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Cambridge City Airport Radar Noise Statutory Nuisance & Planning Assessment

Cambridge City Airport
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For: Cambridge City Council, Environmental Health Department

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Cambridge City Airport Radar Noise - Statutory Nuisance & Planning Assessment

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1. EXECUTIVE SUMMARY

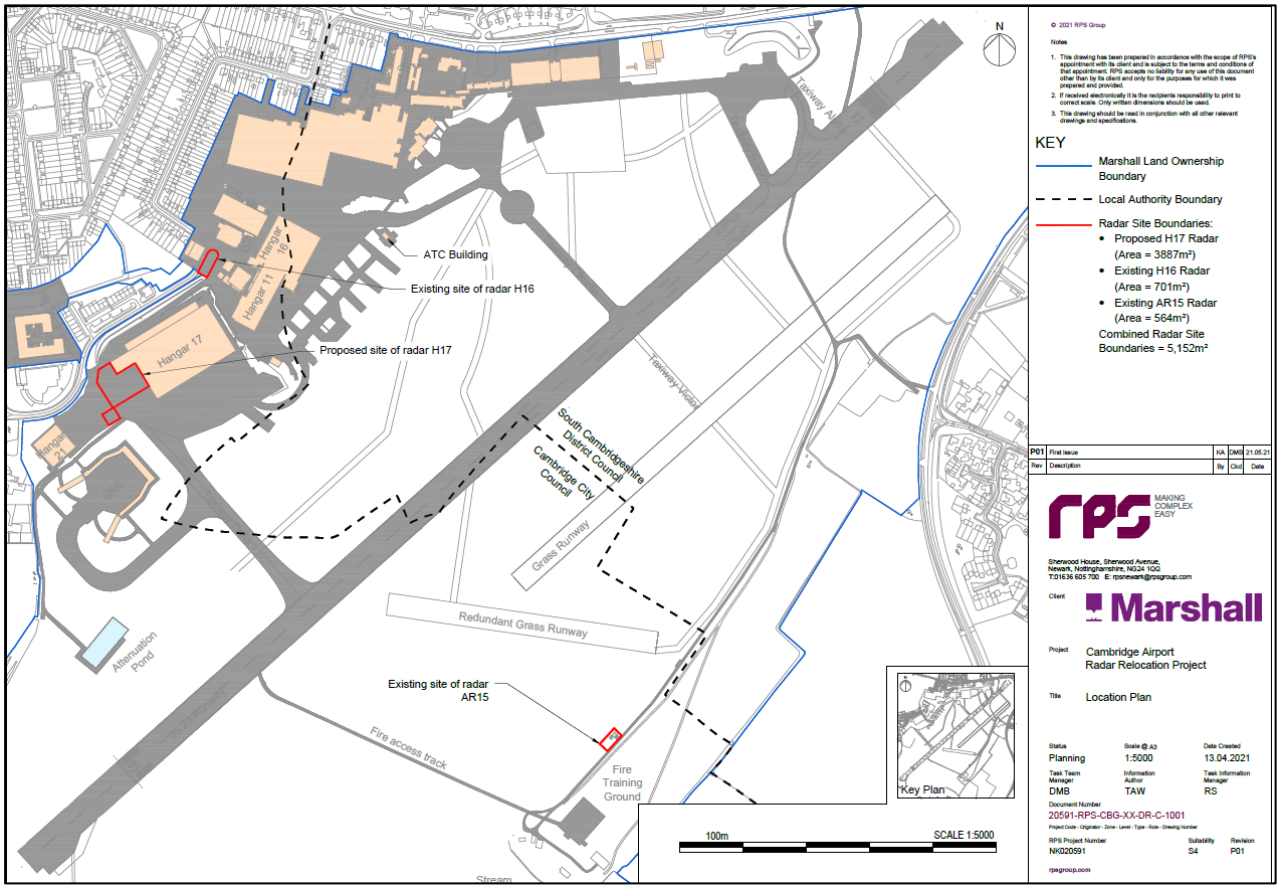
1.1.1 I am Christopher Hurst, a registered Environmental Health Officer/Practitioner and Director of Three Spires Acoustics Ltd and have been retained by Cambridge City Council (hereafter referred to as 'the Council' or CCC) Environmental Health Department, to provide an environmental noise and statutory nuisance assessment of noise immissions from a recently erected 38m radar tower, known as H16 (hereafter referred to as the 'H16 Radar'), at Cambridge City Airport, Newmarket Rd, Cambridge, CB5 8RX.

