
Noise Impact Assessment Considering the Proposed Operational Times – Casino Memorial Pool

For the Proposed Upgrade Of: -
Casino Memorial Pool, 84 Centre Street, Casino,
NSW 2470 .

June 2024

Report No. nss24229 – Final

Prepared at the Request of:-

The Facility Design Group
19 The Terrace,
Cambewarra, NSW 2540

Prepared by:-

NOISE AND SOUND SERVICES PTY LTD
Spectrum House, 3, Cassandra Avenue, St Ives, NSW 2075
Tel: (02) 9449 6499. Mob: 0411 648153

E -mail: noiseandsound@optusnet.com.au Website: www.noiseandsound.com.au

A member firm of the Association of Australasian Acoustical Consultants

ABN: 25660 134 056

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1. INTRODUCTION

Noise and Sound Services was requested by the Facility Design Group of 19 The Terrace, Cambewarra, NSW 2540, to carry out a noise assessment on behalf of Richmond Valley Council, for the proposed upgrade of the Casino Memorial Pool Swim Club, Casino, NSW 2470.

An amendment is proposed to have the hours of operation changed to allow the Swim Club to open at 7:00 am on Sundays and public holidays. The purpose of this report is to provide an independent and accurate assessment of the potential noise impact giving consideration to the proposed opening time of 7:00 am on Sundays and public holidays. This is compared to relevant noise criteria and/or guidelines and provide recommendations for noise mitigation measures where necessary.

2. POOL LOCATION AND DEVELOPMENT

2.1 Location

The Casino Memorial Pool is located at 84 Centre Street, Casino, at the corner of Richmond Street and Bruxner Highway, just north of the Richmond River. The existing centre is shown in Figure 1 below. The refurbishment will be carried out at the same location.



Figure 1. Existing Site and Noise Logger Location ('X') between 88 and 90 Richmond Street). Original Source: Google Earth.

As shown in Figure 1 above, the nearest noise sensitive receivers are the residential properties located to the north of the site being numbers 86 to 90 Richmond Street.

The current opening hours are:-

Monday To Friday: 6am – 6pm

Lap Swimming: 6pm -7pm October – April

Saturday: 10am – 5pm

Sunday: 10am – 5pm

October – April

A part of the amendment is to have the hours of operation changed to allow the Swim Club to open at 7:00 am on Sundays and public holidays. This is significant as 7:00 am to 8:00 am on Sundays and public holidays is regarded as night time when sleep time may be expected by some neighbours.

Noise may occur from pool users when accessing the pool during this night time hour. Michael Pontefract Project Engineer, from Richmond Valley Council has estimated that the car park in both Centre Street and Richmond Street may be used, but predominantly Richmond Street. In the first hour about 20 people may access the pool with 12 vehicles and others just dropping off and leaving. Hence, 3 vehicles on average in any 15 minutes, but possibly 6 vehicles in the first 15-minute period.

The site was inspected on Wednesday 4th August 2021. The noise environment of the area is typically affected by local road traffic using Richmond Street and Bruxner Highway for the passage and parking of occasional private vehicles, home renovation, domestic garden maintenance noise and fauna such as bird sound and dogs barking.

2.2 Proposed Development

NSW Planning Portal Development Application - PAN-428768 - MA2024/0009 Lot 2 DP 862730 – Casino Memorial Park and Swimming Pool, 84 Centre Street, Casino. Proposed – S4.55(2) Modification - The proposed works are to include the partial demolition of existing building and construction of a new swim club. Parking will be in the roadside approximately 25 metres from the northern neighbouring residential boundaries at 88 and 90 Richmond Road.

3. NOISE CRITERIA

The objectives of the noise assessment are to ensure surrounding noise sensitive locations are not unduly affected by noise emissions from the Memorial Pool.

There are no specific Council, State or Federal criteria for noise emissions from aquatic centres. However, this section reviews the NSW Government criteria for other noise sources and developments.

3.1 NSW Government Criteria

The NSW Government, via the Environment Protection Authority (EPA), provide guidelines for many industrial, commercial and domestic types of noise sources. The primary aim of environmental noise control is to minimise the occurrence of offensive noise in the community. To be both effective and equitable, the determination and application of environmental noise control measures must take into account many factors, for example: -

- the variation in response between individuals to any noise;
- the inherently noisy characteristics of many activities;
- the circumstances within which the noise occurs;
- the technical and economic feasibility for noise control; and
- the social worth of the activity.

Offensive noise is defined in the NSW Protection of the Environment Operations Act 1997 (POEO Act) as being noise:-

- a) *that, by reason is of its level, nature, character or quality, or the time at which it is made, or other circumstances:*
 - i. *is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
 - ii. *interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
- b) *that, is of a level, nature, character or quality prescribed by the regulations or that is made at a time or in other circumstances, prescribed by the regulations.'*

The NSW Government, also state that social surveys have indicated that noise from any particular source will be audible to many people in the community when that noise exceeds the background level by more than 5 decibels (dB). The noise may have characteristics which are pleasant or unpleasant to the listener.

Technically the background is found from the noise level that is present for 90% of the measurement time periods (usually 15 minutes each) and this is known as the $L_{AF90, 15 \text{ minute}}$. The source noise is found from the average of the sound energy (again usually 15 minutes samples), which is known as the $L_{Aeq, 15 \text{ minute}}$. The 5 dB over background criterion is primarily aimed at industrial or commercial machine noise or domestic machine noise such as air conditioners.

3.2 NSW Noise Guide for Local Government

The NSW Government's Noise Guide for Local Government (NGLG) provides guidelines for the assessment of offensive and intrusive noise levels. Local councils are encouraged to develop noise policies which specify intrusive noise levels and appropriate descriptors for particular activities in certain situations and locations.

Such a policy could, for example, specify that noise at commercial or industrial premises that exceeds the background noise at the most affected point within a residential boundary by more than 5 dB as measured over a 15-minute period ($L_{Aeq, 15 \text{ minute}}$) is intrusive.

