



30 October 2013

Ref: 13844/4952

Eleebana Shores Retirement P/L
P.O. Box 90
Hallidays Point NSW 2430

Introduction

The current proposal is to construct 64 x one storey and 40 x two storey apartments at 40 to 48 Burton Road, Mount Hutton. The development will be known as Eleebana Shores Seniors Living Retirement Village (Eleebana Shores).

This report provides the results, findings and recommendations arising from an acoustical assessment of the potential for noise emissions from Eleebana Shores to impact on surrounding residential areas and also the potential for noise emanating from nearby commercial activity to impact on Eleebana Shores.

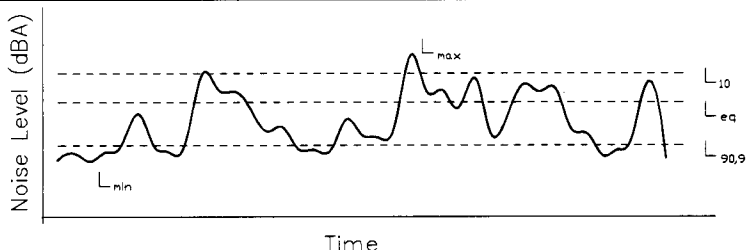
The assessment was requested by Eleebana Shores Retirement Pty Ltd, to accompany a Development Application to Lake Macquarie City Council (NCC).

Table 1 contains the definitions of commonly used acoustical terms and is presented as an aid to understanding this report.

| TABLE 1 DEFINITION OF ACOUSTICAL TERMS | |
|---|--|
| Term | Definition |
| dB(A) | The quantitative measure of sound heard by the human ear, measured by the A-Scale Weighting Network of a sound level meter expressed in decibels (dB). |
| SPL | Sound Pressure Level. The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibels. The human ear responds to pressure fluctuations, resulting in sound being heard. |
| STL | Sound Transmission Loss. The ability of a partition to attenuate sound, in dB. |
| Lw | Sound Power Level radiated by a noise source per unit time re 1pW. |

TABLE 1
DEFINITION OF ACOUSTICAL TERMS (Continued)

| | |
|-----|---|
| Leq | Equivalent Continuous Noise Level - taking into account the fluctuations of noise over time. The time-varying level is computed to give an equivalent dB(A) level that is equal to the energy content and time period. |
| L1 | Average Peak Noise Level - the level exceeded for 1% of the monitoring period. |
| L10 | Average Maximum Noise Level - the level exceeded for 10% of the monitoring period. |
| L90 | Average Minimum Noise Level - the level exceeded for 90% of the monitoring period and recognised as the Background Noise Level. In this instance, the L90 percentile level is representative of the noise level generated by the surrounds of the residential area. |



Existing Acoustic Environment

In NSW the approval and control of noise emissions from commercial and industrial premises is generally based on procedures and criteria detailed in the Industrial Noise Policy (INP).

The INP describes intrusive and amenity criteria applicable to industrial or commercial sites. In this instance the criteria in the INP are used to determine the potential for noise impacts as result of emission from the proposed residential development (e.g. mechanical plant and car parking noise).

These noise criteria depend on the existing background noise level at potentially affected residential receiver areas.

Ambient noise levels representative of these areas were measured at 15 minute statistical intervals using a Svan 949 sound and vibration analysers used as an environmental noise logger. The measurements were done in accordance with relevant Office of Environment and Heritage (OEH) guidelines and AS 1055-1997 "Acoustics – Description and Measurement of Environmental Noise". The noise logger used complies with the requirements of AS 1259.2-1990 "Acoustics – Sound Level Meters", and has current NATA calibration certification.

The logger was programmed to continuously register environmental noise levels over the 15 minute intervals, with internal software calculating and storing Ln percentile noise levels for each sampling

period. Calibration of the logger was performed as part of the instrument's initialisation procedures, with calibration results being within the allowable ± 0.5 dB(A) range.

The logger was located on the site of the proposed development, at 48 Burton Road, from 21st to 28th October 2013. This logger location was chosen to capture the existing noise levels in the vicinity of the nearest potentially affected residential receivers.