1.1.2 H16 is located in the northern part of the Airport adjacent to Hangar 16, to the north of Hangar 17 and I understand that noise immissions from the operation of H16 radar have been the source of complaints from local residents made to the local authority at CCC, since its installation in autumn of 2020.

1.1.3 The environmental health department at CCC have undertaken noise nuisance investigations since autumn 2020 and have requested that an independent environmental noise impact assessment is undertaken in order to determine the noise impact and effect of the immissions and provide an expert acoustic and environmental health officer opinion, as to whether the immissions amount to a statutory nuisance under Section 79 of the Environmental Protection Act Part III 1990.

1.1.4 The council have also requested that I provide an opinion on the acceptability, in terms of the potential significance of operational noise impacts and effects of the proposed relocation of the H16 radar to the north-west of the Airport, immediately to the west of Hangar 17, on an area of hard standing comprising unused apron space (hereafter referred to as the 'H17 Radar'). The location of the existing H16 and AR15 radars and proposed H17 location are shown on the H17 planning application Location Plan (Ref. 20591-RPS-CBG-XX-DR-C-1001 P01) which is reproduced in Figure 1 below.

Figure 1. Cambridge City Airport - Plan of Radar Tower Locations



1.1.5 I have undertaken two noise monitoring surveys in September and November 2021 to determine the noise immissions from the radar at source and at representative residential receptors in the vicinity of the H16 radar tower and to determine the prevailing ambient and background noise levels at two locations which are relatively close to the radar tower. The noise surveys included attended and unattended measurements and were supplemented with audio recordings for post measurement analysis.

1.1.6 The main source of noise complained of and identified as part of the noise surveys is radar motor noise emanating from the radar motor cabin enclosure, at a height of 35m, located below the radar antenna (38m). The noise contains a mid tonal component within the 400 Hertz one third octave band range and identified by narrow band analysis specifically at 378Hertz, which is distinctive at the radar source, radar base and reduces in level with distance from the source. The operation of the radar is potentially 24 hours a day, 7 days a week and therefore has the potential to cause disturbance including sleep disturbance to local residents.

1.1.7 Relevant guidance and standards and significance criteria thresholds have been proposed and include absolute, relative and change level criteria. Assessment against these standards and thresholds has been undertaken applying the measurement data obtained from the noise surveys. Aural assessment during attended measurements and also from analysis of audio recordings, has also been undertaken.

1.1.8 The outcome of the assessment at 58 The Westering is summarised in Table 1 below and indicates that the radar noise immissions are below all the proposed significance criteria thresholds (see Section 4) and therefore it is considered that objectively the radar noise does not cause an unreasonable or unacceptable adverse impact. Aural assessment of the noise indicates that the noise is audible above the prevailing acoustic environment, however, in my opinion, the noise is of a relatively low absolute level and considered not sufficiently distinctive to immediately draw the receivers attention to it or result in significant modifying behaviour such as closing windows or increasing volume of TV or radio to mask out the noise.

Table 1. H16 Noise Assessment Summary Table 58 The Westering

	EXTERNAL		INTERNAL		
Situation	BS4142	Noise Change	Community NR	BS8233	Significance Outcome
Day /Eve	-4 to +3	Up to 2dB	-9	-15 to - 12	Indication of insignificant to low adverse noise
Night	+2		-4	-10 to -7	

1.1.9 However, as a full assessment was unable to be undertaken at the closest property to the radar tower (22 Sunnyside) predictive assessment has been undertaken. The outcome of the predictive assessment indicates that radar noise immissions may have the potential to cause a greater degree of adverse impact externally and it is reasonable to assume that internal tonal noise would be elevated to a similar degree.

1.1.10 It is my professional opinion that the noise from the operation of the H16 radar tower is unlikely to cause a statutory nuisance to residents at 58 The Westering or other residential properties at a similar or greater distance from the radar tower. Noise from the operation of the radar tower however, has the potential to cause a greater degree of adverse impact to residents who live closer to it. However, without further investigation at and within theses receptor properties, the likely existence or occurrence of a statutory nuisance under Section 79 of the Environmental Protection Act Part III 1990 cannot be confirmed.

1.1.11 It is also my opinion that the noise mitigation measures detailed by Marshalls Airport acoustic experts indicate, that when compared to the post mitigation (2nd stage) situation there has been significant reduction in noise from the operation of the radar, specifically at 400Hertz one third octave band, which is the dominant tonal feature of the noise and which residents have complained of and has caused disturbance to them.

