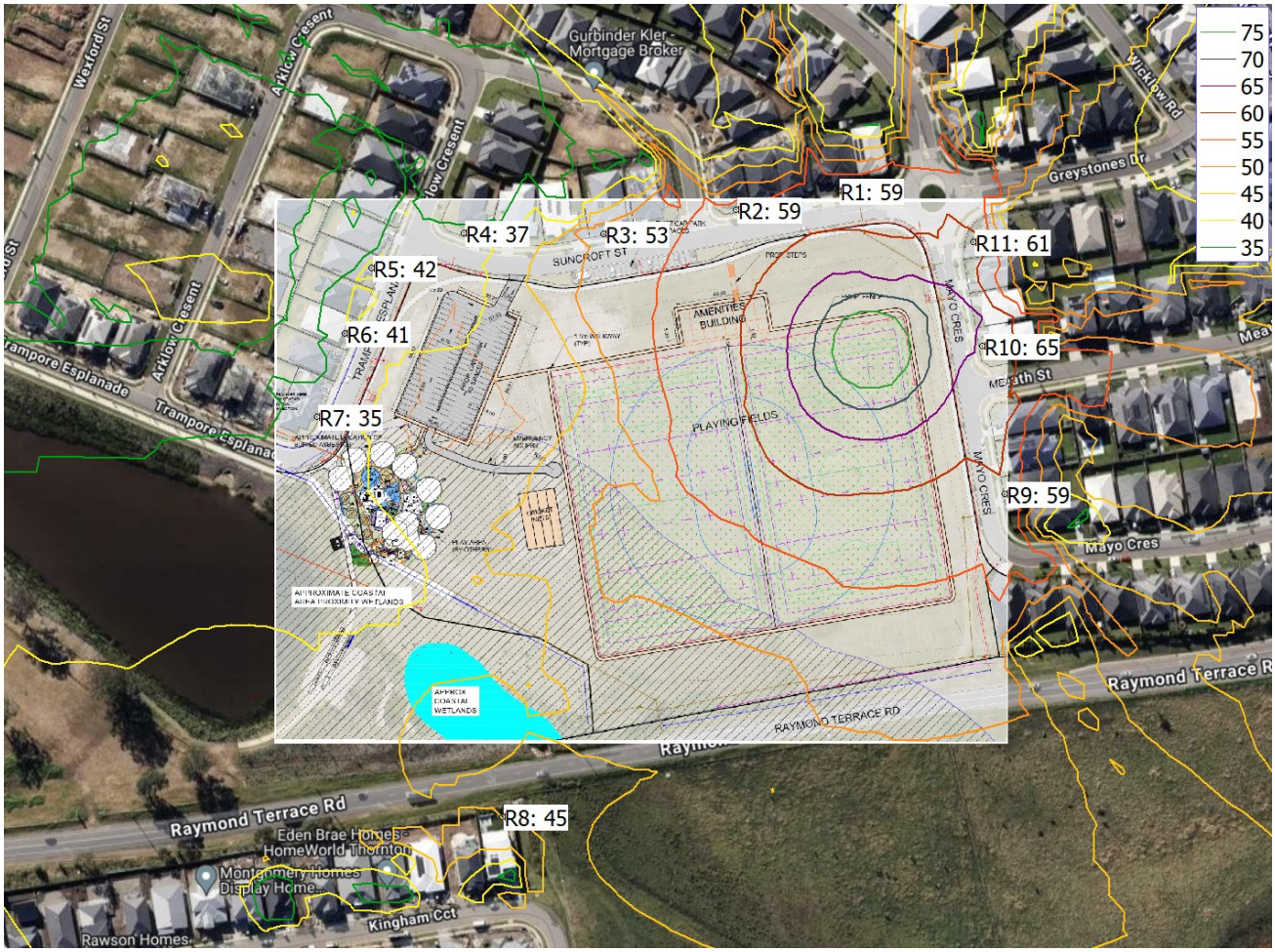


Figure 4-2 Excavation East dB(A) Leq(15min)

