Noise and Sound Services

Mechanical Plant Noise Assessment

At:-

1 Bilambee Avenue,
Bilgola Plateau,
NSW 2107

September 2020

Report No. nss23254 – Final

Prepared at the Request of:-

DreamBuild Pty Ltd
Unit 6, 37A King Road,
Hornsby, NSW 2077

Prepared by:-

NOISE AND SOUND SERVICES
Spectrum House, 3 Cassandra Avenue, St Ives, NSW 2075
Tel: (02) 9449 6499 Mob: 0411 648 153
E -mail: noiseandsound@optusnet.com.au **Website:** www.noiseandsound.com.au
A member firm of the Association of Australasian Acoustical Consultants
ABN: 7277 134 9599

Association of Australasian Acoustical Consultants

C O N T E N T S

1 INTRODUCTION

Noise and Sound Services was requested by DreamBuild Pty Ltd of Unit 6, 37A King Road, Hornsby, NSW 2077, to set the noise goals for future mechanical plant for a proposed development. The development is the proposed construction of a new commercial premises and eight residential units on the two floors above the commercial space at 1 Bilambee Avenue, Bilgola Plateau, NSW 2107.

A detailed mechanical design is not available for the project at the time of preparation of this report. Therefore, the purpose of this report is to identify potential affected neighbouring residential premises, measure the existing background noise levels in the area and set noise goals in accordance with the requirements of Northern Beaches Council Development Application. Where applicable, this report is also prepared in accordance with the NSW Government's Noise Policy for Industry (2017) as required by the development consent. It will then be DreamBuild Pty Ltd's responsibility to achieve the given goals when designing the mechanical system.

2 SITE AND DEVELOPMENT DESCRIPTION

2.1 Site Description

The site at 1 Bilambee Avenue, Bilgola Plateau is in a residential area approximately 1000 metres north of Barrenjoey Road. The nearest neighbouring premises are at 112 Plateau Road, 114 Plateau Road and 1 Bikurra Avenue as shown in Figure 1 below.

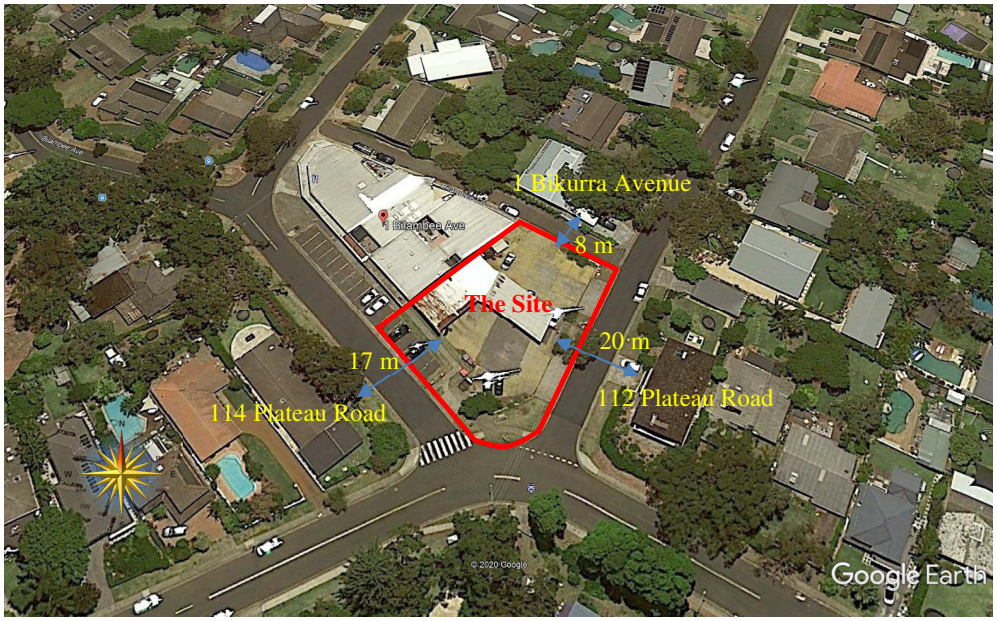


Figure 1. Site Plan. Dimensions are Approximate.
Source: Google Earth.