The noise is assessed at the most affected point on, or within, the neighbouring residential property (unless that residence is more than 30 metres from the boundary). Intrusive noise is not the same as offensive noise as defined in the POEO Act 1997. Intrusive noise can represent offensive noise, but whether this is always the case depends on the source of the noise, noise characteristics and cumulative noise levels. Sounds from community activity within a Memorial Pool, should not be automatically considered to be offensive just because it may exceed the 5 dB on background criterion.

3.3 NSW Government Noise Policy for Industry (2017)

The assessment procedure for industrial and commercial noise sources given in the Noise Policy for Industry (2017) has two components:-

- **Controlling intrusive noise impacts; and**
- **Maintaining noise level amenity;**

Both components are taken into account when determining a project noise trigger level. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so ‘trigger’ a management response. The project noise trigger level reflects the most stringent noise level requirement.

3.3.1 Intrusive Noise Impacts

The NSW Government, in their Noise Policy for Industry (2017) states that:- *‘The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the LAeq descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold.’*

The perception of noise and its level of offensiveness depend greatly on the broader situation within which it occurs. Noise that might intrude into a resting or sleeping place may be found offensive whereas the same noise occurring in a market place or noisy working area may pass unnoticed. The concept of *‘background + 5 dB’* derives from this consideration.

The Noise Policy for Industry defines the background noise level as:

‘the underlying level of noise present in ambient noise, generally excluding the noise source under investigation, when extraneous noise is removed’.
‘Sound levels contributing to background levels can include sound from nearby traffic, birds, insects, animals, machinery and similar sources, if these sounds are

a normal feature of the location. The background noise level is represented by the $L_{AF90,15min}$ descriptor when undertaking short-term monitoring.'

The Rating Background Level is used for assessment purposes. This is the single-figure background noise level derived from monitoring over a representative period of time, typically one full week. The outcome of this approach aims to ensure that the intrusiveness noise level is being met for at least 90% of the time periods over which annoyance reactions can occur (taken to be periods of 15 minutes).

The Noise Policy for Industry applies minimum assumed RBL values which result in minimum intrusiveness noise levels as follows in Table 2 below.

TABLE 2: MINIMUM ASSUMED RBL VALUES AND PROJECT INTRUSIVENESS LEVELS

Time of Day	Minimum assumed RBL Values (dBA)	Minimum Intrusiveness Noise Levels – $L_{Aeq, 15 min}$ (dBA)
Day	35	40
Evening	30	35
Night	30	35

3.3.2 Protecting Noise Amenity

In the Noise Policy for Industry, it is stated that: *'To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined, should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable.'* The relevant part of the NSW Government's recommended levels are given in Table 3 below.

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

Where a receiver is affected by existing levels of industrial noise, a project amenity noise level applies for each new source of industrial noise. The project amenity noise level is then equal to the recommended amenity noise level minus 5 dB.

TABLE 3: AMENITY NOISE LEVELS

Receiver	Noise amenity area	Time of day	Recommended amenity noise level - L_{Aeq} , dB(A)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface – residential receiver only	All	All	Plus 5 dB(A) to recommended amenity noise level

In cases where transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the L_{Aeq} noise level from that industrial noise source may exceed the project amenity noise level, the project amenity noise level may be derived from the $L_{Aeq, period}$ (traffic) minus 15 dB (other conditions may be applicable).

4. BACKGROUND NOISE MEASUREMENTS

Existing ambient and background noise levels have been monitored at the nearest residence, at the northern side to the subject site i.e., 88 Richmond Street for a period of 9 days. This is representative of the background noise in the relevant areas. The instrumentation, procedure and results are described below.

4.1 Background and Ambient Noise Monitoring Procedure

Free field unattended continuous noise monitoring was carried out from Wednesday 4th August 2021 through to Friday 13th August 2021. Noise measurements were carried out in accordance with Australian Standard AS 1055:2018, *Acoustics – Description and measurement of environmental noise*. The noise logger was set for the ‘A’ frequency weighting and ‘fast’ time weighting.

The measured background noise levels ($L_{AF90, 15 \text{ minute}}$) are considered to be representative of background noise at all potentially affected residences in close vicinity of the subject site. The energy average noise levels ($L_{Aeq, 15 \text{ minute}}$) at the logger location include the intermittent noise generated by local and distant road traffic noise, fauna and community noise.

4.2 Instrumentation

The instrumentation used for the measurement of the existing environment consisted of a Brüel and Kjær – model 2250L, Environmental Noise Logger (serial number 3006868). This meter conforms to Australian Standard AS IEC 61672.1-2004: ‘Electroacoustics - Sound level meters – Specifications’ as a class 1 precision sound level meter and has an accuracy suitable for both field and laboratory use.

The calibration of the meter was checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4231 (serial number 2292735). No significant system drift occurred over the measurement period.

The environmental noise logger has been checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with a conformance certificate within the last 24 months as required by the regulations. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW 2070.

The calibrator has been checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with a conformance certificate within the last 12 months as required by the regulations. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW 2070.

4.3 Noise Monitoring Results

Measured ambient noise levels are assessed according to the NSW Noise Policy for Industry in terms of ambient noise (L_{Aeq}) and background noise (L_{AF90}) for the time periods defined as: Day: 7:00 am – 6:00 pm, Evening: 6:00 pm – 10:00 pm and Night: 10:00 pm – 7:00 am.

The recorded L_{AF90} levels determine the Rating Background Level (RBL). The RBL is defined as the median value of the tenth percentile value for the recorded L_{AF90} levels for the complete monitoring period. The tenth percentile is also referred to as the Assessment Background Level (ABL).

The resultant RBL (L_{AF90}) and ambient (L_{Aeq}) levels for each period are summarised below in Table 5. The full statistical noise measurement results are shown in graphical form in Appendix A.

TABLE 5 – SUMMARY OF EXISTING NOISE LEVELS.

Time of Day	Rating Background Noise Levels (L_{A90}) dBA	Log Average Existing Ambient Noise Levels (L_{Aeq}) dBA
Day (07:00 – 18:00)	40	52
Evening (18:00 – 22:00)	33	48
Sunday (07:00 – 08:00)	37	50
Night (22:00 – 07:00)	28*	47

Notes

- All levels rounded to the nearest whole decibel.
- Minimum of 30 dBA is applied. See Table 1 above.