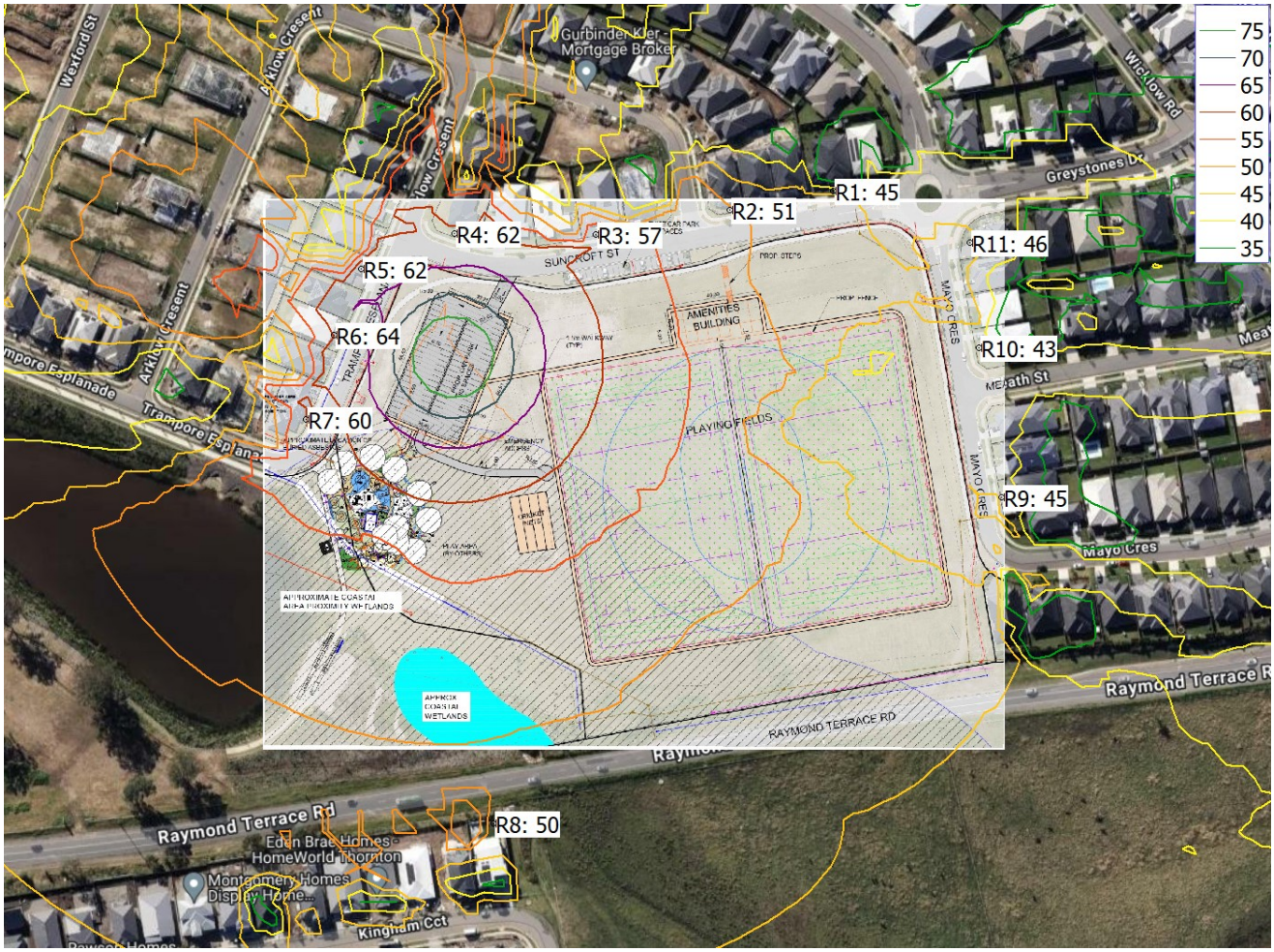


Figure 4-3 Excavation West dB(A) Leq(15min)