2.2 Development Description

The proposed development consists of two retail areas on the ground floor, five residential units on the first floor and three residential units on the second floor. Full details are shown in the concept architectural drawings by Benson McCormack Architecture, for Project Number: 2021A, drawing number DA-100, Drawn by: JSN, checked by: DB, Revision: B, dated Aug. 20.

3 NOISE CRITERIA

This section provides details of NSW State regulations for mechanical plant noise from commercial and for air conditioner noise from residential premises.

3.1 The NSW Government's 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.

3.1.1. 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 L_{Aeq} 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 $L_{AF90,\ 15\ min}$ 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).

3.1.2. 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 (Table 2.2) are given in Table 1 below.

TABLE 1: AMENITY NOISE LEVELS

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

3.1.3 Modifying Factor Adjustments

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same sound pressure level. A correction should be applied to both the intrusive and the amenity

measurement before a comparison is made with the criteria. An abbreviated version of the correction factors is shown in Table 2 below:-

TABLE 2 – MODIFYING FACTOR CORRECTIONS

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band or narrow band analysis	Level of one third octave band exceeds the level of the adjacent bands by 5 dB or more (500-10000 Hz)	+ 5 dB	Narrow band frequency analysis may be required to precisely detect occurrence
Low Frequency Noise	Measurement of C-weighted and A-weighted level	Measure/assess C and A-weighted levels over same time period. Correction to be applied if the difference between the two is 15 dB or more	+ 5 dB	C-weighted is designed to be more responsive to low frequency noise
Intermittent Noise	Subjectively Assessed	Level varies by more than 5 dB and the intermittent nature of the noise is clearly audible	+ 5 dB	Adjustment to be applied for night time only
Duration	Single event noise 1.5 min to 2.5 hr	One event in any assessment period	0 to 20 dB(A)	Conditional on duration
Maximum adjustment		Where two or more modifying factors are indicated	10 dB(A)	Excludes duration correction

Note: Tonal noise - Level of one third octave band exceeds the level of the adjacent bands on both sides by 5 dB or more if the centre frequency of the band containing the tone is in the range 500-10000 Hz; 8 dB or more if the centre frequency of the band containing the tone is in the range 160 to 400 Hz; or 15 dB or more if the centre frequency of the band containing the tone is in the range 25-125 Hz.

3.2 Protection of the Environment Operations (Noise Control) Regulation

The NSW State legislation which is the Protection of the Environment Operations (Noise Control) Regulation 2008, Section 52 states:-

"Air conditioners and heat pump water heaters:-

(1) A person must not cause or permit an air conditioner or heat pump water heater to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday or,

(b) before 7 am or after 10 pm on any other day.

Maximum penalty: 100 penalty units in the case of a corporation, 50 penalty units in the case of an individual.

(2) A person is not guilty of an offence under subclause (1) in relation to a heat pump water heater if the conduct alleged to give rise to the offence occurs within 6 months after the commencement of this Regulation.

(3) A person is not guilty of an offence under subclause (1) unless:

(a) the person has, within 7 days after causing or permitting an air conditioner or heat pump water heater to be used in such a manner, been warned by an authorised officer or enforcement officer not to cause or permit the air conditioner or heat pump water heater to be used in that manner, and

(b) the person causes or permits an air conditioner or heat pump water heater to be used in that manner within 28 days after the warning has been given.

(4) In this clause: heat pump water heater means a device that heats water using the energy generated from the compression of a gas."

3.3 State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 (SEPP)

Subdivision 3 Air-conditioning units, 2.5 Specified development. The construction or installation of an air-conditioning unit is a development specified for this code and states:-

(f1) be designed so as not to operate:

(i) during peak time—at a noise level that exceeds 5 dB(A) above the ambient background noise level measured at any property boundary, or
(ii) during off peak time—at a noise level that is audible in habitable rooms of adjoining residences.

Peak time means between 8:00 am and 10:00 pm on any Saturday, Sunday or public holiday, or the time between 7:00 am and 10:00 pm on any other day.

4 EXISTING BACKGROUND AND AMBIENT NOISE

Existing external ambient and background noise levels have been monitored for a period of seven days at the boundary of a residential premises (112 Plateau Road) from 21st August 2020 to 28th August 2020.