5. ENVIRONMENTAL NOISE GOALS

As discussed in Section 3.3 above the assessment procedure given in the Noise Policy for Industry (2017) has two components to determine project-specific noise triggers (goals): Intrusive noise impacts and noise level amenity. The noise goals relevant to each assessment period based on logged noise levels are given below. The more stringent of the two apply.

5.1 Intrusive Criteria

To ensure that on-site noise sources are not intrusive, the L_{Aeq, 15 minute} noise level due to stationary sources should not exceed the background L_{AF90, 15 minute} level by more than 5 dB when measured at the affected residential property boundary. The intrusive noise goal is based upon the RBL level of 40 dBA for the day period, 33 dBA for the evening and 30 dBA for the night period. The intrusive L_{Aeq, 15 minute} noise goal for noise generated by the development is therefore 45 dBA for the day period, 38 dBA for the evening and 35 dBA for the night period at, or within the nearest potentially affected residential boundaries.

5.2 Amenity Criteria

The amenity criteria are used to limit the maximum ambient noise levels within an area from stationary noise sources associated with the proposed development. To protect the acoustic amenity of land users the combined noise from all stationary noise sources should not exceed the Acceptable Noise Level (ANL) calculated according to the procedures as given in chapter 2 of the NSW Noise Policy for Industry. The amenity assessment relates only to industrial-type noise and does not include road, rail or community noise. Modifications are made to the recommended ANL to account for the existing level of industrial (or commercial) noise. As the existing environment is unaffected by industrial or commercial type noise the ANL is not modified and therefore represents the amenity criteria.

TABLE 6 – SUMMARY OF AMENITY CRITERIA.

Type of Receiver	Time of Day	Recommended Acceptable Noise Level (L _{Aeq, period})	Existing Amenity Level (L _{Aeq, period})	Amenity Criterion (L _{Aeq, period})
Residence urban location	Day	55	60	55
	Evening	45	56	45
	Night	40	50	40

Note - All levels rounded to the nearest whole decibel.

5.3 Project Specific Noise Criteria

Applying both the amenity and intrusive criteria to the development and adopting the more stringent of the two, determines the project specific noise levels. Project specific noise criteria based on logged data are provided below in Table 7 below.

TABLE 7 – PROJECT SPECIFIC NOISE CRITERIA.

Time of Day	Intrusive Noise Criteria dB - (L _{Aeq,15 minute})	Amenity Noise Criterion dB - (L _{Aeq, period})	Project Specific Noise Criterion dB - (L _{Aeq,15 minute})
Day (07:00 – 18:00)	45	55	45
Evening (18:00 – 22:00)	38	45	38
Sunday (07:00 – 08:00)	42	40	40
Night (22:00 – 07:00)	35	40	35

Maximum noise level event assessment. The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development/premises night-time noise levels at a residential location exceed: • L_{Aeq, 15 minute} **40 dB(A)** or the prevailing RBL plus 5 dB, whichever is the greater, and/or • L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater, a detailed maximum noise level event assessment should be undertaken. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

6. NOISE SOURCE MODELS

Noise models have been prepared for the occurrence of noise emissions from the Casino Memorial Pool. This section provides details of the calculations and noise models for each scenario.

6.1 Noise Modelling Specifications

The sound pressure level from a source noise has been modelled using the International Standard ISO 9613-2 (1996(E)) '*Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation*'. This Standard specifies methods for the description of noise outdoors in community environments. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources and covers the major mechanism of attenuation. The method allows for downwind propagation conditions within an angle of $\pm 45^\circ$ of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground.

6.2 Basic Noise Modelling Equation

The equivalent continuous downwind sound pressure level (L_{Aeq}) at each receiver point has been calculated for each noise source using the equation below:-

$$L_{Aeq} = L_w + D_c - A$$

Where:

- L_w is the sound power level of the noise source;
- D_c is directivity correction; and
- A is the attenuation that occurs during the propagation from source to receiver.

The attenuation term A in the equation above is given by:-

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

Where:

- A_{div} is the attenuation due to geometric divergence;
- A_{atm} is the attenuation due to atmospheric absorption;
- A_{gr} is the attenuation due to the ground effects;
- A_{bar} is the attenuation due to a barrier; and
- A_{misc} is the attenuation due to miscellaneous other effects.

The last term (A_{misc}) generally refers to miscellaneous propagation through foliage, industrial sites and areas of houses. Due to the vicinity of the development to the neighbouring dwellings the attenuation due to atmospheric absorption, ground effects and other miscellaneous effects are of minor significance at this site.

For noise generated within a building structure the following formula is used to predict the sound pressure level at each receiver point.

$$L_{Aeq} = (L_{Aeq, int} + 10 \log_{10} S - R) - 14 + D_c - A$$

Where:

- $L_{Aeq, int}$ is the sound pressure level within the space;
- S is the area of the building envelope radiating noise;
- R is the sound reduction index of the building envelope component;
- D_c is directivity correction; and
- A is the attenuation that occurs during the propagation from source to receiver.

6.3 Car Park Noise Emissions Models and Assessments

Noise emissions from the car park are modelled on the measured noise levels of one car arriving, parking and departing. Normal speech will be less than vehicle noise.

Noise levels measured by Noise and Sound Services Pty Ltd at 3 metres are shown below in Table 8. Noise levels for three cars parking and departing include the closing of car doors, starting the engine and a short period of idle.

TABLE 8. CAR PARK NOISE EMISSIONS FROM PRIVATE CARS

Operation	Duration	Sound Pressure Level ($L_{Aeq, T}$) dBA	Maximum Noise Level ($L_{AF, max}$) dBA	Measurement distance
Arriving and Parking	45 secs	57	66	3 metres
Departing	40 secs	62	70	3 metres

The above measured levels are adjusted for the number of cars within the car park and the distance to the nearest receiver boundary. The measured noise levels have also been converted to give 15-minute energy average ($L_{Aeq, 15 \text{ minute}}$) noise levels.

