# Acoustic Assessment – Stage 1 Concept Development Application Anambah, NSW

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Vara Consulting

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**Document Details**

Acoustic Assessment – Stage 1 Concept Development Application Anambah, NSW.

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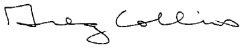
| 2224613_240829_0 | 0 | Gregory Collins-MAAS |  | 29 August 2024 |

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# 1. Introduction

## 1.1 Background

RAPT Consulting has been engaged to undertake a desktop environmental acoustic assessment to inform a Concept Development Application (CDA) for the approval for Stage 1 of the development, being the construction of 240 residential lots and associated works located at Lot 55 DP874170 and Lot 177 DP874171 Anambah NSW.

The site is located within the Anambah Urban Release Area (URA) and is part of the Branxton to Anambah Regionally Significant Growth Area identified in the Hunter Regional Plan 2041. It is strategically located in proximity to other areas earmarked for urban release including the Lochinvar URA, Anambah Road URA, Anambah Employment Area, Anambah Urban Extension Site (Wyndella) and Anambah Road Urban Extension Site.

The Stage 1 plan is shown in Figure 1-1.

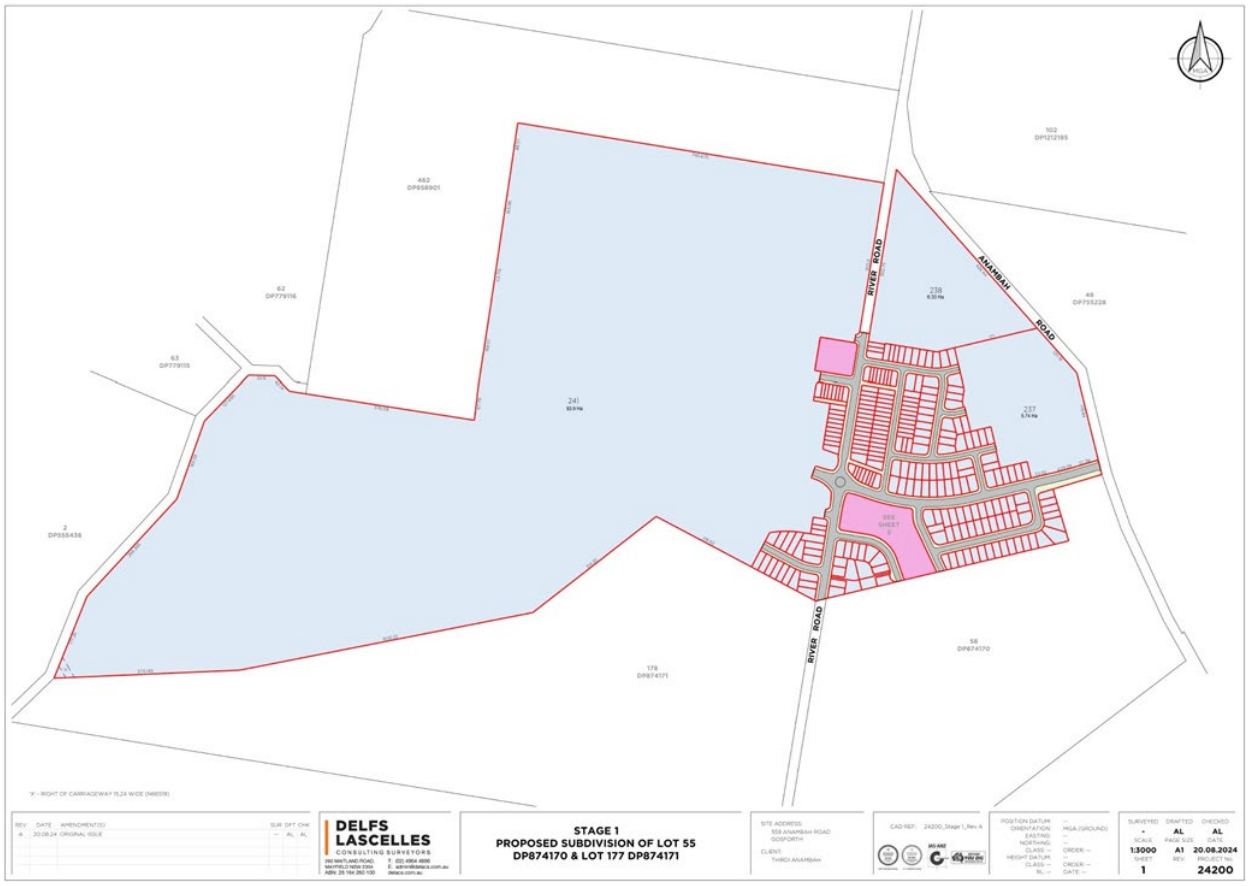



*Figure 1-1 Stage 1 Plan (Source: DELFS LASCELLES)*

## 1.2 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 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

The NSW Noise Policy for Industry (NPfI) provides guidance for determining residential receiver categories. Other non-residential receivers located within these areas would be considered to be located in rural, suburban or urban areas. Table 2.3 from the NPfI regarding receiver classifications is reproduced in Table 2-1 below.

*Table 2-1 Determining Which Residential Receiver Category Applies*

| Receiver category | Typical planning zoning – standard instrument* | Typical existing background noise levels | Description |
|---|---|---|---|
| Rural residential | RU1 – primary production<br>RU2 – rural landscape<br>RU4 – primary production small lots<br>R5 – large lot residential<br>E4 – environmental living | Daytime RBL <40 dB(A)<br>Evening RBL <35 dB(A)<br>Night RBL <30 dB(A) | **Rural** – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse.<br><br>Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered. |
| Suburban residential | RU5 – village<br>RU6 – transition<br>R2 – low density residential<br>R3 – medium density residential<br>E2 – environmental conservation<br>E3 – environmental management | Daytime RBL<45 dB(A)<br>Evening RBL<40 dB(A)<br>Night RBL <35dB(A) | **Suburban** – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the |