4.1 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 3. The full statistical noise measurement results are shown in graphical form in Appendix A below

TABLE 3 – SUMMARY OF EXISTING NOISE

Time of Day	Rating Background Noise Levels (L_{AF90}) dBA	Log Average Existing Ambient Noise Levels (L_{Aeq}) dBA
Day (07:00 – 18:00)	37	54
Evening (18:00 – 22:00)	34	48
Night (22:00 – 07:00)	32	44

Note 1- All levels rounded to the nearest whole decibel.

4.2 Noise Goals

The noise goals ($L_{Aeq,\ 15\ minute}$) for on-site commercial and residential mechanical plant at the most affected neighbouring residential boundaries is 39 dBA for day and evening (i.e. 34 dBA plus 5 dB) and **37 dBA** (i.e. 32 dBA plus 5 dB) for night time use. It is important to note that this noise goal applies to the combination of all on-site mechanical plant alone and not to the combination of ambient noise (such as road traffic).

For compliance assessments, the ambient noise in the area must be logarithmically subtracted from the source noise. For an example, when the source noise and unavoidable background is 'on' a measurement of 43 dBA is obtained and then when the source noise is 'off' the background measurement of 40 dBA is obtained. The mechanical plant noise alone is then **40 dBA** (from $10 \log_{10} (10^{43/10} – 10^{40/10})$) not 43 dBA. All results must be rounded to whole decibels.

The Protection of the Environment Operations (Noise Control) Regulation 2008 Section 52 as given in Section 3.3 above applies for night time use of mechanical plant use with residential premises.

5 LOCATION OF PLANT AND SOUND LEVELS

5.1 Air Conditioner Condensers

It is understood that the outdoor air conditioner condensers may be Daikin RZQS125AV1 or RZQS140AV1 or similar. These have a manufacturer's sound pressure level of 54 dBA to 56 dBA at one metre. Hence, with a direct line of sight, the condensers would need to be located at a distance of 10 metres from any neighbouring boundary to meet the day/evening time noise goal of 39 dBA (from $39 = 56 - 20 \log_{10}(10) + 3$). The 3 dB is for acoustic façade reflection. For night time use this distance is increased to 13 metres. However, where there is a suitable barrier in the form of a wall or closed fence which did not allow a direct line of sight the noise goal could be met at 5 metres for day/evening use and 7 metres for night time commercial use. In addition, for night time use of the outdoor air conditioner condensers from residential premises need to be is inaudible in habitable rooms of adjoining residences.

Hence, to achieve the noise goals, it is recommended that no outdoor air conditioner condenser is located at distances less than those given above. This includes existing neighbours and neighbours within private balconies of apartments within the proposed development.

Where these distances are not practicable to achieve within the private balcony locations the outdoor air conditioner condensers should be located at the rooftop or within the basement car park. The location should be as far from the rooftop edge or the ramp entrance to the car park as practicable. In addition, the manufacturer's EPA sound power level (L_{WA}) for each outdoor air conditioner condenser should not exceed 71dBA.

5.2 Rooftop Mechanical Plant

Rooftop plant must meet a sound pressure level ($L_{Aeq,15\ minute}$) of not more than 37 dBA at 20 metres. This equates to an output sound power level of not more than 71 dBA (from $71 = 37 + 20 \log_{10}(20) + 10 \log_{10}(2\pi)$). If the output sound power level cannot be met, the noise emissions can be reduced with a suitably designed acoustic barrier around the plant. This may involve the use of acoustic louvres to provide noise reduction whilst enabling sufficient airflow.

5.3 Chamber Substation

The emissions from the chamber substation must meet a sound pressure level ($L_{Aeq,15\ minute}$) of not more than 37 dBA at 7 metres. The chamber substation will need to be specially acoustically designed once more details are known of the

source noise sound pressure level and 1/3 octave band frequency. The design may include the use of acoustic louvres and acoustic absorbent lining of the chamber area.