Ambient Leq and background noise levels, obtained from the logger, are summarised below in **Table 2** and graphically in **Appendix I**. Detailed logger data is not included in this report but is available on request. Periods of adverse weather were excluded from the data prior to analysis.

| TABLE 2 MEASURED AMBIENT NOISE LEVELS 21/10/13 to 28/10/13 | | | |
|---|---------------------|---------------------|---------------------|
| Location | Day | Evening | Night |
| Site Logger | 40 dB(A) L90 | 33 dB(A) L90 | 26 dB(A) L90 |
| | 58 dB(A) Leq 15 min | 47 dB(A) Leq 15 min | 47 dB(A) Leq 15 min |

In setting noise goals for a particular project the INP considers both Amenity and Intrusiveness criteria. The former is set to limit continuing increase in noise from industry, whilst the latter is set to minimise the intrusive impact of a particular noise source. Amenity criteria are dependent upon the nature of the receiver area and the existing level of industrial noise. The residential areas near the site are best described acoustically as suburban. The site under assessment is subject to little existing industrial noise at any time and, as such, the amenity criteria for these times are the acceptable level from the INP.

The intrusiveness criteria are based on the Rating Background Level (RBL) for the time period, plus 5 dB(A). The RBL (L90) is defined as the overall single figure background level representing each assessment period.

Table 3 below specifies the applicable base noise objectives for the site being assessed.

| TABLE 3 BASE NOISE LEVEL OBJECTIVES | | |
|--|--|---|
| Period | Intrusiveness Criterion* Leq (15 min) dB(A) | Amenity Criterion** Leq (Period) dB(A) |
| Day | 45 | = Acceptable level = 55 |
| Evening | 38 | 45 |
| Night | 35*** | 40 |

* Rating Background Level (RBL) + 5dB. RBL is the median value of each ABL (Assessment Background Level) over the entire monitoring period. The ABL is a single figure representing the "L₉₀ of the L₉₀s" for each separate day of the monitoring period.

** Suburban zone amenity criterion per Tables 2.1 and 2.2 of INP.

*** The accepted minimum RBL is 30 dB(A) L90, per the INP.

The project specific noise levels for the site are the lower of the intrusiveness or amenity criteria, as follows,

Day 45 dB(A) L_{eq} (15 min)

Evening 38 dB(A) L_{eq} (15 min)

Night 35 dB(A) L_{eq} (15 min)

Noise Impact Assessment

The main sources of noise from the site have been identified as;

- Cars using the driveway, and
- Mechanical plant.

Driveway Noise

The development will have a one way loop driveway which will have separate entry and exit points. The driveway will have traffic calming devices so that vehicles moving around the site will only do so at slow speeds.

The layout of the driveway is such that noise from vehicles will be acoustically shielded by the buildings in the proposed development. The worst case for noise from the driveway will come from vehicles passing along the northern section of the driveway as it passes closest to the northern site boundary (as shown in **Appendix II**).

A traffic study for the project has indicated that there should be approximately 208 vehicle movements per day associated with the development. Based on a (practical) 16 hour day this equates to approximately 13 movements in an hour. Peak times during the morning and evening are expected to generate 22 movements.

Assuming a linear relationship the between number of residences and the number of vehicle movements, approximately two thirds of the movements will be along the northern driveway (that is, the vehicles associated with the 36 westernmost units will not use this section of driveway).

To consider the worst case, a day/evening time scenario of four vehicle movements in a 15 minute period was assessed (based on the peak of 22 movements per hour, equating to 5.5 movements in 15 minutes and two thirds of the vehicles being on the northern driveway). A night time scenario of two vehicle movements in a 15 minute period was also assessed.

The L_w of a car moving at 15 kph was taken from the Spectrum Acoustics technical database. The assessment of potential impacts from the use of the driveway was carried out using the OEH accepted Intermittent Traffic Noise guidelines due to the non-continuous nature of the traffic flow.