1.1.12 However, It is also evident that the sound reduction performance of the radar motor cabin enclosure, specifically at 400Hertz is still relatively low and it may be possible and practicable to enhance the performance of the ventilation louvres 'to the H16 radar motor cabin' and so reduce the tonal component of the received noise immissions further. I am not an acoustic noise control engineering expert and therefore suggest that a consultancy is engaged to discuss this aspect of the case, as necessary, to inform CCC if further works are practicable.

1.1.13 It is also understood that the H16 radar is currently not in full operation and the Airport have committed to only run commissioning tests for periods between 8am and 6pm and these are limited in frequency. Therefore, it could be argued that currently there is no 'state of affairs' to determine the existence of a statutory nuisance. However, if this position was to change due to failure of the existing AR15 radar it could be reasonably foreseen that a statutory nuisance 'could be established' if an ongoing state is considered to exist. Ultimately it is up the courts to decide if Best Practicable Means have been undertaken to prevent or counteract the effects of the nuisance.

1.1.14 Regarding the relocation of the radar tower to location H17, the outcome of the noise assessment indicates that the background and ambient acoustic environment are different and higher than those experienced by residents in The Westering and on one side of the street on Sunnyside. This is due to the increased noise from local traffic on Barnwell Rd/ A1134 to the west and noise emissions from the paint abatement plant at Marshalls Airport, on the northern corner of Hanger 17, which in my opinion both legitimately form part of the background noise level.

1.1.15 The objective assessment I have undertaken indicates that noise emissions from the proposed H17 radar location is unlikely to cause unacceptable adverse or significant adverse noise impact and measurements showed no noise level change with the radar off/on situations. The aural assessment indicates that noise from the radar during the assessment was inaudible at approx. 200m when in operation.

1.1.16 It is therefore considered that the relocation of the radar to the H17 location is a suitable alternative to the current H16 location and having ‘regard to national and local planning policy requirements' the evidence suggests that it will not result in 'unacceptable' adverse noise impact to closest residential properties in Barnes Close / Peverel Road which will be approx. 200m from the proposed H17 radar.

1.2 Consultants Experience

1.2.1 I am Christopher Hurst, a registered Environmental Health Officer/Practitioner and Director of Three Spires Acoustics Ltd. I have BSc (First Class Hons) in Environmental Health Studies and a Post Graduate Diploma in Acoustics & Noise Control. I am a Member of the Institute of Acoustics (MIOA), Chartered Environmental Practitioner (CEnvH) and Associate Member of the Institute of Licensing (AMIOL), and am registered with the Environmental Health Registration Board (EHORB). I have over 25 years' experience in environmental regulatory control including environmental noise assessment and the use of statutory nuisance provisions.

My professional experience has included the assessment of environmental noise in relation to construction noise, planning, nuisance, licensing and other regulatory regimes. I have been part of national working parties regarding guidance on noise control from places of entertainment, outdoor concerts and professional practice guidance on planning & noise. I have also presented expert testimony regarding planning, statutory nuisance and licensing cases and acted as an expert Environmental Health Officer in a number of noise related cases. I am also one of the co-developers of the noise app which is now used by over 380 local authorities and housing associations. https://www.thenoiseapp.com

1.2.2 Professional Associations

Member of The Institute of Acoustics (MIOA)

Member of The Institute of Licensing (AMIOL)

Chartered Environmental Practitioner (CEnvH)

2. BACKGROUND TO CASE & SITE DESCRIPTION

2.1.1 Cambridge City Airport, also known as Marshalls Airport, Newmarket Rd, Cambridge, CB5 8RX, erected a 38m high radar tower, know as H16 Radar, in autumn 2020. The radar tower is located within the perimeter of the airport site, close to residential properties in Sunnyside and The Westering. A Google Maps street view, from Sunnyside is presented in Figure 2 below and a Google Maps aerial photo of the site is presented at Figure 3.

2.1.2 The council have provided a briefing note detailing the background and history of the case, some of which I have reproduced below.

