

Balranald Key Workers Accommodation

Noise & Vibration Impact Assessment

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1 INTRODUCTION

Acoustic Logic has been engaged to review potential noise and vibration impacts associated with the proposed Key Workers Accommodation for Balranald Hospital.

The issues which will be addressed in this report are:

- Identification of the noise and vibration standards which will be applicable to this project.
- Identification of potentially impacted nearby development.
- Identify likely sources of noise and vibration generation and predicted noise levels at nearby development.
- Formulation of a strategy to comply with the standards identified and mitigation treatments in the event that compliance is not achievable.
- Review of requirements for traffic noise intrusion from the Sturt Highway (A20).

2 SITE DESCRIPTION

Key Worker Accommodation is proposed within pre-fabricated cabins on the western extent of the existing Balranald Hospital site. The site is bounded by Market Street to the north, Court Street to the south and McCabe Street (Sturt Highway) to the west.

Preparation works are also proposed prior to the installation of the cabins, including installation of services and concreting for the cabins to be installed on. The total construction timeline is expected to be relatively limited, with works occurring over a period of 1-2 months.

The standard work hours as detailed in the NSW EPA *Interim Construction Noise Guideline* are as follows:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- Sundays or Public Holidays: No work.

2.1 RECEIVER LOCATIONS

Sensitive receiver locations as presented in Figure 1 and detailed below. These locations will be used as a basis for this assessment.

- **R1:** Residential dwelling to the south along Court Street.
- **R2:** Residential dwelling to the west along McCabe Street.
- **R3:** Residential dwelling to the north-west along Market Street.
- **H1:** Balranald Hospital

An aerial photo of the site, monitoring locations and surrounding receivers is shown in Figure 1



Figure 1 - Site Map and Receiver Locations
Source: NSWSixMaps

- Hospital Site
- Residential Receivers
- Construction Works

3 BACKGROUND NOISE LEVELS

The Interim Construction Noise Guideline recommends the use of rating background noise levels for the establishment of residential noise management levels, the procedure of which is detailed in the NSW EPA *Noise Policy for Industry* (NPI). The NPI also details minimum background noise levels, where measurements are not undertaken at the location of the nearest noise sensitive receivers, which will be adopted for this assessment. The minimum background noise level for the daytime period (being the period of construction works) is 35 dB(A) $L_{90(\text{period})}$.

4 NOISE AND VIBRATION MANAGEMENT LEVEL

4.1 EPA INTERIM CONSTRUCTION NOISE GUIDELINE

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise management levels (based on ambient noise monitoring).
- Review of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission management levels is not possible.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise effected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise effected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than 10dB(A) $L_{eq(15min)}$.
- *"Highly noise affected level"*. Where noise emissions are such that nearby properties are "highly noise effected", noise controls such as respite periods should be considered. For residential properties, the "highly noise effected" level occurs when construction noise exceeds 75dB(A) $L_{eq(15min)}$ at nearby residences.

In addition to the above management levels for residential receivers, the ICNG nominates a Management Level of 45dB(A) $L_{eq(15min)}$ internally for hospitals.

A summary of the above recommended noise levels from the ICNG is presented below in Table 1 and **Error! Reference source not found.**

Table 1 – Noise Management Levels - Residential

Location	"Noise Affected" Level - dB(A) $L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A) $L_{eq(15min)}$
Residential Receivers	45	75
Hospital Wards	45 (Internally) 55 (Externally)	-

If noise levels exceed the management levels identified in the tables above, reasonable and feasible noise management techniques will be reviewed.

4.2 VIBRATION

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures*; and
- For human exposure to vibration, the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment.

4.2.1 Structure Borne Vibrations (Building Damage Criteria)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 4.

It is noted that the peak velocity is the value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 2 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms ⁻¹)			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

The surrounding buildings would be considered type 2 structures.

4.2.2 Assessing Amenity

The NSW EPA document *"Assessing Vibration: A Technical Guideline"* provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings and is used in the assessment of vibration impact on amenity.

Relevant criteria are presented below.

Table 3 – EPA Recommended Vibration Criteria

		RMS acceleration (m/s ²)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices		0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

5 NOISE AND VIBRATION ASSESSMENT AND RECOMMENDATIONS

5.1 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE LEVELS

Construction activities are proposed to include:

- Preparation/concreting works to lay pads for the accommodation buildings.
- Mobile crane to install pre-fabricated cabins on prepared surface.
- Finishing works to connect services etc. to cabins, and finalise installation.