- The 15-minute energy average ($L_{Aeq, 15 \text{ minute}}$) for one car arriving is **44 dBA** from ($44 \text{ dBA} = 57 \text{ dBA} - 10 \log_{10} (900/45)$).
- The 15-minute energy average ($L_{Aeq, 15 \text{ minute}}$) for one car departing is **48 dBA** from ($48 \text{ dBA} = 62 \text{ dBA} - 10 \log_{10} (900/40)$).

The 15-minute energy average level ($L_{Aeq, 15 \text{ minute}}$) for one car arriving or departing over 25 metres is **35 dBA** from ($35 \text{ dBA} = 57 \text{ dBA} - 10 \log_{10} (900/45) - 10 \log_{10} (25/3)$). Line source calculation. For six cars the 15-minute energy average level

($L_{Aeq, 15 \text{ minute}}$) simultaneously arriving or leaving the car parking area will be **43 dBA** from ($43 \text{ dBA} = 35 + 10 \log_{10} (6/1)$). The maximum level is 70 dBA at 3 metre and 52 dBA at 25 metres from $52 = 70 - 20 \log_{10} (25/3)$. Point source calculation.

Therefore, the predicted $L_{Aeq, 15\text{-minute}}$ noise level at the most affected residential. As this traffic noise assessment meets the criteria at the nearest and most affected residential and commercial receivers, the criteria are also met for all other receiver locations regarding car parking and departing activities from the proposed development.

It is therefore determined that traffic movements relating to the proposed development comply with the noise goals at the nearest affected receiver boundaries.

7. NOISE MITIGATION AND ASSESSMENT

Although it is predicted that the noise from the people arriving and leaving the car parking area is predicted to meet the criteria for sleep disturbance, as given in NSW Government's Noise Policy for Industrial (2017), it is recommended that signs are erected in the car parking area to remind people use the area to minimise sound level in respect of the occupants of the neighbouring areas, particularly at times before 8:00 am.

8. CONCLUSION

Noise emissions from the proposed people arriving and leaving the car parking area at the future Casino Memorial Pool refurbishment Swim Club are predicted to comply with the noise goals provided by the NSW Government's Noise Policy for Industrial (2017) providing the recommendations, as given above, are incorporated into the design and construction of the refurbished centre.

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4 th June 2024	Ken Scannell MSc., MAAS	Draft
Date	Checked by:	Status
5 th June 2024	Mark Scannell BA, MAAS	Draft
Date	Issued by:	Status
6 th June 2024	Ken Scannell MSc., MAAS	Final

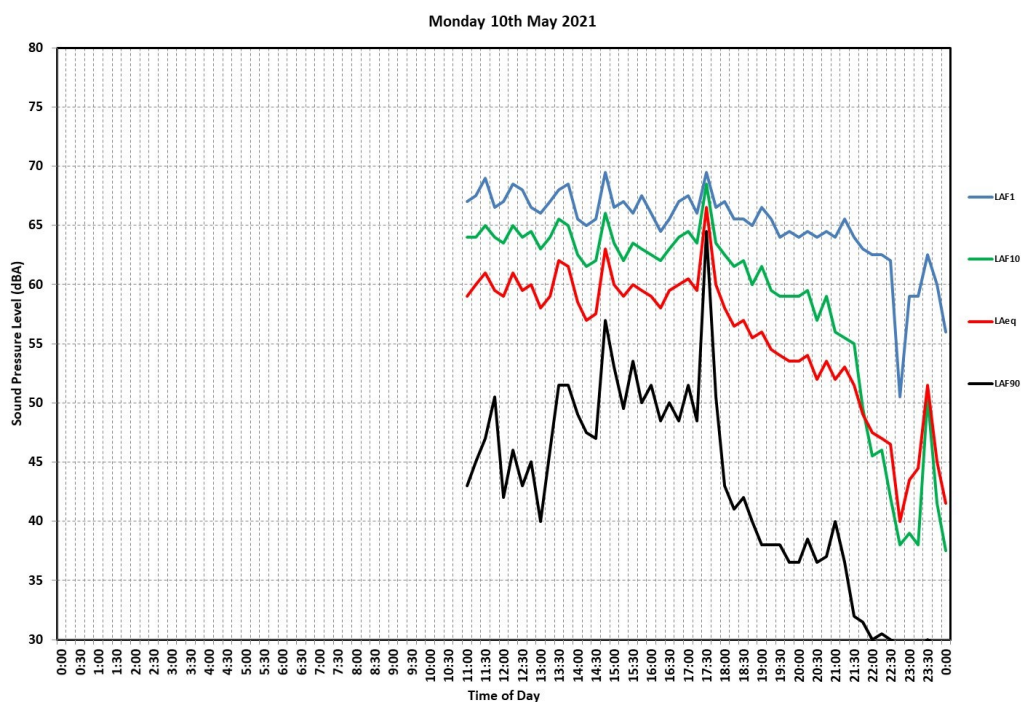
Important Note. All products and materials suggested by 'Noise and Sound Services' are selected for their acoustical properties only. All other properties such as airflow, aesthetics, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, grout or tile cracking, loading, shrinkage, ventilation, etc are outside of 'Noise and Sound Services' field of expertise and **must be** checked with the supplier or suitably qualified specialist before purchase.