5.4 Lift Motor and Diesel Pump

To achieve the noise goals, it is recommended that the lift motor and the diesel pump are located within the basement car park. In addition, the lift motor should have a manufacturer's sound power level (L_{WA}) that should not exceed 70 dBA. The diesel pump should have a manufacturer's sound power level (L_{WA}) that should not exceed 86 dBA.

6 CONCLUSION

It is concluded that, provided the plant and equipment is as given in this report, or comparable alternatives are used, the mechanical plant are capable of compliance with the noise goals. The noise goals are developed in accordance with the guidelines from Northern Beaches Council and the NSW Government's Noise Policy for Industry (2017) as required by the development consent.

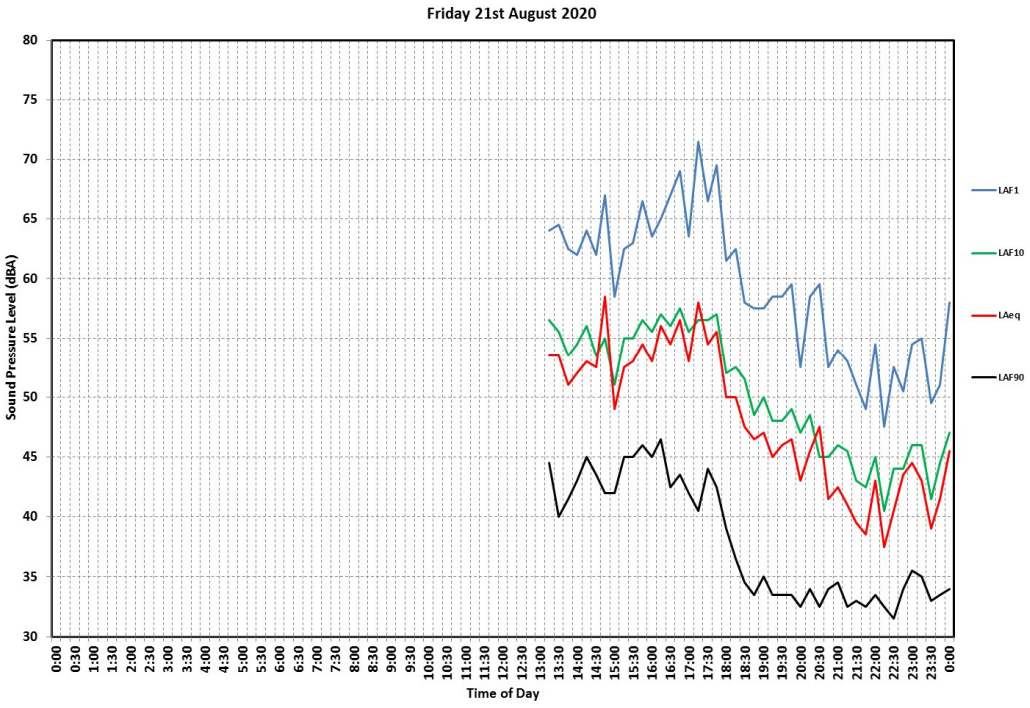
Date	Prepared by:	Status
4th September 2020	Mark Scannell B.A. MAAS	Draft
Date	**Checked by:**	**Status**
8th September 2020	Ken Scannell MSc MAAS	Draft
Date	**Issued by:**	**Status**
17th September 2020	Ken Scannell MSc MAAS	Final