| Urban residential | R1 – general residential<br>R4 – high density residential | Daytime RBL> 45 dB(A)<br>Evening RBL> 40 dB(A) | **Urban** – an area with an acoustical environment that:<br>*is dominated by 'urban hum' or |

| Receiver category | Typical planning zoning – standard instrument* | Typical existing background noise levels | Description |
|---|---|---|---|
| | B1 – neighbourhood centre (boarding houses and shop-top housing)<br>B2 – local centre (boarding houses)<br>B4 – mixed use | Night RBL >35 dB(A) | industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources<br>*has through-traffic with characteristically heavy and continuous traffic flows during peak periods<br>*is near commercial districts or industrial districts<br>*has any combination of the above. |

Based on previous background noise surveys in regional NSW and the guidance stemming from Table 2-1, residential and other receptors in the vicinity of the proposal would generally be regarded as Rural with background noise levels being:

- Daytime RBL <40 dB(A)
- Evening RBL <35 dB(A)
- Night RBL <30 dB(A)

The LAeq ambient noise level 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. In these rural circumstances where the acoustical environment is generally described by natural sounds, having little road traffic or industrial activity the LAeq noise level is also usually lower than what would be expected in an Urban or Sub-Urban environment.

Recent noise surveys undertaken by RAPT consulting in rural settings in the Hunter Region have yielded the following ambient noise levels.

Table 7 of the NSW EPA Road Noise Policy provides guidance on the application of a façade correction factor. Due to the monitoring locations not being within 3.5 metres of a wall that could reflect sound, a façade correction factor has been added to the measurements.

*Table 2-2 Ambient Noise Monitoring Results dB(A) Leq*

| Descriptor | Location 1 | Location 2 | Location 3 | Time Interval |
|---|---|---|---|---|
| $L_{Aeq(9hr)}$ | 51 + 2.5 = 53.5 | 47 + 2.5 = 49.5 | 45 + 2.5 = 47.5 | 10:00pm – 7:00am |
| $L_{Aeq(15hr)}$ | 59 + 2.5 = 61.5 | 54 + 2.5 = 56.5 | 55 + 2.5 = 57.5 | 7:00am - 10:00pm |

An aerial review of the vicinity of the proposal to identify additional noise sources in the area indicates:

- an organics processing facility is located to the west
- The Royal Newcastle Aero Club to the south
- The New England Highway to the south
- Other commercial and industrial facilities to the south.