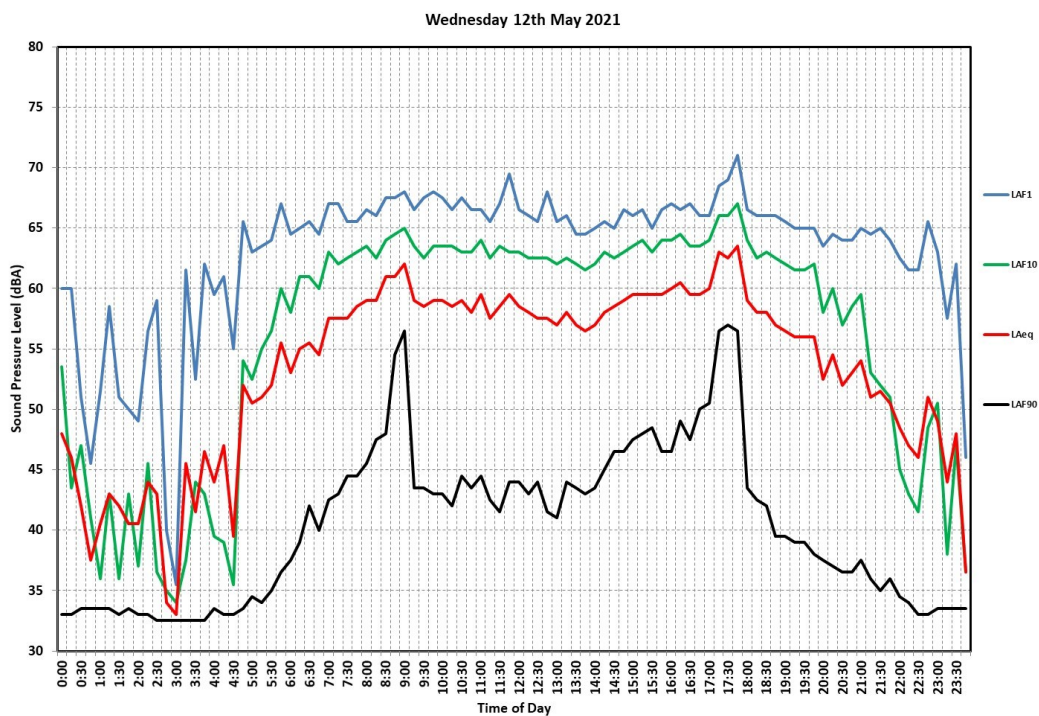
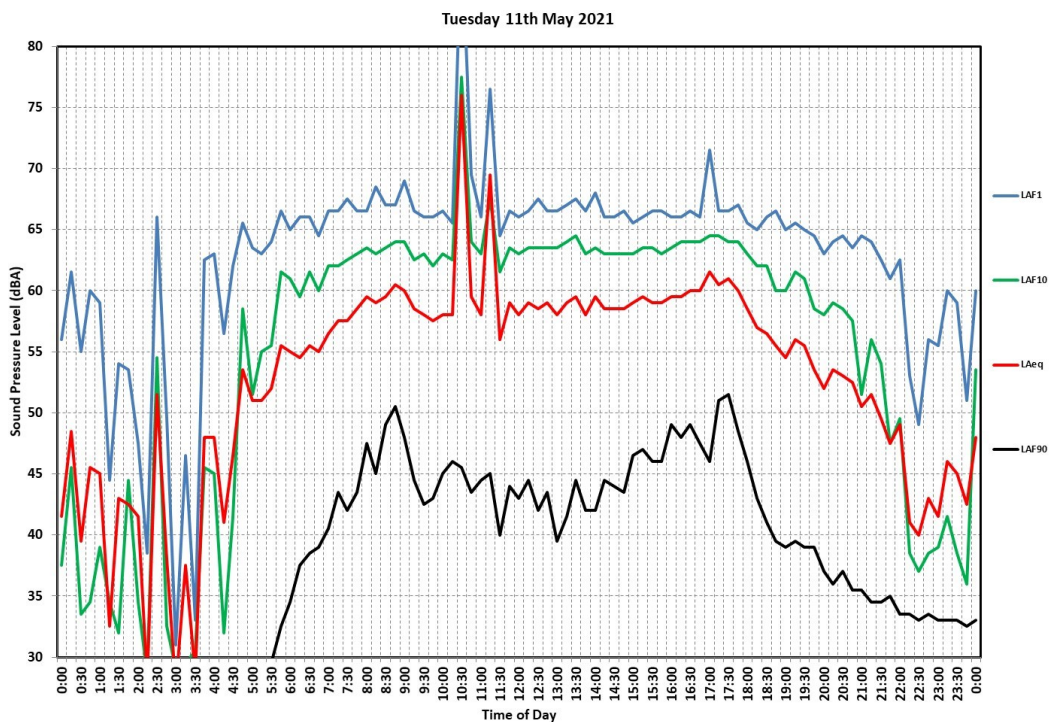
APPENDIX A – MEASURED AMBIENT NOISE LEVELS