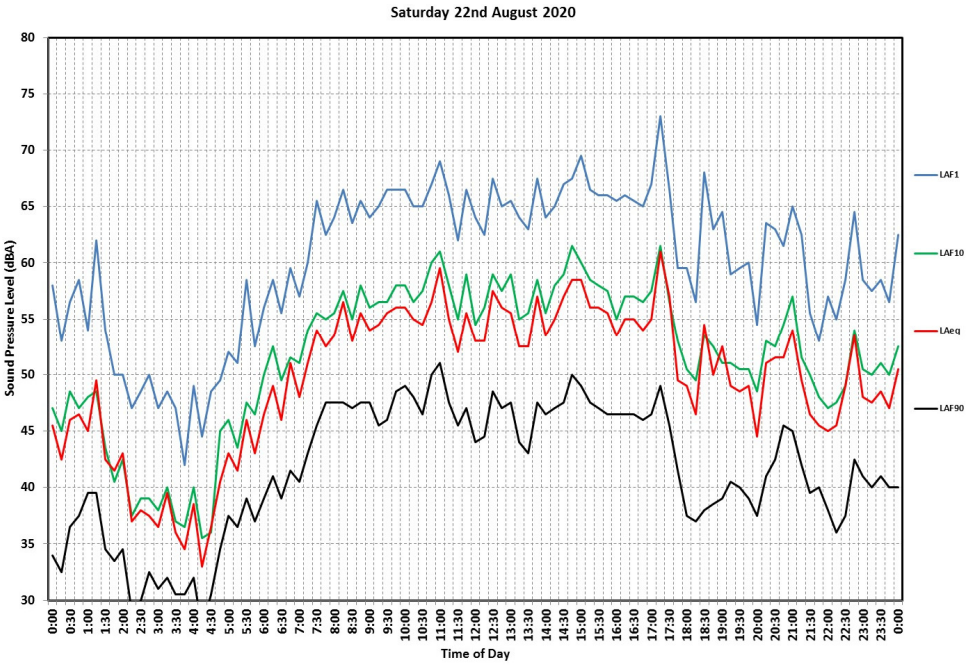
Important Note. *All products and materials suggested by 'Noise and Sound Services' are selected for their acoustical properties only. All other properties such as air flows, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, grout or tile cracking, loading, 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.*