# 3. Noise and Vibration Objectives

## 3.1 Construction Noise

Given the rural nature of the project area it was requested to utilise the lowest adopted values in the NSW EPA publication Noise Policy for Industry (NPfI) (October 2017) for deriving construction noise goals for the project. Table 2.1 of the NPfI provides minimum assumed rating background levels and are shown in Table 3-1.

*Table 3-1Minimum assumed Rating Background Levels dB(A)*

| | Day<br>7 am to 6 pm | Evening<br>6 pm to 10 pm | Night<br>10 pm to 7 am |
|---|---|---|---|
| Minimum Assumed Rating Background Level<br>$L_{A90(Period)}$ | 35 | 30 | 30 |
| Minimum Project Intrusiveness Noise Level<br>$L_{Aeq(15min)}$ | 40 | 35 | 35 |

Construction noise is assessed with consideration to DECCW *Interim Construction Noise Guidelines* (ICNG) (July 2009). The INCG 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 3-2.

*Table 3-2 ICNG Recommended Construction Hours*

| Work type | Recommended standard hours of work |
|---|---|
| Normal construction | Monday to Friday: 7 am to 6 pm.<br>Saturday: 8 am to 1 pm.<br>No work on Sundays or Public Holidays. |
| Blasting | Monday to Friday: 9 am to 5 pm.<br>Saturday: 9 am to 1 pm.<br>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 3.3.

*Table 3-3 ICNG Noise Guidelines at Receivers*

| Period | Management Level $L_{Aeq(15\ min)}$ |
|---|---|
| Residential Recommended standard hours | Noise affected level: RBL + 10<br>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) |
| 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) |
| Community Centres | Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses. In this case a municipal building 'public space' has been utilised which has a recommended maximum internal design level of 50 dB(A) Leq |

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.

Based on the above and the project rating background levels provided in Table 2-1, construction noise management levels have been derived, as shown in Table 2-4. It is anticipated that construction would only take place during standard hours, however for completeness out of hours NML's have been provided.

*Table 3-4 ICNG Construction Noise Management Levels Leq(15min) dB(A)*

| Receiver | Within Recommended Standard Hours | Outside Recommended Standard Hours | |
|---|---|---|---|
| | | Evening (6pm-10pm) | Night (10pm-7am) |
| Residential (external) | 45 | 35 | 35 |
| Classrooms at schools and other educational institutions (internal)<br>Outdoor Noise Level 55 dB(A) (assumes 10dB(A) loss through an open window | 45 | 45 | 45 |
| Offices, retail outlets (external) | 70 | 70 | 70 |
| industrial premises (external) | 75 | 75 | 75 |

## 3.2 Vibration Guidelines

### 3.2.1 Human Exposure

Vibration goals 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 3-5 for the applicable receivers.

*Table 3-5 Preferred and Maximum Levels for Human Comfort*

| Location | Assessment Period[1] | 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 1 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 3-6 for the applicable receiver type.

*Table 3-6 Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)*

| Location | Daytime [2] | | Night-time [2] | |
|---|---|---|---|---|
| | Preferred value | Maximum value | Preferred value | Maximum value |
| Critical areas [3] | 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 2 Daytime is 7:00 to 22:00 and night-time is 22:00 to 7:00: and*
*Note 3 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 3-7 for DIN 4150-3: 1999-02 and Table 3-8 for BS7385.2 – 1993.

*Table 3-7 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* | |
| 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 4 At frequencies above 100Hz, the values given in this column may be used as minimum values*

*Table 3-8 BS7385.2 Transient Vibration Guideline Values for Potential building - Cosmetic Damage*

| Building Type[6] | Peak component particle velocity in frequency range of predominant pulse | |
|---|---|---|
| | 4 Hz to 15 Hz[5] | 15 Hz and above[5] |
| 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 5 Values referred to are at the base of the building: and*
*Note 6 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 3-9 provides the recommended minimum safe working distances for vibration intensive plant from sensitive receivers.

*Table 3-9 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.

# 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 road and associated infrastructure. 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 %[13] |
|---|---|---|---|
| **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 7The 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
- no modifying factors have been applied to noise source SWLs as tonal influences were not considered to be a feature of the construction or operational noise environment.