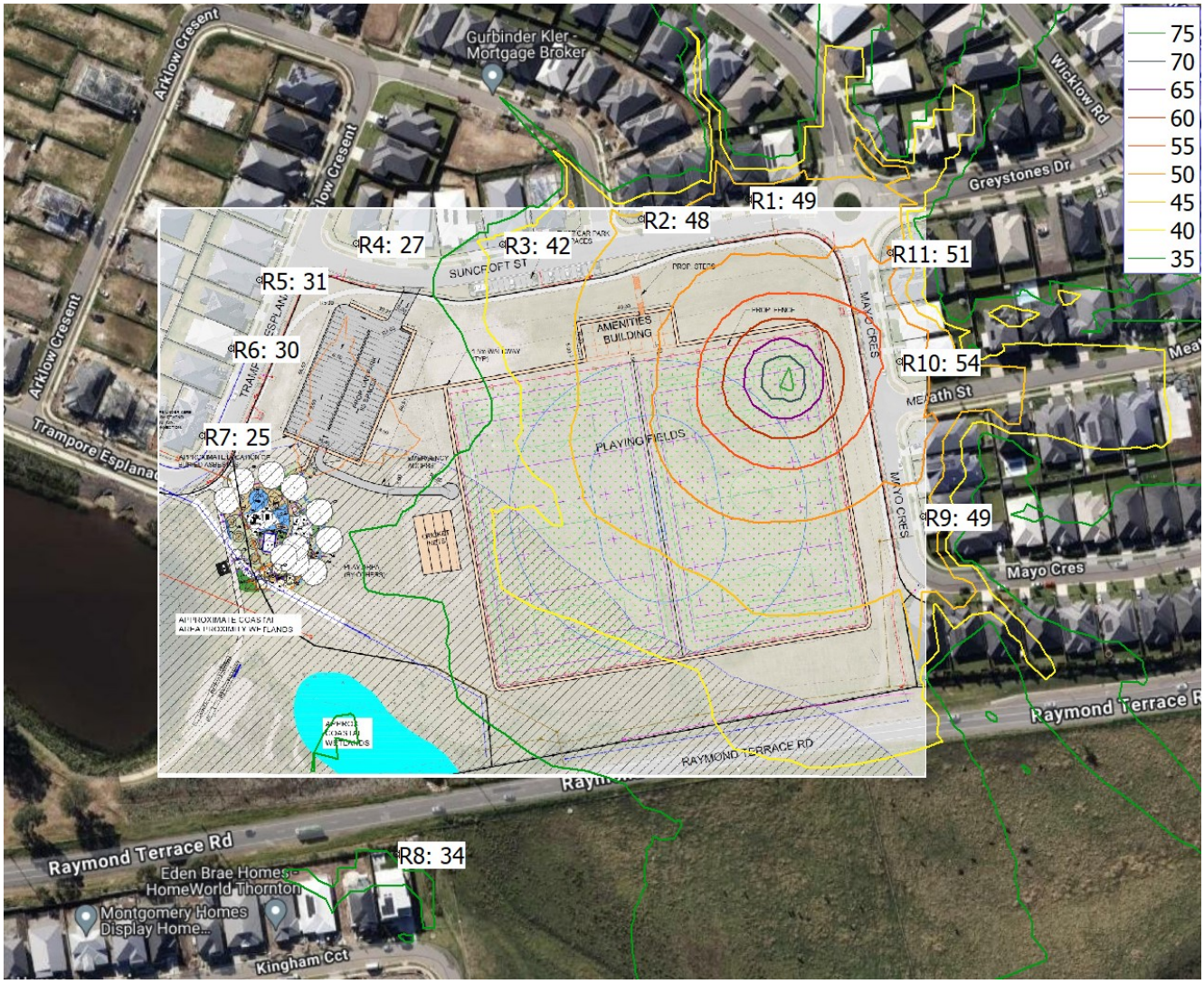


Figure 4-4 Build East dB(A) Leq(15min)