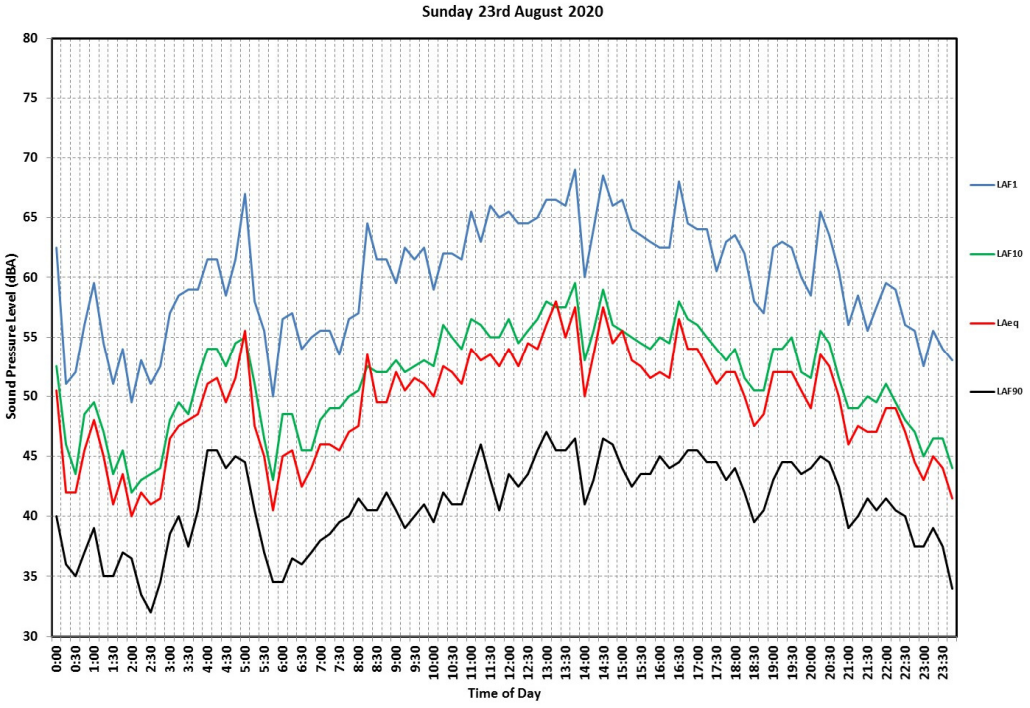
APPENDIX A – MEASURED RESULTS

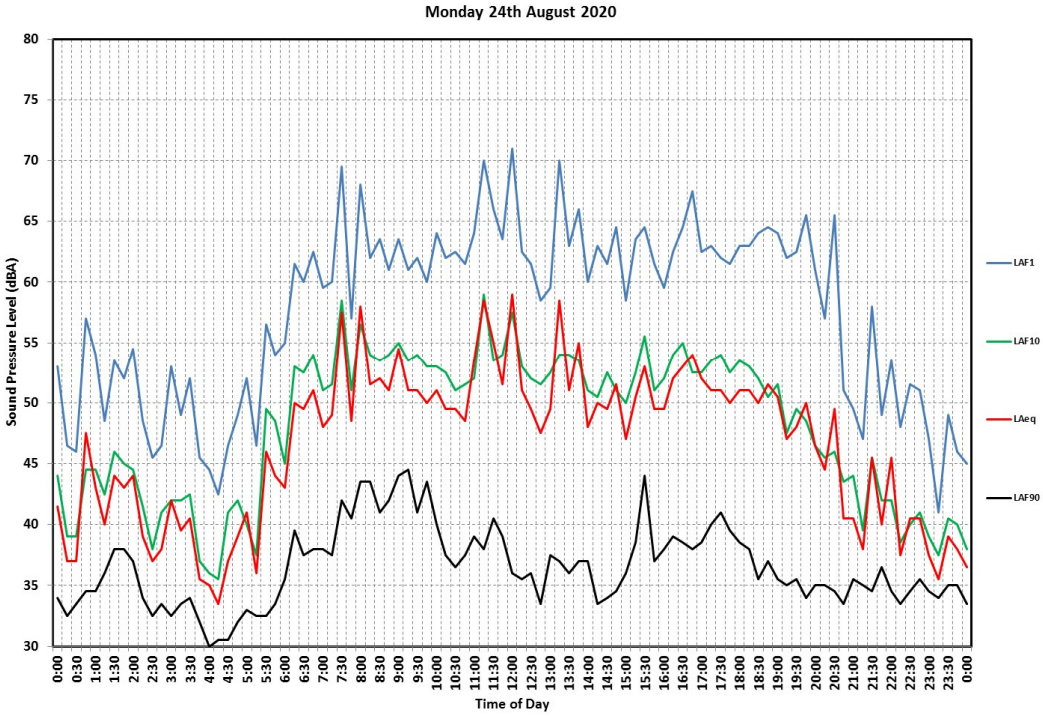
Environmental noise levels can vary considerably with time; therefore, it is not adequate to use a single number to fully describe the acoustic environment. The preferred, and now generally accepted, method of recording and presenting noise measurements is based upon a statistical approach. For example, 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 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.

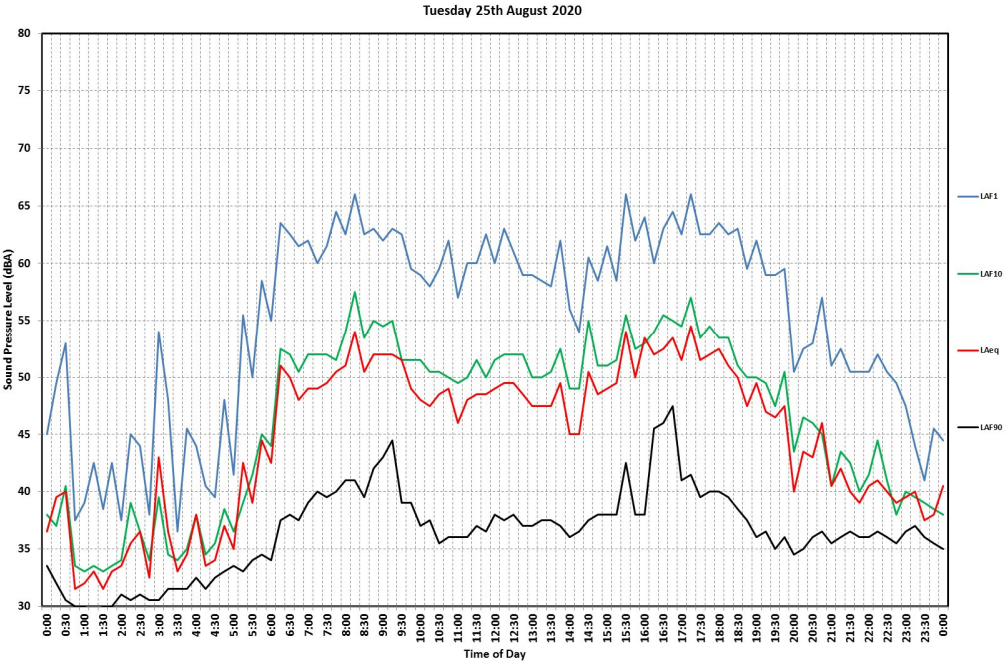
The measurement results from ambient noise monitoring are shown below. Details of the measurement procedure are given in Section 5 above.