Equation 1, below, outlines the mathematical formula used in calculating the $L_{eq,T}$ noise level for intermittent traffic noise.

$$L_{eq,T} = L_A + 10 \log \left[1 + \frac{ND}{T} \left(\frac{10^{(L_{max} - L_b) / 10} - 1}{2.3} - \frac{(L_{max} - L_b)}{10} \right) \right]$$

Equation 1

Where

L_b is background noise level, dB(A)

L_{MAX} is vehicle noise, dB(A)

T is the time for each group of vehicles (min)

N is number of vehicle trips

D is duration of noise of each vehicle (min)

The calculation of impacts has been made on the assumption of vehicles travelling in the approximate centre of the driveway with a receiver at 12m from the boundary, as shown as a star in Appendix II (this being 30m from the existing residence to the north as per convention in the INP).

| TABLE 4 RECEIVED NOISE dB(A) (Leq (15 min)) – DRIVEWAY | | |
|---|-------------|-------|
| Element | Day/Evening | Night |
| No. of Vehicle movements (per 15 minute) | 4 | 2 |
| Lw per vehicle @ 15 kph | 84 | 84 |
| Distance Loss (20m) | -34 | -34 |
| Received Noise (Leq 15 min) per eqn. 1 | 38 | 35 |
| Criterion – night (Leq 15 min) | 45/38 | 35 |

The results shown in Table 4 indicate that, under the worst case assessed conditions, there will be no exceedance of any of the adopted noise criteria as a result of the assessed use of the driveway.

Mechanical Plant

Each unit in the development will be individually air conditioned. The locations of the air conditioning plant are yet to be finalised but is likely to be on the external patio of each unit.

Typical condenser units on split systems for residential applications such as this have sound power levels in the vicinity of 64 to 72 dB(A).

This means that in the free field, with no reflecting surfaces and no impediments or barriers to noise, each a/c condenser unit would produce sound pressure levels of around 35 dB(A) at approximately 22m from the condenser (i.e. Based on an Lw of 70 dB(A) for the condenser).

In terms of potential noise impacts on adjoining properties, the cumulative effects of more than one condenser operating at the same time, and in relatively close proximity, needs to be considered.

Table 5 shows a theoretical calculated noise impact at a residential boundary 30m from the acoustic centre of the combined emissions from ten condenser units as may be the case with one for the two storey apartment blocks. This would be considered a worst case scenario where all condensers in a set of ten units were operating at maximum sound power levels.

| TABLE 5 THEORETICAL AIR CONDITIONER NOISE IMPACT | |
|---|-------|
| Item | dB(A) |

| | |
|---------------------------|-----------------|
| 10 x condensers @ 70dB(A) | 80 |
| Distance loss (30m) | 38 |
| Received Noise | 42 leq (15 min) |

Table 5 is a representative calculation showing the impact of noise from ten condensers at a distance of 30m. As indicated above the noise from each condenser will be at 35 dB(A) Leq at a distance of approximately 22m.

This means that at a distance of 50m, for example, the noise from each condenser will be reduced to a received level of 28 dB(A)). That is, if the received noise from one condenser was 35 dB(A) (at 22 m) the received noise from another condenser 50m away from the reception point would be 28 dB(A) and, therefore, there would be very minor cumulative noise impacts.

The calculation in Table 5 assumes a worst case of ten condensers all located in relatively close proximity and determines the combined noise impact at a distance 30m with no impediments to the passage of the sound.

In the entire development there will likely be more than ten air conditioners operating at the same time, however, the distance separation between the various condensers will be sufficient that there will be minimal cumulative noise impacts.

To ensure the minimisation of emissions from the condensers consideration must be given to the following;

- Locating condensers in basement car parks, in enclosures, or behind fences or other structures to minimise noise impacts at existing residences and reducing the potential for cumulative noise impacts,
- Reviewing the sound power level of the air conditioning condenser units to allow for the purchase of the quietest and most practical units, and
- To reduce the potential for noise from the condenser at one unit in the development impacting on other units the condensers should be located such that they are shielded from the other units by intervening structures and building elements.