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.

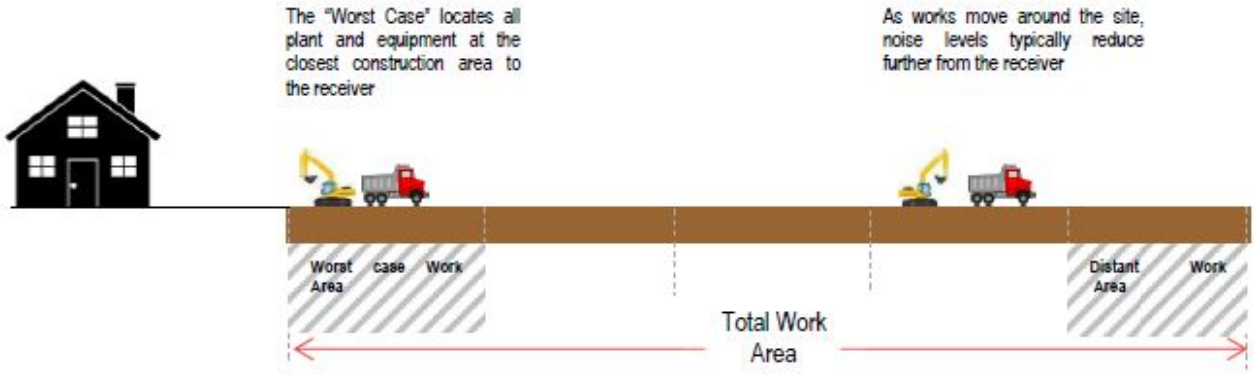



*Figure 4-1 Example of Differing Work Areas*

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 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 Assessment Results**