> *The purpose of the newly erected Radar tower is essentially a "backup" to the pre-existing Radar, which is nearly 50 years old. It is obsolete and unsupported by the original equipment manufacturer. Spare parts are extremely difficult to source. Equipment failure, although infrequent, is increasing. Equipment outages are also increasing in duration. A recent equipment failure, in January 2021, required 10 days of fault finding, component sourcing and equipment repair. The Radar was not available during this time. The probability of a terminal radar component failure is increasing with time. The possible future implication is that the permanent Radar could suffer a terminal malfunction and the" back up" Radar could become the permanent Radar.*
>
> *Before a radar is permitted to operate, it must go through a "commissioning process" to ensure that it is "fit for purpose". The commissioning process is required by the Civil Aviation Authority and includes a number of tests and training sessions that have to be satisfied and completed to demonstrate that the radar can operate safely in day and night time circumstances. The recently erected Radar went through an extended period of commissioning over a whole month in February 2021, which we understood lead to further complaints from residents (see comments below).*

Figure 2. Goggle Maps Street View of H16 Radar Tower from Sunnyside

Figure 3. Google Maps Aerial Photograph of H16 Radar Tower and Environs

2.2 History of Complaint

2.2.1 The following details have been obtained from the Council's briefing note and other information provided to myself by the council, including extracts from the planning consultation documents for the relocation of H16 Radar to the proposed H17 Radar position.

2.2.2 Cambridge City Council have received 13 complaints regarding disturbance caused by the operation of the H16 Radar Tower, the first of which was received on the 17th November 2020.

2.2.3 Residents from Sunnyside, The Westering and Peverel Road have made complaints about tonal noise, the source of which has been determined by the council and the Airport's and resident's acoustic consultants, as from the operation of the radar motor. Other complaints concerned other sources of noise, which I understand are not connected with the operation of the radar, as well as complaints regarding shadow flicker which is the effect of the sun (low on the horizon) shining through the rotating radar antennae structure, casting a moving shadow at receptors, perceived as a "flicker" due to the rotating antennae speed repeatedly casting the shadow.

2.2.4 Following receipt of the complaints the council initiated an investigation to ascertain if a statutory noise nuisance existed, under The Environmental Protection Act 1990.

2.2.5 I have been informed that at the start of 2021 Marshalls considered if they could re-locate the new Radar to an alternative and less intrusive site on the airport. Marshalls have

provisionally earmarked a site, and have undertaken pre-planning public consultation, http://cambridgeairport.com/radar-consultation/. It is anticipated that the timescale for the determination of planning application for relocation of the radar to H17 will be dictated by the planning process but it is understood that a decision in early 2022 is likely. It is also understood that construction of the radar will reuse the majority of the H16 radar, including its mast, radar head, ground based cabin, upper motor cabin enclosure, emergency generator and security fencing. If the H17 radar is approved it is understood that the dismantling of the H16 radar and erection of the proposed H17 radar is expected to take 6 to 7 months.

2.2.6 The proposed relocation site is discussed in more detail in Section 10 of this report.

2.2.7 Marshalls have also employed the services of Noise Consultants Ltd (NCL), who undertook a noise assessment which included;

- Identification and separation of various potential sources of noise at the airport and to isolate the radar noise as a specific source.
- Application of attenuation works to various sources of noise and re-assessment to ascertain the net effect on the overall sound climate.
- Isolation of the remaining Radar noise and propose suitable attenuation work that could be applied.
- Re-measure once above carried out (joint visit by Council Officer and Noise consultant on 1st February 2021)

2.2.8 Following the joint visit on 1st February 2021, the Council Officer (case officer) and Marshalls' noise consultant, jointly agreed at the time of the visit that the sound levels had reduced (Council Officer having carried out a subjective assessment) such that Civil Aviation Authority radar certification' commissioning works / radar running' could re-commence for the month of February.

2.2.9 Subjective aural assessments were carried out by council officers from within residents' homes during February 2021, and whilst the Radar noise could be heard, at the time was not at a level that could be considered a statutory noise nuisance , having regard to all factors that need to be considered when determining if a statutory nuisance was likely. Officers who carried out these assessments were of the view that during warm spring and summer months, it may well become such. To this end Marshalls were written to and asked to consider what further attenuation work might be suitable. The complainants were also written to and told that the investigation remained open and that should the Radar become operational again (for whatever reason) further site visits and assessment would be made to inform next best steps.

2.2.10 During this same period, the residents employed the services of Mike Stigwood of MAS Environmental Consultants who carried out an environmental noise impact assessment of the radar noise. Mr. Stigwood concluded that noise immissions from the operation of the

radar were likely to give rise to a nuisance and therefore the council should use its powers under Section 79 and 80 of the Environmental Protection Act PTIII 1990.