Where condenser units are mounted in semi enclosed spaces the wall and ceiling adjacent to the condenser could be lined with absorptive material. For example, perforated metal sheeting, 10% open area, backed with mineral fibre infill (fibrous infills must not be wetted during construction or in service) or 25 mm foil faced building blanket. Perforated metal sheetings come in many different decorative colours and profiles and are available locally. Alternatively, the undersides of any enclosures may be lined with 13 mm perforated plasterboard. This will act to decrease the reverberant buildup of noise in the space and, therefore, reduce environmental noise emissions from the condensers. It will also decrease noise ingress into rooms thereby maintaining the amenity of these rooms.

In addition to minimising environmental noise as a result of the condensers, there may be the potential for structure borne noise to impact on rooms within the building. To avoid the possibility of structure

borne noise due to vibrations, all duct work for HVAC venting must be isolated from the main structure of the building. Duct and pipe penetrations must be kept free of the structure either by externally lagging or by use of non-setting sealants at the point of penetration.

Vibrating equipment such as a/c condenser units must be mounted such that vibrations cannot transfer to the surrounding structure.

Existing Noise sources

The Ducks Crossing Restaurant and Function Centre operates from 50 Burton Road, adjacent to the proposed Eleebana Shores development.

Ducks Crossing operates a licensed premises with a D.A. consent (DA 4753/2004) that contains the Standard Noise Conditions (condition 29 of the DA) typically imposed by the Office of Liquor Gaming and Racing (OLGR) which are reproduced below:

"The L10 noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8 kHz inclusive) by more than 5 dB between 7.00 a.m. and 12.00 midnight at the boundary of any affected residence.

The L10 noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz - 8kHz inclusive) between 12:00 midnight and 07:00 a.m. at the boundary of any affected residence.

Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am."

A 5dB penalty will be applied for any noise with a low frequency tone between 31.5 and 250 Hz.

Condition 30 of the DA consent also states that the Leq (15 min) noise from mechanical plant or machinery operating at Ducks Crossing, when measured at the most affected residential boundary, shall comply with either the intrusive or amenity criteria as calculated in accordance with procedures in the NSW Industrial Noise Policy (INP).

Ducks Crossing currently operates as a restaurant and function centre with some accommodation. Entertainment at the venue may consist of amplified music which would cease at 10:00pm.

The proposed Eleebana Shores development is to be located at number 40 to 48 Burton Road. This site is currently residential with houses on two lots. It is, therefore, apparent, that to be operating in compliance with their DA consent conditions, noise emissions from Ducks Crossing must be in compliance with the noise condition detailed above at the existing residential boundary to its north.

This implies that there are currently no adverse impacts at the existing residential boundary as a result of noise from Ducks Crossing. As this existing residential boundary will form the southern boundary of the proposed development it is also apparent that, provided the operation of Ducks Crossing is in

compliance with the DA consent conditions, there will be no adverse noise impacts at the proposed Eleebana Shores.

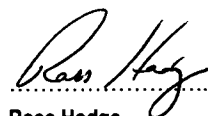
Conclusion

The results of this assessment have shown that the development at Eleebana Shores can be constructed without adversely impacting upon the acoustic environment of the area.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please do not hesitate to contact the undersigned.