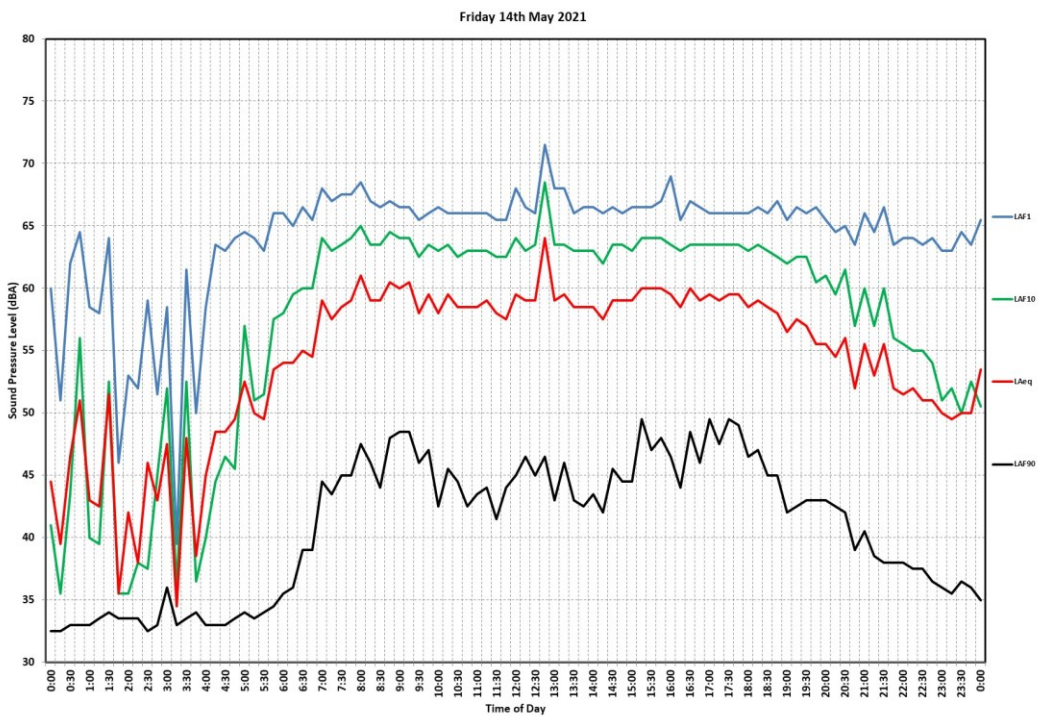
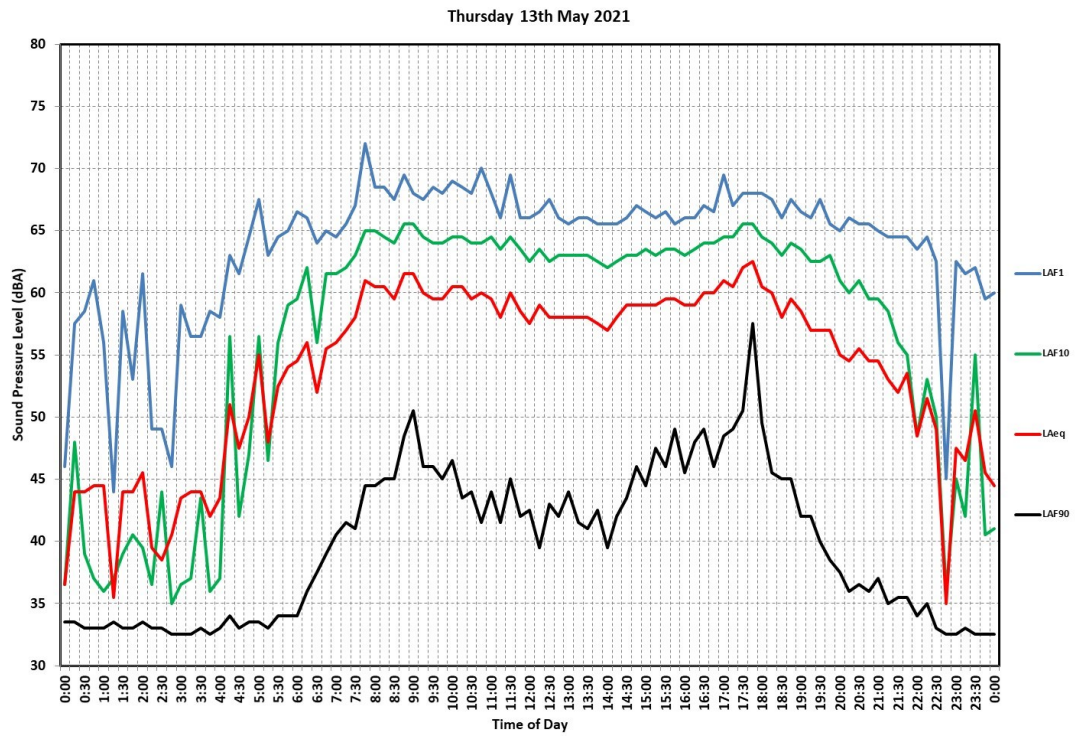
Environmental noise levels can vary considerably with time; therefore, it is not adequate to use a single number to fully describe the acoustic environment. The preferred, and now generally accepted, method of recording and presenting noise measurements is based upon a statistical approach. For example, the L_{AF10} noise level is the level exceeded for 10% of the time and is approximately the average maximum noise level. The L_{AF90} level is the noise level that is exceeded for 90% of the time and is considered to be approximately the average of the minimum noise level recorded. This level is often referred to as the “background” noise level. The L_{Aeq} level represents the average noise energy during the measurement period. This level is often referred to as the ‘ambient’ noise level.