2.2.11 In the interim since February 2021, Marshalls advised the council that they had completed further attenuation work during the period 30th April to 7th May 2021. They also stated their intention of re-starting the commissioning work, on the 11th May, for a 72-hour continuous period. Marshalls advised the council of the start date/time on 11th May 2021. Since May 2020 further periods of H16 radar certification / commissioning running have occurred but these have been mainly for day time periods 08.00 to 1800hrs ranging from 1 to 5 days only.

2.2.12 Noise mitigation measures undertaken to the radar motor cabin enclosure to date, include the following:

- **January 2021**
  - Installation of Sonobex's Noise Trap Blox behind all weather louvres.
- **April / May 2021**
  - Sealing of all gaps and holes around the perimeter of the cabin;
  - Provision of enhanced rubber and brush seals to the cabin door and floor access panel;
  - Provision of high performance sound absorbent treatment within the cabin
  - Application of Akotherm D40 50mm thickness around the motor gear
  - Application of Akotherm D40 50mm thickness around the remainder of the cabin ceiling and the cable tray
  - Installation of Isomat TS 8kg/m^2 (1000mmx1000mm) cut-to size
  - Installation of Rockwool RWA45 50mm thickness around the walls.

2.2.13 The NCL noise assessment also indicated that the emissions from the H16 radar differed in magnitude and characteristics in orientation around it, in particular those measured in the south west side to those measured in the north west side. The noise characteristics on the south-west side include a tonal peak at 400 Hertz , which was not prominent at an equivalent distance on the north west side.

2.2.14 A further subjective assessment was conducted by two different officers to those who carried out the former assessments, on Thursday 15th July 2021. Following this visit, the opinion of the officers was that the radar noise was not a statutory noise nuisance at that point in time, but again concern voiced regarding impact on residents should usage of the H16 radar be increased.

3. LEGISLATIVE FRAMEWORK

3.1.1 This section of the report reviews the relevant legislation, current national, and local guidance and standards which are considered relevant to the case in question

3.2 Nuisance

3.2.1 The common law[1] has long recognised that noise may be a problem, mainly by way of an action for the tort[2] of nuisance. In England and Wales common law nuisances are divisible into public nuisances and private nuisances. The first deals with interferences with the comfort of the general public and is a crime. The latter deals with the unreasonable and substantial interference[3] with the use of property or personal comfort and is a civil wrong (tort) and does not attract criminal liability.

3.2.2 Statutory Nuisances are matters prescribed by statute as such and covers both public and private nuisances.

3.2.3 At common law, the remedies for public and private nuisance are either damages to compensate for the harm which has been done or an injunction to prevent something from happening in the future. In addition, public nuisance is a criminal offence triable either way, that can attract penalties of unlimited fines and imprisonment.

3.3 Environmental Protection Act Part III 1990 Section 79-80 Statutory Nuisance

3.3.1 Local Authorities have powers and duties to address issues arising from noise through the statutory nuisance provisions of the Environmental Protection Act 1990 (EPA 90) Part III, Section 79-80 (EPA). Section 79(1) (g) of the EPA defines a statutory noise nuisance as: “Noise emitted from a premises so as to be prejudicial to health or a nuisance.” (Note: “noise” in this context also includes vibration.)

3.3.2 Local Authority Environmental Health services have a duty to inspect their districts from time to time for statutory nuisances. Additionally, Local Authorities have a duty to take reasonable steps to investigate any complaint about alleged noise nuisance made by persons residing in their district. Where they are satisfied to the civil standard of proof (on the balance of probability) that a statutory nuisance in law exists, or is likely to occur or recur, they have a duty to serve an abatement notice on the person(s) responsible for the nuisance.

3.3.3 Failure to comply with such a notice can result in further formal action being taken by the Local Authority. This includes prosecution of the recipient(s) of the abatement notice (to the criminal standard of proof).

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[1] *Common law is law made by judges, based on previous court decisions and customs as distinct from statute law created by Parliament*

[2] *Tort is an old French word for a "wrong." A tort is a civil wrong. A civil wrong involves a breach of a duty owed to someone else, as opposed to criminal wrongdoing which involves a breach of a duty owed to society. Torts are civil wrongs other than breaches of contract and certain equitable wrongs. Tort usually refers to the causing of damage to property or its use or to a person's reputation or harm to a person's commercial interest*

[3] *Howard v Walker [1947]*

3.3.4 Proof of the existence, likely occurrence or recurrence, of 'noise emitted from premises such as to be prejudicial to health or a nuisance' , is required before a local authority are required to act by the service of an abatement notice.