With respect to construction noise, the impact on nearby development will be dependent on the activity in question and where on the site the activity is undertaken. The primary construction equipment and sound power levels associated with the works are as follows:

Table 5 - Sound Power Levels of the Proposed Equipment

Equipment / Process	Sound Power Level dB(A)
Concrete Pump	110
Trucks	105
Compactor	105
Hand Tools	95-100
Mobile Crane	105

The noise levels presented in the above table are derived from the following sources, namely:

- Table A1 of Australian Standard 2436-2010.
- Data held by this office from other similar studies.

Noise levels take into account correction factors (for tonality, intermittency where necessary).

5.2 NOISE IMPACT ASSESMENT

The predicted noise levels during excavation and construction will depend on:

- The activity undertaken.
- The distance between the work site and the receiver. For many of the work areas, the distance between the noise source and the receiver will vary depending on which end of the site the work is undertaken. For this reason, the predicted noise levels will be presented as a range.

Predicted noise levels are presented below. Predictions take into account the following:

- Noise reduction as a result of distance.
- Depending on the management level adopted, noise emission are predicted to either external areas (property boundaries/building facades) or internal areas. Where noise levels are predicted to internal areas, the NSW EPA Interim Construction Noise Guideline suggests that a reduction from external noise levels to internal spaces of 10 dB(A) is a conservative estimate. This recommended reduction has been used to calculate the internal noise levels at the place of worship adjacent to the site.

Table 4 – Predicted Noise Generation to R1 Residential Receivers South of Site

Activity	Predicted Level – dB(A) $L_{eq}(15min)$ (External Areas)	Comment
Concrete Pump	53 – 60	Noise levels below 'highly noise affected level' at all times. Refer discussion for proposed mitigation measures.
Trucks	53 – 60	
Compactor	53 – 60	
Hand Tools	43 – 55	
Mobile Crane	53 – 60	

Table 5 – Predicted Noise Generation to R2 Residential Receivers West of Site

Activity	Predicted Level – dB(A) $L_{eq}(15min)$ (External Areas)	Comment
Concrete Pump	59 - 63	Noise levels below 'highly noise affected level' at all times. Refer discussion for proposed mitigation measures.
Trucks	59 – 63	
Compactor	59 - 63	
Hand Tools	49 - 58	
Mobile Crane	59 - 63	

Table 6 – Predicted Noise Generation to R3 Residential Receiver North-West of Site

Activity	Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)	Comment
Concrete Pump	53 - 61	Noise levels below 'highly noise affected level' at all times. Refer discussion for proposed mitigation measures.
Trucks	53 - 61	
Compactor	53 - 61	
Hand Tools	43 - 56	
Mobile Crane	53 - 61	

Table 7 – Predicted Noise Generation to Hospital Site

Activity	Predicted Level – dB(A) $L_{eq(15min)}$ (Internal Areas)	Comment
Concrete Pump	45 – 52	Predicted noise levels shown to internal areas are where windows are retained open. Where windows are closed, a further 10dB reduction would be expected, which would provide noise levels below nominated management levels. Exceedances with windows open are expected where works occur in the eastern portion of construction zone.
Trucks	45 – 52	
Compactor	45 – 52	
Hand Tools	35 - 48	
Mobile Crane	45 – 52	

5.3 DISCUSSION

Noise levels are expected to be below the 'highly noise affected level' at all times. Noise levels exceed the 'noise affected management level', noting that minimum background noise levels have been used for the assessment. In practice, it is likely that daytime background noise levels are higher than included in the current assessment due to traffic movements along McCabe Street/Sturt Highway.

Further, construction works will be for a limited duration only, and generally not continuous. For example, once concreting works are completed it will need to cure prior to installing cabins. This will provide natural periods of respite for any noise affected receivers.

Given the nature of the works and proposed activities, vibration levels exceeding those in Section 4 are not expected to be exceeded.

Notwithstanding, the following mitigation measures are recommended during construction works.