Yours faithfully

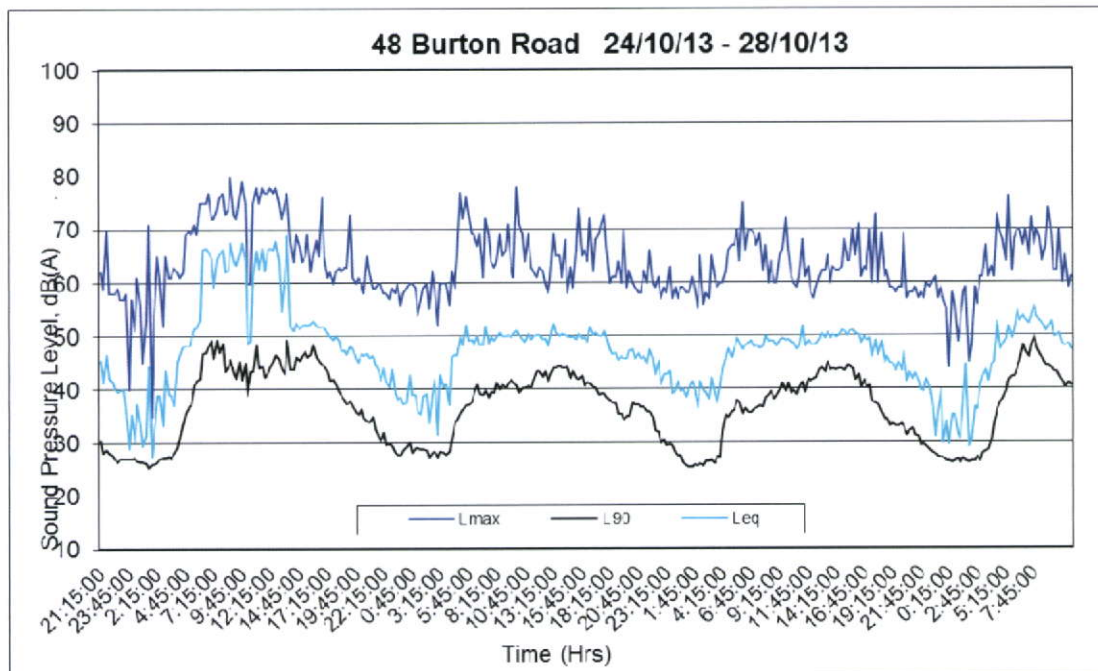
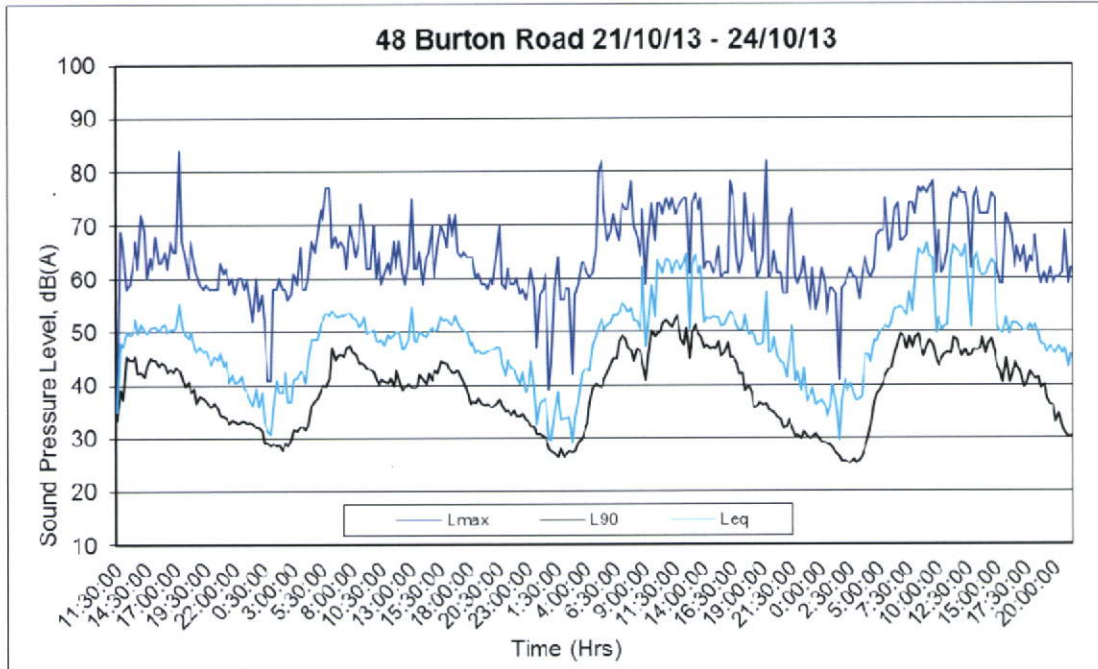
SPECTRUM ACOUSTICS PTY LIMITED



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APPENDIX I
 NOISE LOGGER CHARTS



APPENDIX II Driveway Noise Source Location



★ Driveway Noise Source