3.3.5 The legal requirements for establishing liability in Statutory Nuisance cases are objective. The threshold is a high one: either substantial interference with use or enjoyment of property or personal discomfort or prejudicial to health must be proved. The standard cannot be defined precisely; each case should be examined on its merits; and where there is a dispute much will depend on the view taken by the court of the seriousness of the harm.

3.4 Factors to be taken into consideration when determining a nuisance

3.4.1 The legal test for determining a noise nuisance is an objective one and the noise must be both excessive and unreasonable. The following factors are some of those typically applied by those making judgements on nuisance, to whether a set of circumstances exist which can be considered to constitute statutory nuisance.

3.4.2 Reaching a decision whether a complaint amounts to a Statutory Nuisance often requires that a number of factors need to be weighed up and assessed properly. The relevant factors are detailed in many precedent setting cases and legal texts and include:

- The level and character of the noise
- The duration and frequency of its occurrence
- The time of the noise (day or night)
- The presence of any aggravating characteristics to the noise
- The characteristics of the neighbourhood
- Motive – malice can render noise a nuisance
- Where the noise takes place and is experienced
- The number of people affected

3.4.3 Even after those qualifications have been satisfied a local authority may also consider;

- Whether, in legal terms, it qualifies as a nuisance
- What measures are required to reduce or stop the noise
- Whether the perpetrator is being reasonable
- The potential for a 'best practicable means defence'

3.4.4 The Level and Character of Noise

There is no specific objective noise standard in nuisance legislation above or below which a noise nuisance exists, as the variables involved in the assessment of noise in nuisance cases must be considered as a whole. However, environmental noise standards allow standardised assessments to be made by acousticians and environmental health officers (EHO's) of noise and vibration effects produced by a noise source into a specific location.

3.4.5 There are different ways noise assessments can be carried out;

I. The effects can be determined by reference to guideline values for example, BS8233:2014 Guidance on sound insulation and noise reduction for buildings.

II. The effects can be determined by considering the change in noise level that would result from the noise source. The usual approach is to use an appropriate noise index for the characterisation of the noise that is generated by the source. This approach is contained within Institute of Environmental Management & Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment November 2014.

III. The effects can be determined by comparing the resultant noise level after the noise source is placed into the local environment against the background noise level (LA90) of the area. This is the method employed by BS4142:2014 Methods for rating and assessing industrial and commercial sound and is used to determine the significance of effect.

3.4.6 The approach to assessment adopted by the acoustician and EHO can influence the effects that will ultimately be determined. It is essential, therefore, that any decision to adopt a particular approach is professionally supported, with a clear rationale.

3.4.7 It is also important to take account of the context of the noise source and the environment in which it is taking place, for instance in the case in question, it is considered that an assessment comparing the specific noise with the underlying background and ambient noise situation and an assessment comparison against guideline levels within a defined standard, are both appropriate in establishing the significance and intensity of effects and ultimately reasonableness of the activity in question.

3.4.8 Different noise metrics can also assist in the characteristics of noise in terms of its spectral frequency content.

3.4.9 Duration & Frequency

The duration and frequency of occurrence of the noise in question will have obvious consequences to its impact and effect. If the noise is classed as non-permanent or occasional, it is less likely to form a set of circumstances or state of affairs which may be considered to cause a nuisance. If it is persistent and regular it is more likely that levels above significance thresholds will cause a nuisance, taking into account the other objective nuisance tests.

3.4.10 Time of Day

Noise at night which causes sleep disturbance or noise which occurs during weekend periods or public holidays, will have a greater effect on recipients than a similar level of noise during the typical working day and will generally be considered with more weight when judgements are made about nuisance.

3.4.11 Locality

Where the complaint consists of interference with the use and enjoyment of land, the locality principle is used as a means of determining whether there is an actionable nuisance[4]. The question of locality was raised in Sturges v Bridgman 1879, in which Thesiger, LJ stated '*What would be a nuisance in Belgrave Square would not necessarily be so in Bermondsey'*

An example may be that noise from industrial plant and equipment is acceptable in an industrial estate but much less likely to be acceptable in a suburban area. The case in question is a mixed industrial / commercial and residential area and therefore context is an important factor and will be taken into account when setting proposed significance criteria.

3.4.12 Reasonableness

Reasonableness will be an important factor in determining whether the noise intrusion amounts to a nuisance and the principle of 'give and take'[5] will apply.

The amount of noise depends on the type of plant and equipment used as well as other factors such as structural transfer of noise and vibration and the manner of operation and mitigation applied. Many items of plant can have noise reduction techniques applied.