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

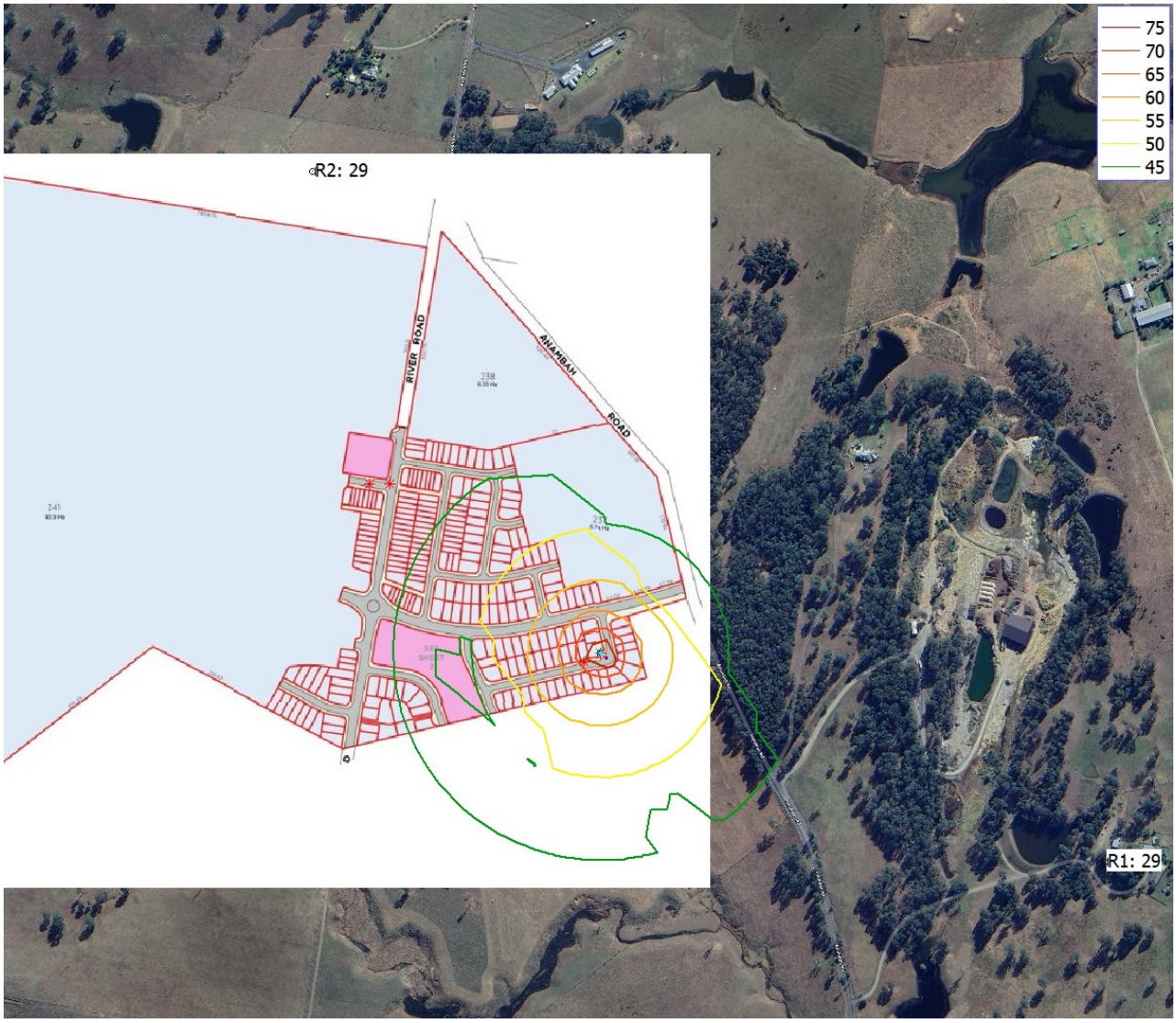



*Figure 4-2 Excavation East dB(A) Leq(15min)*

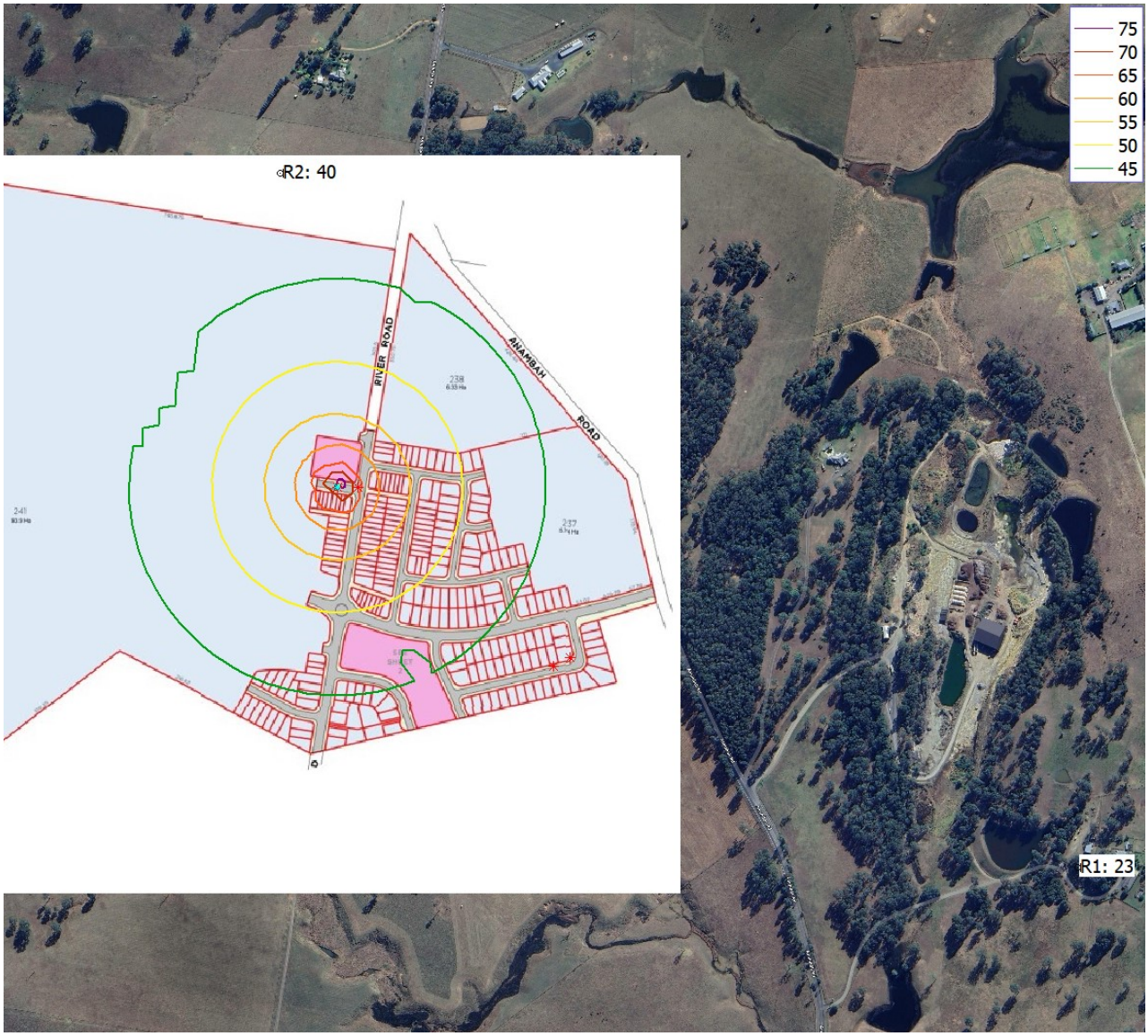



*Figure 4-3 Excavation West dB(A) Leq(15min)*

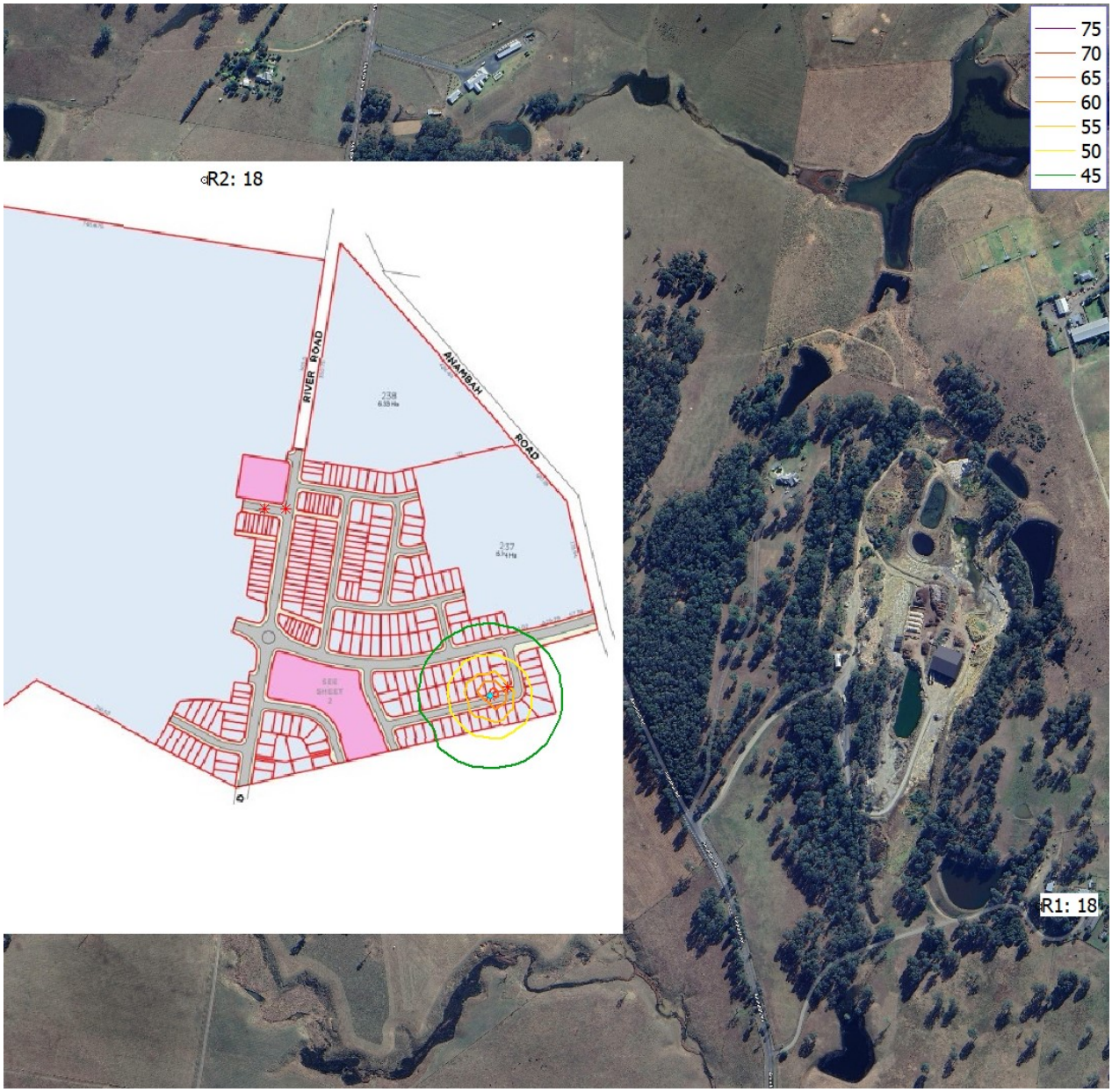



*Figure 4-4 Build East dB(A) Leq(15min)*

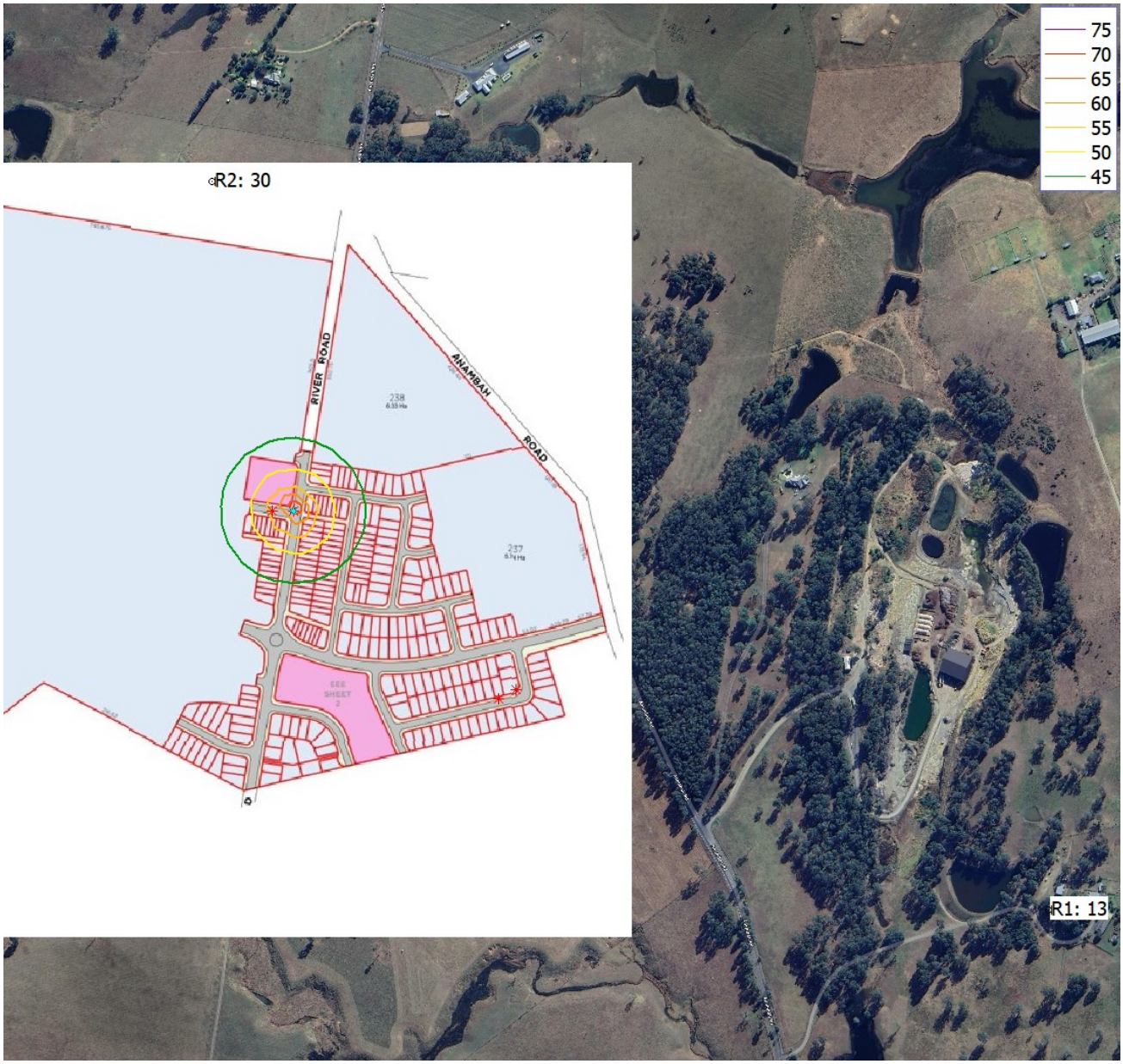



*Figure 4-5 Build East dB(A) Leq(15min)*

The results of the construction noise assessment indicate construction works could comply with NML's in all assessed situations. The Highly affected noise level is also expected to be complied with.