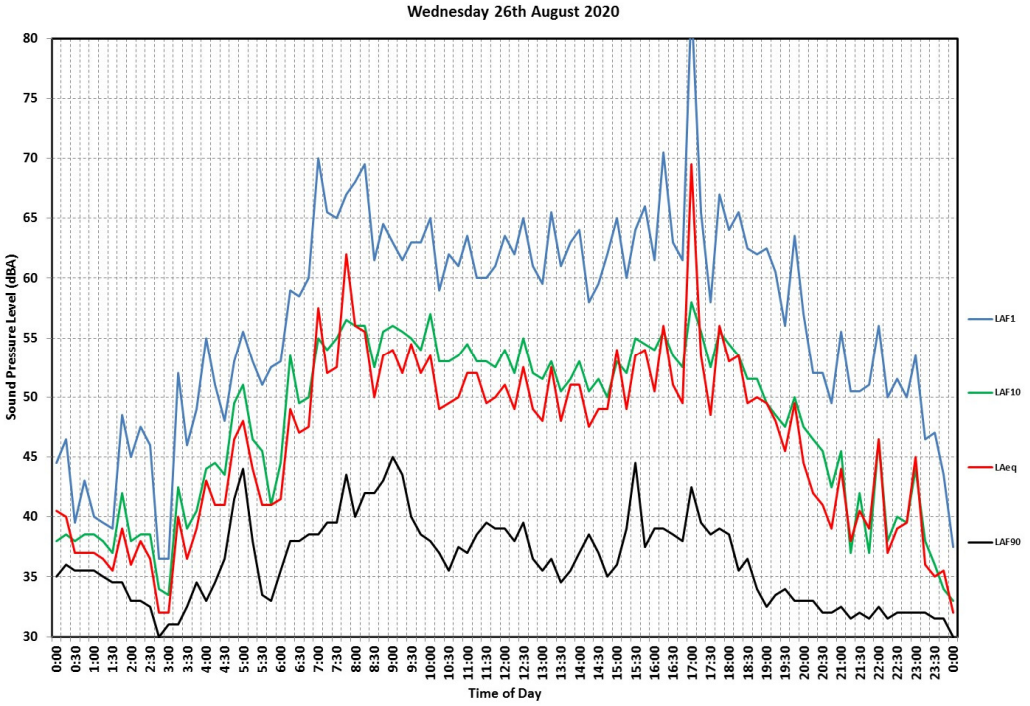


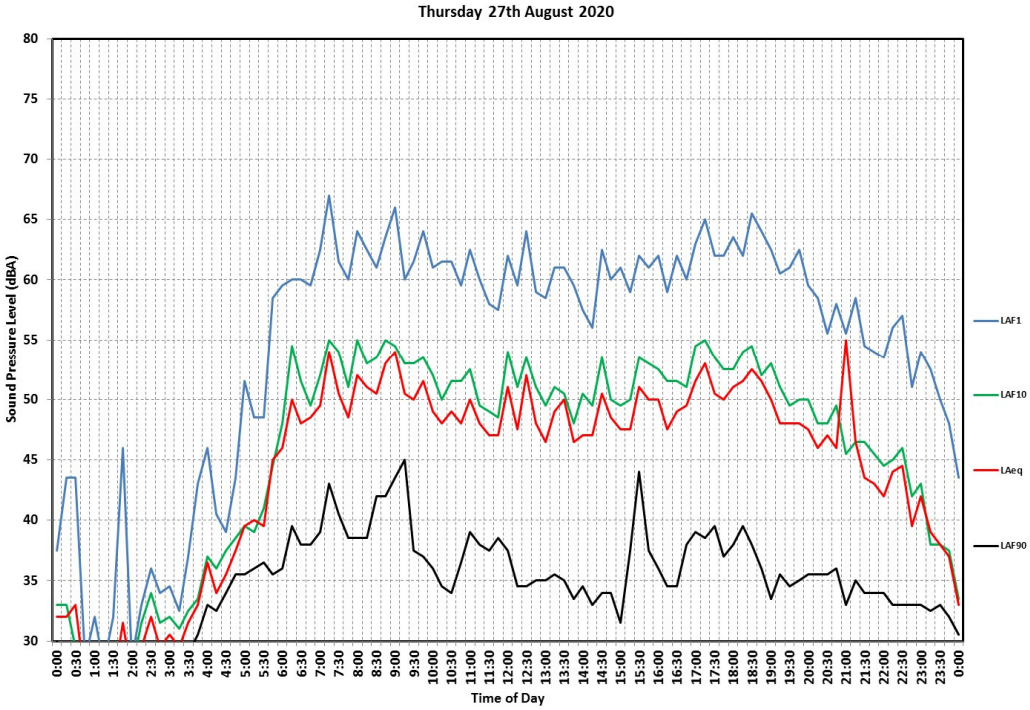

Saturday 22nd August 2020
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90

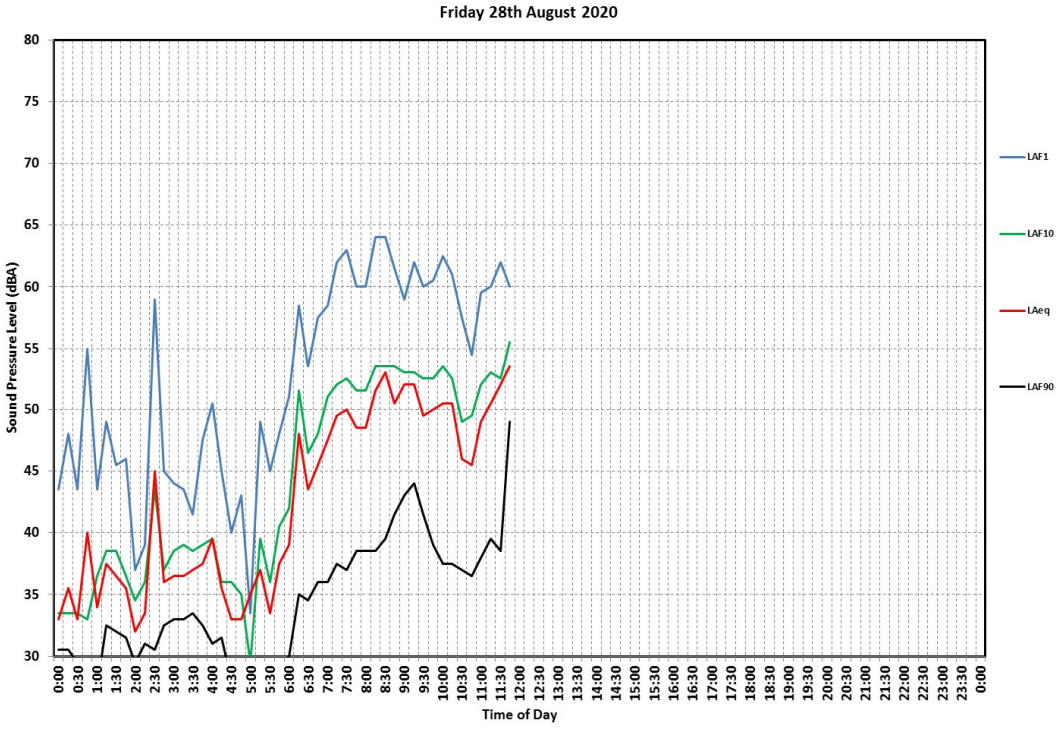

Sunday 23rd August 2020
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Monday 24th August 2020
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Tuesday 25th August 2020
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Wednesday 26th August 2020
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Thursday 27th August 2020
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Friday 28th August 2020
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90

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 **dBA.**

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 $L_{Aeq, 15\ minute}$ 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 (L_P) – 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to 20 micropascals.

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