3.5 Environmental Protection Act Part III 1990 Section 82

3.5.1 Section 82 of the Environmental Protection Act Part III 1990, enables a person aggrieved by a statutory nuisance to bring proceedings in the magistrates court against the person responsible. The court may then issue an order requiring the abatement of the nuisance and/or prohibiting its recurrence. The procedure is only available if the statutory nuisance is in existence at the date of the hearing.

3.5.2 The matters must be proved by the person starting the proceedings to the criminal standard of 'beyond all reasonable doubt/ be sure to convict'. This is different to the appeals procedure regarding section 80 notices, where the defendant must prove, to the civil standard, 'on the balance of probabilities' that one or more of the statutory defences has been properly applied.

3.6 Best Practicable Means (BPM)

3.6.1 Regulation 2(2)(e) of the Statutory Nuisance (Appeals) Regulations 1995, provides that best practicable means were used to prevent, or counteract the effects of the nuisance. BPM

[4] *Sturges v Bridgman 1879*

[5] *as in Dymond v Pearce [1972] 1 All ER 1142*

grounds are only available in noise cases for nuisance emitted from or caused on industrial, trade, or business premises.

3.6.2 BPM is defined as Section 79 (9) EPA 1990

"(9) In this Part "best practicable means" is to be interpreted by reference to the following provisions—

(a) "practicable" means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;

(b) the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures

(c) the test is to apply only so far as compatible with any duty imposed by law;

(d) the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances; and, in circumstances where a code of practice under section 71 of the [1974 c. 40.] Control of Pollution Act 1974 (noise minimisation) is applicable, regard shall also be had to guidance given in it.

4. RELEVANT NOISE ASSESSMENT STANDARDS AND GUIDELINES

4.1.1 The following standards and guidance are considered relevant to the case in question and are discussed in detail below.

4.2 BS4142:2014 +A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

4.2.1 This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature which includes:

- sound from industrial and manufacturing processes
- sound from fixed installations which comprise mechanical and electrical plant and equipment.
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site

4.2.2 The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

4.2.3 The standard is applicable to the determination of the following;

- rating levels for sources of sound of an industrial and/or commercial nature
- ambient, background and residual sound levels, for the purposes of
- assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature;

and for the purposes of:

1) investigating complaints;

2) assessing sound from existing, proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and

3) assessing sound at proposed new dwellings or premises used for residential purposes.

4.2.4 It is important to note the determination of noise amounting to a nuisance is beyond the scope of this British Standard.

4.2.5 Certain acoustic features or character can increase the significance of impact that might be expected from a comparison of the specific sound level to the background sound level. Where such features are present at the assessment location, a character correction to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.

4.2.6 The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. The greater this difference, the greater the magnitude of the impact as detailed in Table 2 below.

Table 2. BS4142 Assessment Outcome Table

Difference between background noise and rating level	Assessment Outcome
+10dB	indication of a significant adverse impact, depending on the context.
+5dB	indication of an adverse impact, depending on the context
0dbB	indication of an low impact, depending on the context

4.2.7 The context can significantly affect the outcome of the Initial estimate, which is based solely on the difference between the rating and background sound levels. The background sound level (LA90) specifically excludes acoustic events occurring for less than 90% of the time, such

as passing vehicles or activity occurring for much but not all of the time. This means that the difference between rating and background sound levels can be identical for two locations with very different acoustic characteristics and corresponding sensitivities to noise.

4.3 BS8233:2014 Sound Insulation and Noise Reduction for Buildings.

4.3.1 Guidance on suitable internal noise levels can be found in BS8233:2014: Sound insulation and noise reduction for buildings. BS8233 suggests indoor ambient noise criterion for reasonable resting and sleeping conditions in bedrooms and living rooms. The guidance is mainly applied in relation to steady continuous noise and much of the underlying research was based on and guidance relates to transportation noise, which does not have the same characteristics as noise in the case in question

4.3.2 BS8233 relates to external noise, typically from transportation sources or other anonymous noise sources without character etc, which may effect the internal sound environment, therefore are not strictly applicable to the case in question but may be used for comparative purposes in the assessment of impact and potential effect.