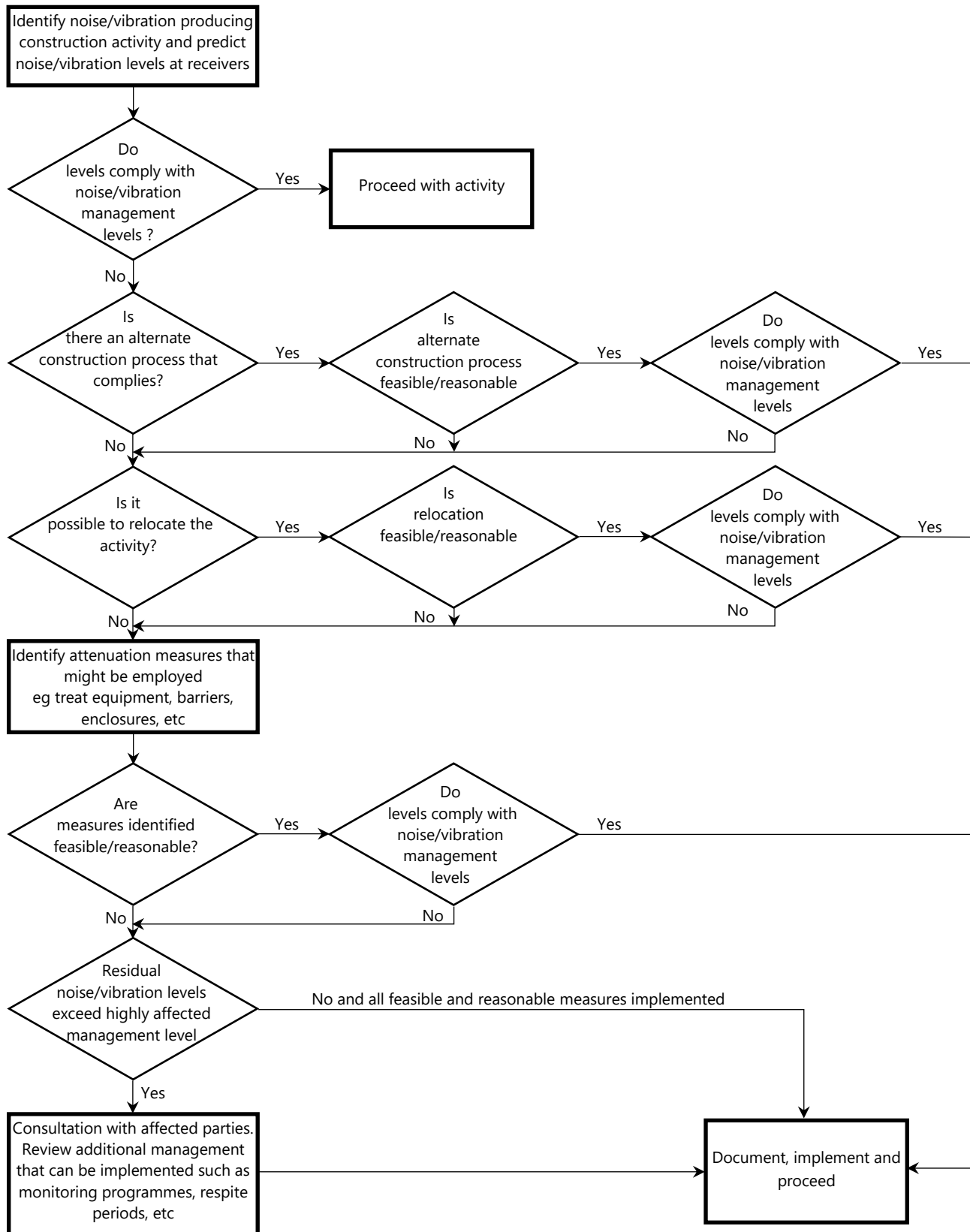
5.4 RECOMMENDATIONS

In light of the above, we recommend:

- Quiet work methods/technologies:
 - As much as practicable, use of quieter methods are adopted.
 - Concrete pump trucks should be located as far as practicable from adjacent sensitive receivers where possible..
 - Materials handling/vehicles:
 - Trucks and bobcats to use a non-tonal reversing beacon (subject to OH&S requirements) to minimise potential disturbance of neighbours.
 - Avoid careless dropping of construction materials into empty trucks.
 - Trucks, trailers and concrete trucks (if feasible) should turn off their engines during idling to reduce noise impacts (unless truck ignition needs to remain on during concrete pumping).
- Complaints handling - In the event of complaint, the procedures outlined in Section 8 should be adopted.
- Site Induction:
 - A copy of the Noise Management Plan is to be available to contractors. The location of the Noise Management Plan should be advised in any site induction.
 - Site induction should also detail the site contact to be notified in the event of noise complaint.

6 CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PRECEDURAL STEPS

The flow chart presented below illustrates the process that will be followed in assessing construction activities.



7 ADDITIONAL NOISE AND VIBRATION CONTROL METHODS

In the event of complaints, there are a number of noise mitigation strategies available which can be considered. The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of available methods.

7.1 SELECTION OF ALTERNATE APPLIANCE OR PROCESS

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. Undertaking this activity using bulldozers, ripping and/or milling machines will result in lower noise levels.