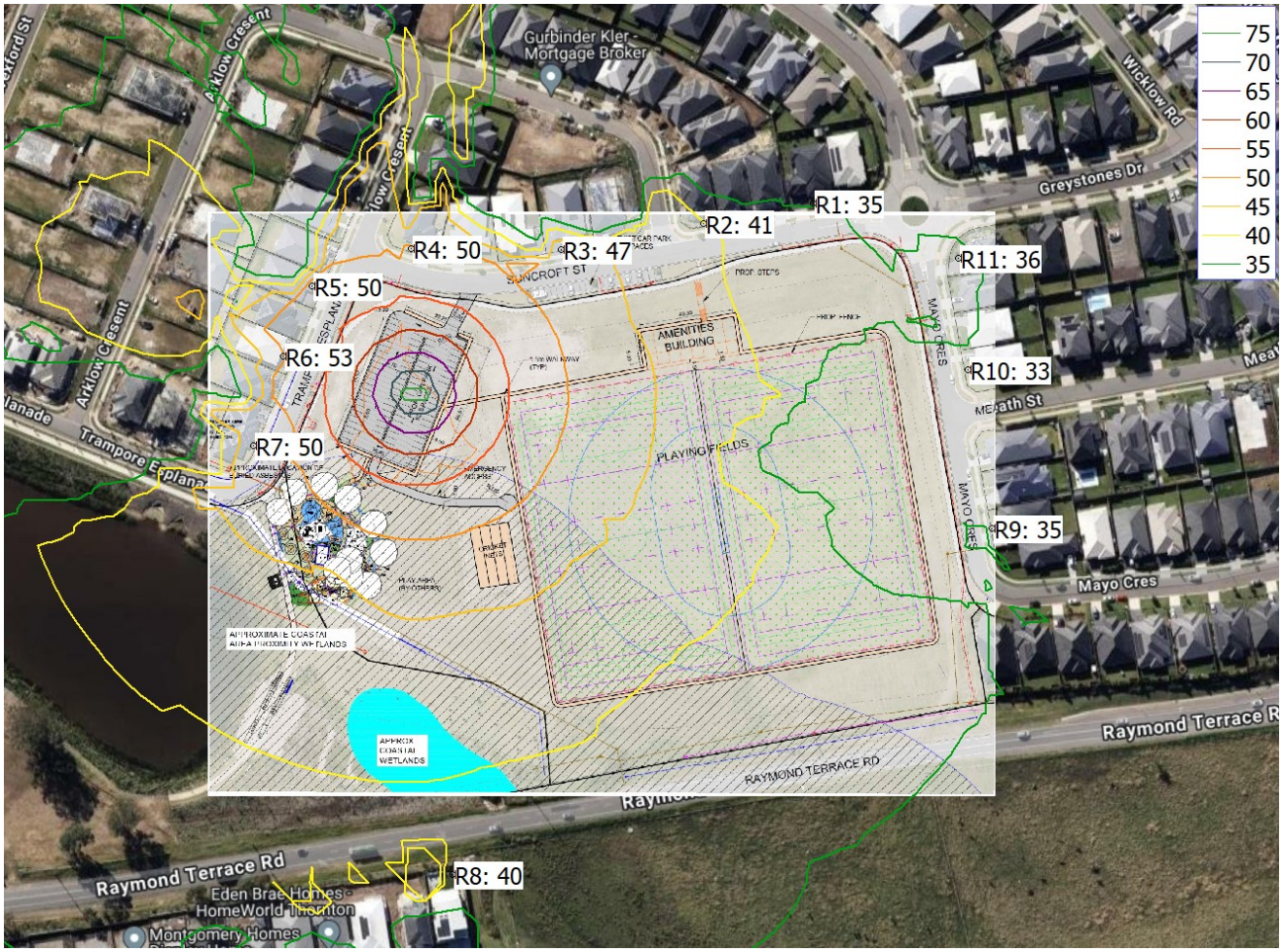


Figure 4-5 Build West dB(A) Leq(15min)

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

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. Site 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.

Spectator and Participant Noise

Outdoor noise in the form of human raised to very loud voice has been sourced from RAPT Consulting's database and has been assessed with a sound power level of 75 dB(A). It is understood that each oval will generally consist of no more than 30 persons. Noise has been assumed to be operating from the oval areas in the form of 15 persons conversing in raised to very loud voice cumulatively in each of the oval areas. It has been assumed that 50% of persons are conversing at any one time as not all persons will be speaking simultaneously. Shouting may also occasionally occur in brief stages by a coach or others to 'direct traffic' on a training ground. Shouting has also been sourced from RAPT Consulting's database and has been assessed with a sound power level of 97dB(A). Shouting has been assumed to occur 10% of the time.

Additionally spectators have been assumed to be surrounding the ovals in the form of 440 persons. 220 spectators have been assumed to be using the same raised to very loud voice

as not all persons would be speaking simultaneously. Additionally shouting from the spectators has been assumed to be occurring by 50 spectators 10% of the time.

Vehicle Noise

Onsite vehicles entering and exiting noise modelling assumptions include 10 cars in 15 minutes with a 10km/hr sound power level of 85dB(A) and a sound power level of a car door opening and closing of 78dB(A) which has been sourced from RAPT consultings' internal sound level database. It has been assumed the western carpark will be utilised during opening hours.