While NML's are expected to be complied with, is recommended a construction noise management plan be implemented as part of the proposal to minimise noise emanating upon the community.

## 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.

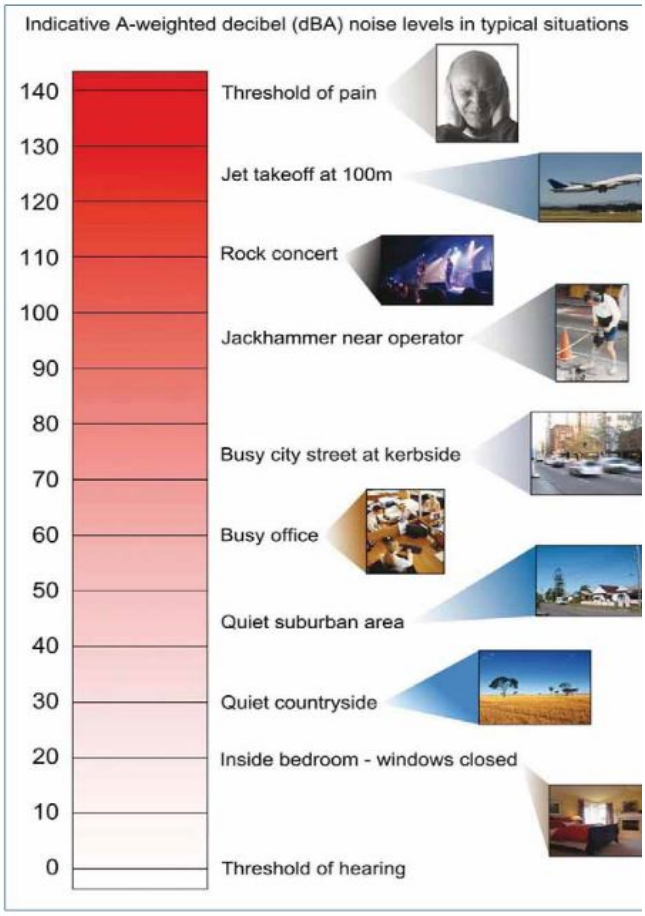
- If valid noise and/or vibration data for an activity is available for the complainant property, from works of a similar severity and location, it is not expected that monitoring will be repeated upon receipt of repeated complaints for these activities, except where vibration levels are believed to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

# 5. Conclusion

This acoustic assessment has been undertaken to inform a Concept Development Application (CDA) for the approval for Stage 1 of the development, being the construction of 240 residential lots and associated works located at Lot 55 DP874170 and Lot 177 DP874171 Anambah NSW.

The assessment outlined in this report indicates that construction noise management levels will be complied with. The highly noise affected level of 75dB(A) LAeq(15min) is also 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.

# 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.<br>An educational institution, library, childcare centre or kindergarten.<br>A hospital, surgery or other medical institution.<br>An active (e.g. sports field, golf course) or passive (e.g. national park) recreational area.<br>Commercial or industrial premises.<br>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<br>(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.<br>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:<br>Noise impacts<br>Noise mitigation benefits<br>Cost effectiveness of noise mitigation<br>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). |