7.2 ACOUSTIC BARRIER

Given the position of adjacent development, it is unlikely that noise screens will provide significant acoustic benefit for commercial or residential receivers, but will provide noticeable improvement for those on ground level.

The placement of barriers at the source is generally only effective for static plant. Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.

Barriers can also be placed between the source and the receiver.

The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

7.3 MATERIAL HANDLING

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

7.4 TREATMENT OF SPECIFIC EQUIPMENT

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

7.5 ESTABLISHMENT OF SITE PRACTICES

This involves the formulation of work practices to reduce noise generation. A more detailed management plan will be developed for this project in accordance to the construction methodology outlining work procedures and methods for minimising noise.

7.6 COMBINATION OF METHODS

In some cases it may be necessary that two or more control measures be implemented to minimise noise.

7.7 NOISE MONITORING TECHNIQUES

Where noise monitoring is undertaken (either by attended short term measurements or long term unattended noise monitoring), it should be conducted at a practical location representative of the impact to nearby noise sensitive receivers. Where this is not possible, noise measurements of construction processes should be taken such that noise levels can be accurately predicted to receivers. Any reporting of noise measurement results may include the following information:

- The date and time that the measurements were undertaken;
- The location of measurements, noise receivers and construction processes. A site map should be included for clarity.
- A description of the construction processes being undertaken during the measurement period.
- The measured noise construction noise levels, and the noise level at the façade of nearby receivers (if noise levels are predicted).
- A comparison to the NSW EPA *Interim Construction Noise Guideline* noise management levels.

8 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise or vibration recommendations occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices.

If a noise complaint is received the complaint should be recorded. Any complaint form should list:

- The name and address of the complainant (if provided);
- The time and date the complaint was received;
- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held.

9 ROAD TRAFFIC IMPACTS

The proposed cabins are located adjacent to McCabe Street/Sturt Highway (A20). Relevant requirements of the State Environment Planning Policy (Transport and Infrastructure) 2021 are detailed below.

9.1 SEPP (TRANSPORT & INFRASTRUCTURE) 2021

2.120 Impact of road noise or vibration on non-road development

- (1) *This section applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration—*
 - (a) *residential accommodation,*
 - (b) *a place of public worship,*
 - (c) *a hospital,*
 - (d) *an educational establishment or centre-based child care facility.*
- (2) *Before determining a development application for development to which this section applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this section and published in the Gazette.*
- (3) *If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded—*
 - (a) *in any bedroom in the residential accommodation—35 dB(A) at any time between 10 pm and 7 am,*
 - (b) *anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.*
- (3A) *Subsection (3) does not apply to a building to which State Environmental Planning Policy (Housing) 2021, Chapter 3, Part 7 applies.*
- (4) *In this section, freeway, tollway and transitway have the same meanings as they have in the Roads Act 1993.*

With respect to residential accommodation, the requirements of the SEPP apply to roadways with traffic volumes which exceed 20, 000 vehicles AADT, based on traffic volume data produced by Transport for NSW.

There are two primary sources for published traffic volumes provided by TfNSW:

- Traffic volume maps provided identifying roadways which exceed either 20, 000 AADT or 40, 000 AADT (RTA maps). These maps cover an area between Kiama in the south and Maitland in the north, and extend to Penrith in the west. Identified roadways are typically limited to the greater Sydney area and coastal highways.
- Traffic volume viewer, which provides current and historical traffic counts for specific locations. These include some locations which would also be covered by the above maps, as well as areas outside of RTA map coverage.
 - There are no traffic counters located close to Balranald published by TfNSW.
 - The closest traffic counter to the site on the Sturt Highway is located at Euroley (Station ID: NNDSTC). The 2022 average daily traffic count at this location is 1, 374, substantially below the 20, 000 AADT requirement detailed in Clause 1.120 of the Transport SEPP.

In light of the above, a detailed assessment of traffic noise impacts from the adjacent roadway is not required to be undertaken for the Key Workers Accommodation under the SEPP (Transport and Infrastructure) 2021 legislation.

10 CONCLUSION

A noise and vibration assessment has been undertaken for the proposed Key Workers Accommodation associated with Balranald Hospital. Potential noise and vibration impacts on nearby development have been assessed.

Recommendations have been provided to control potential noise impacts to nearby residential receivers.

A review of the requirements detailed in State Environment Planning Policy (Transport and Infrastructure) 2021 has also been completed. Based on the available data published by Transport for NSW, a detailed acoustic assessment of road noise impacts on the proposed accommodation is not required.

Please contact us should you have any further queries.

Yours faithfully,



Acoustic Logic Pty Ltd
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