To simulate a reasonable worst-case scenario, received noise produced by anticipated activities outlined above have been simulated.

The results of the operational assessment are shown in Table 4-3 and Figure 4-6.

Table 4-3 Operational Modelled Results dB(A) Leq(15min)

Receiver ID	Cumulative Operational Result	Receptor Type	Project Noise Trigger Level Day/Evening	Comply Yes/ No
R1	40	Residential	43 / 43	Yes
R2	40	Residential	43 / 43	Yes
R3	41	Residential	43 / 43	Yes
R4	38	Residential	43 / 43	Yes
R5	38	Residential	43 / 43	Yes
R6	39	Residential	43 / 43	Yes
R7	36	Residential	43 / 43	Yes
R8	35	Residential	43 / 43	Yes
R9	43	Residential	43 / 43	Yes
R10	42	Residential	43 / 43	Yes
R11	39	Residential	43 / 43	Yes

Figure 4-6 Operational Result dB(A) Leq(15min)

Discussion

In the absence of noise goals for outdoor entertainment activities, in this case a training or sports facility, while not mandatory the results of the assessment indicate compliance with NPfI project noise trigger levels of 43 dB(A) Leq(15min) can be achieved. It should be recognised that this was a simulation and in reality, received noise levels can be expected to be lower than the modelled results for reasons outlined previously in this assessment or on occasion louder depending on activity and location of sound sources.

The NPfI was used as a 'yardstick' for this assessment and is not generally applicable to sports fields.

Section 3.1 of this report mentions Section 2.4 of the NGLG:

It may not be possible or appropriate to manage noise through a general noise limit for outdoor entertainment events in all circumstances. The appropriate noise limit (if indeed a noise limit is necessary) will depend on the particular circumstances of the venue and the type of entertainment event. Unless the venue is very remote, it is unlikely that a noise limits to prevent annoyance at every neighbouring residence is possible. However, setting a noise limit can prevent the noise levels emitted from an event from being any higher than necessary. Noise limits will need to be site-specific and reflect what is achievable in practice, without overly restricting the ability of an event to proceed. These considerations have to be balanced against the reasonable expectations of residents not to be subjected to 'offensive noise'.

While the NGLG offensive noise test is a subjective test, it is provided below:

Q1: is the noise loud in the absolute sense? Is it loud relative to other noise in the area

A1: The results of the assessment indicate the noise is not loud in the absolute sense at any of the assessed receptors. Also the modelled results are below the existing ambient LAeq noise levels that are presented in Table 2-1 of the report.

Q2: Does the noise include characteristics that make it particularly irritating?

A2: Unknown based on different people having different vocal characteristics, however generally it is viewed the noise characteristics are not particularly irritating.

Q3: Does the noise occur at times when people expect to enjoy peace and quiet?

A3: It is understood the activities cease by 10:00pm.

Q4: Is the noise atypical for the area?

A4:, the answer is no.

Q5: Does the noise occur often?

A5: Depending on the circumstance the noise source may occur often however as per Q1, the noise at nearest receivers is not loud in the absolute sense.

Q6: Are a number of people affected by the noise?

A6: This is currently unknown to RAPT Consulting, however the impression there is limited persons who are *potentially* 'affected'.

The results of the offensive noise test suggest that noise from the sporting fields is generally not offensive.

The results of the assessment are considered to be a reasonable worst case and in reality, received noise levels can be expected to be lower than what is presented. The noise levels generated during training sessions will vary according to the following factors:

- The number of individuals in the area – players will be spread around the outdoor play areas
- The level of noise made by each person – this is obviously different from individual to individual, and various factors such as age, personality, mood, activity and countless other factors will play a part. The louder events are not capable of being sustained over an extended period, and
- The location of the individuals relevant to the residences – as the distance between the source and the receiver increases, the noise level at the receiver will decrease.

It is recommended that management of noise, particularly any excessive noise generated by individuals, be included in any site management plan. By managing noise excessive noise being generated by individuals, it is viewed site noise levels can be managed and while not mandatory can comply with NPfI project noise trigger levels.