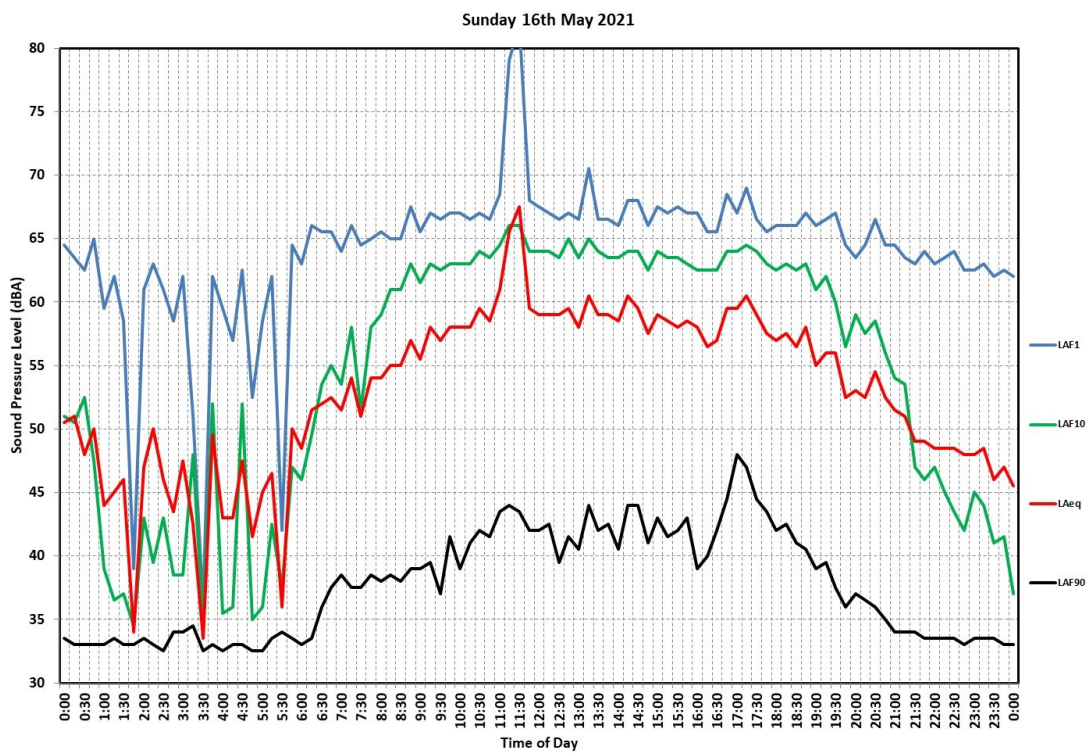
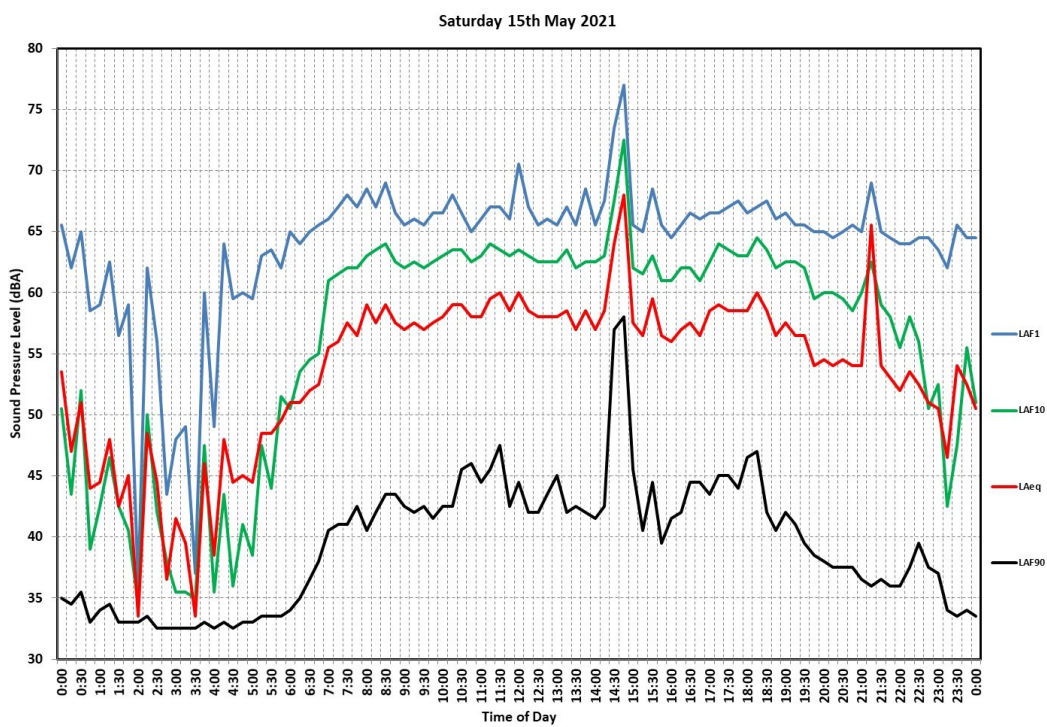
The measurement results from ambient noise monitoring are shown below.

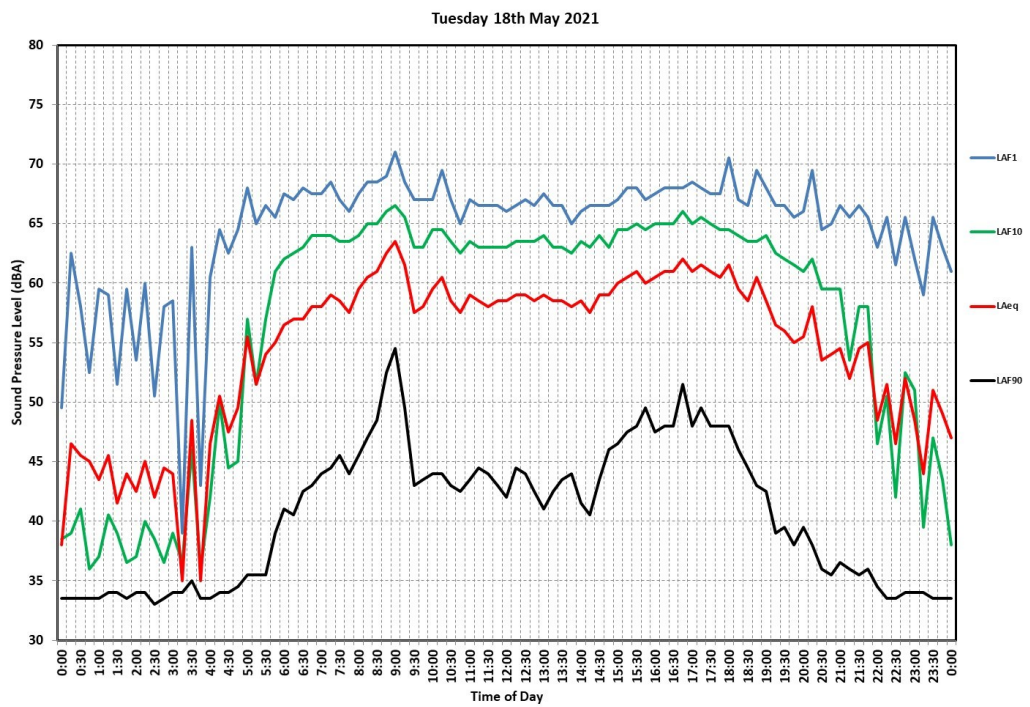
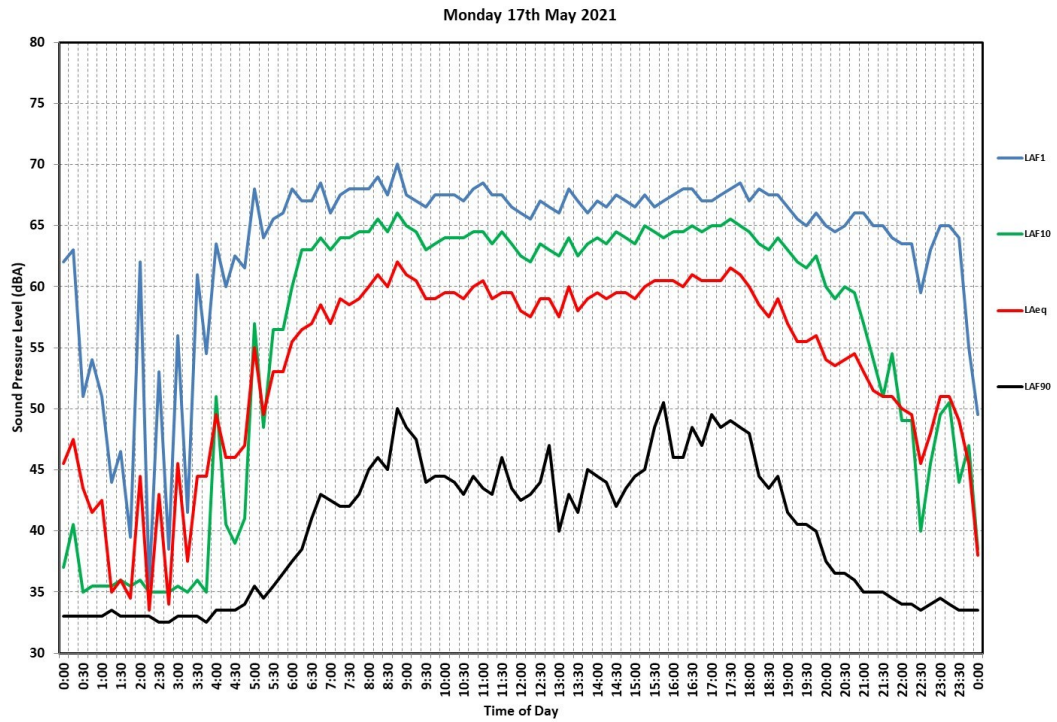
Logged Ambient Noise Levels 88, Richmond Street, Casino