5. Conclusion

This acoustic assessment has been undertaken to inform a Review of Environmental Factors (REF) for the proposed sportsfield development at 15 Suncroft Street Chisholm NSW

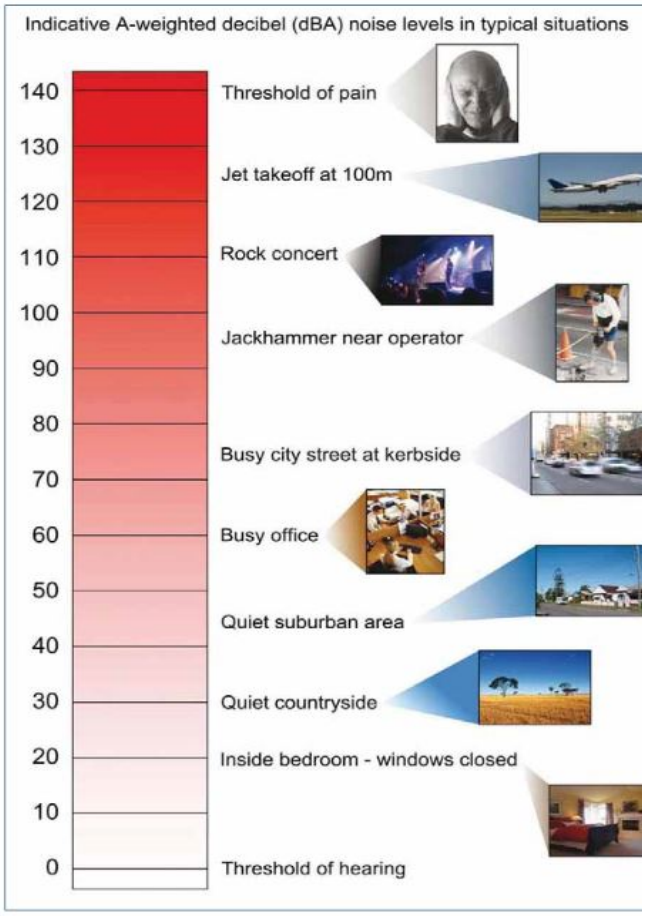
Construction

The assessment outlined in this report indicates that construction noise management levels have the potential to be exceeded depending on work activity and location. 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 through the implementation of a CNMP similar to what has been recommended in this report.

Operation

Based on the results and the information provided regarding the development, compliance with noise goals is expected for the development on neighbouring residences. Recommendations have been made for management to have measures in place to particularly to deal with any unexpected excessive noise from patrons. Therefore, from an acoustics perspective the findings suggest the proposal is acceptable.

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).
DnT,w	Weighted Standardised Level Difference A single number rating of the sound level difference between two rooms. DnT,w is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling
Dw	Weighted Sound Level Difference A single number rating of the sound level difference between two rooms. Dw is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling
Impact sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor
L'nT,w	Weighted, Standardised Impact Sound Pressure Level A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard 'tapper' machine. L'nT,w is measured on site. The lower the L'nT,w, the better the acoustic performance.
Lw (or SWL)	Sound Power Level. The level of total sound power radiated by a sound source.
Masking Noise	Intentional background noise that is not disturbing, but due to its presence causes other unwanted noises to be less intelligible, noticeable and distracting.

NRC	Noise Reduction Coefficient A single number rating between 0 and 1 of the ability of a material to absorb sound. It is the average of the absorption coefficients in the 250-2000Hz octave bands rounded to the nearest 0.05. The larger the number, the more absorptive the material.
Octave Band	Octave Band A range of frequencies where the highest frequency included is twice the lowest frequency. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.
Room Criterion (RC)	The Room Criteria (RC) Method is a HVAC related background noise acceptability rating method. The RC method is a family of criterion curves (specifying sound levels by octave bands) intended to establish HVAC system design goals and a rating procedure.
RT or T60	Reverberation Time The time (in seconds) taken for the sound pressure level generated by a particular noise incident to decay by 60 decibels following the conclusion of the noise event (hence T60 abbreviation). Reverberation Time is used for assessing the acoustic qualities of a space, describing how quickly sound decays within a space. The reverberation time is related to the room volume and total absorption.
Rw	Weighted Sound Reduction Index A single number rating of the sound insulation performance of a specific building element. Rw is measured in a laboratory. Rw is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete.
Speech transmission	(STI) is a measure for the transmission quality of speech with respect to intelligibility. A value of 0 indicates completely unintelligible speech while a value of 1 indicates perfectly intelligible speech.