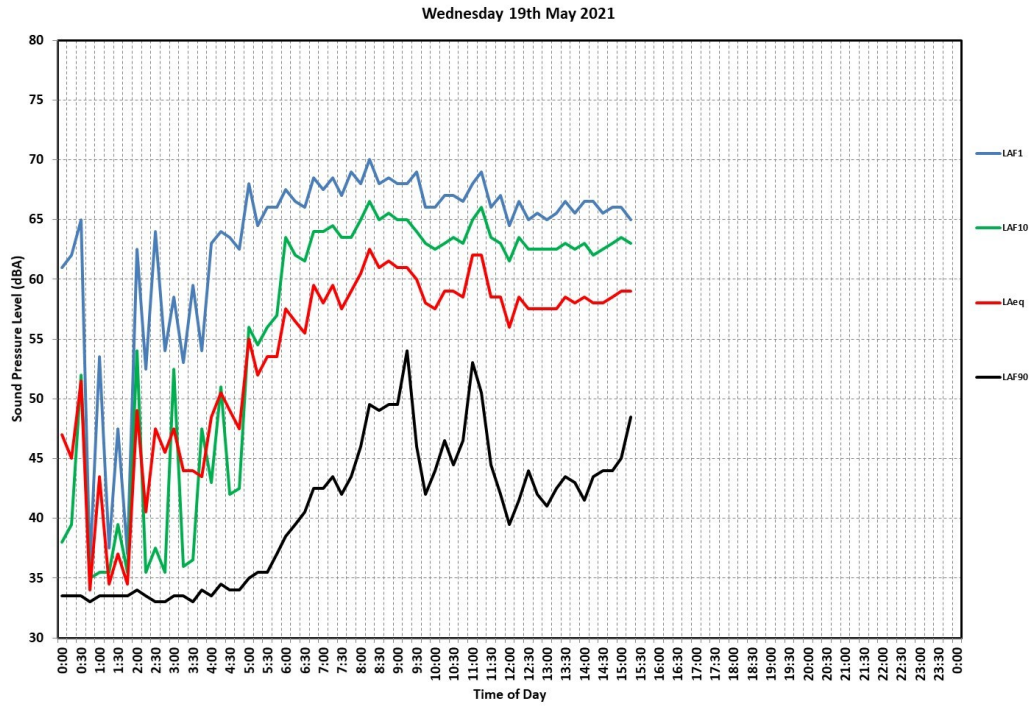












APPENDIX B – GLOSSARY OF TECHNICAL TERMS

‘A’ Frequency Weighting – The most widely used sound level frequency filter is the A scale, which roughly corresponds to the inverse of the 40 dB (at 1 kHz) equal-loudness curve. Using this filter, the sound level meter is less sensitive to very high and, in particular, very low frequencies. Sound pressure level measurements made with this filter are commonly expressed as **dB(A)**.

Acoustic Fence – A fence which has enough mass to reflect a significant amount of sound and has no holes or gaps (including at the base).

Ambient Sound – The all-encompassing sound associated with that environment being a composite of sounds from many sources, near and far.

Assessment Background Level (ABL) – The tenth percentile value of the recorded L_{AF90} level for each day, evening and night period.

Background Noise Level ($L_{AF90, T}$) – A statistical parameter used for assessments of constantly varying noise levels. The L_{AF90} is the ‘A’ frequency weighted noise level that is exceeded for 90 % of the measurement period, ‘T’. The measurement period is normally 15 minutes. The background noise is therefore the lowest noise level that occurs for 1.5 minutes in any 15 minute period.

Decibel (dB) – The logarithmic ratio of any two quantities and relates to the flow of energy (power). A scale used in acoustical measurement related to power, pressure or intensity. Expressed in dB, relative to standard reference values.

Energy Average Noise Level ($L_{Aeq, T}$) – The L_{Aeq} noise level is also known as the equivalent continuous sound pressure level. This is the ‘A’ frequency weighted logarithmic average of the sound energy of the measurement time ‘T’. When measured over a 15 minute time period the symbol $L_{Aeq, 15 \text{ minute}}$ is used. This is the standard descriptor used for source noise measurements and ambient noise measurements.

Percentile Level (L_{90} , L_{10} , etc) – A statistical measurement giving the sound pressure level which is exceeded for the given percentile of a specified time period, e.g. L_{90} is the level which is exceeded for 90% of a measurement period.

Rating Background Level (RBL) – The median value of the tenth percentile value (ABL) for the recorded L_{AF90} levels for each day, evening and night period over the complete 7 days or more of noise monitoring. The tenth percentile is also referred to as the Assessment Background Level (ABL).

Sound Pressure Level (SPL) – 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure of 20 micro Pascals.