4.4 World Health Organisation (WHO) Community Noise Guidelines 1999 & 2018

4.4.1 The WHO guideline values for community noise, are appropriate to what are termed "critical health effects". This means that the limits are at the lowest noise level that would result in any psychological or physiological effect. The guidelines have recently been updated (October 2018) but still references some of the guidelines levels in the 1999 document. Although they are mainly considered for use with transportation noise sources such as road, rail and aircraft, they are useful in providing some guidance on negative sleep effects. They state that if negative effects on sleep are to be avoided the Leq,8hr should not exceed 30dB(A) for continuous noise, which approximates to 45dB(A) externally

4.5 Community Reaction to Criteria for External Noises. Kosten & Van Os (1962)

4.5.1 A criteria for rating internal noise impact based on a set of noise rating curves (NR) was described in Kosten and Van Os (1962). A set of curves similar to those described above are used with criterion for specific uses (and became the foundation of ISO noise rating curves). The criterion for a bedroom is NR 25 regardless of the time of occurrence of the noise. Various corrections can be made for dwellings depending on the character of the area and the character of the noise. In this case the criterion may be lowered by 5 due to the presence of or pure tones easily perceptible and as the locality is residential urban an addition of +5 needs to made to the criterion. Therefore it is considered reasonable to apply an acceptability criterion for the living room NR=30 day and NR 25 Night. Table 3 below details the criteria table.

4.5.2 Assessment – If the measured octave band spectrum exceeds the corrected NR criterion curve in any octave band by less than 5dB, the noise is rated as marginal, by 5-10dB the noise is rated as difficult to accept, by greater than 10dB the noise is rated unacceptable.

Table 3. NR Community Reaction Table

Selection of Criteria	NR
Basic Criteria For Inside Sleeping Rooms	25
Basic Criteria For Inside living Rooms	30
Corrections to be added to basic NR number	
Pure tone or other characteristic easily distinguishable	-5
Impulsive or intermittent noise	-5
Type of area	
Very quite Suburban	-5
Suburban	0
Residential Urban	+5
Urban near some industry	+10
Area of heavy industry	+15
Corrected criterion is basic criterion plus appropriate corrections	**Day NR 30** **Night NR 25**

4.6 IEMA Guidelines on Noise Impact Assessments

4.6.1 The Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Assessment 2014, address the key principles of noise impact assessment and are applicable to all development proposals where noise effects may occur. The guidelines set out key principles for noise impact assessment relevant to all types of project regardless of size. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. The guidance recognizes that the effect associated with a noise impact will be dependent on a number of factors including but not limited to, the sensitivity of the receptor, frequency and duration of the noise source and time of day. The Guidelines accept that a simple change in noise levels using a single noise indicator may fail to adequately reveal the actual noise impact of the proposal. The character of the noise must be considered and the Guidelines suggest comparing other noise indicators such as the LAeq, LAmax and LA90 as a more rigorous approach.

4.6.2 Absolute levels such as those set out in WHO Guidelines are also considered and the Guidelines suggest that a change in noise levels in an area where the existing levels are above WHO Guidelines should be considered as having more of an adverse effect than a change in noise levels in an area where existing levels are well below.

4.6.3 The Guidelines stop short of providing specific assessment criteria which developments should achieve but instead suggests that the methodology adopted should be selected on a site by site basis regarding relevant national and local standards. The Guidelines contain effect descriptors for changes in noise levels and for noise effect levels. These are summarized in Table 4 below

Table 4. IEMA Guidelines effect descriptors

Effect Descriptors	
Very substantial	Greater than 10 dB LAeq change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB LAeq change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB LAeq change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB LAeq change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB LAeq change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB LAeq change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB LAeq change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

4.6.4 The Guidelines are not prescriptive as to how a noise impact assessment should be carried out, and allow assessors to consider factors such as frequency spectra, days and times of operation, frequency of operation and any other factor which allows the noise to be assessed in context.

4.7 Proposed Assessment Criteria

4.7.1 Due to the type of noise complained of, which contains tonal and potential modulation elements, a relative assessment approach detailed in BS4142 and absolute LAeq,T levels contained within the BS8233 and NR Kosten & Van Os method and a examination of any change in level are appropriate for evaluation purposes.

4.7.2 Table 5 provides a summary of the proposed assessment criteria and significance thresholds that will be applied for assessment purposes and have been used along with statutory nuisance objective tests detailed in Section 3 to form an opinion on, if a statutory nuisance exists or is likely to occur or recur.

Table 5. Proposed Assessment Guidance and Significance Thresholds

Guidance	Proposed Significance Threshold
BS 4142:2014+A12019	LAr,Tr-L90,T = Greater than 5dB dependant upon context
BS8233:2014	Internal noise from source above the Guideline criteria
Kosten & Van OS Community NR	Internal NR from source noise above the modified Noise Rating Criteria
Level Change IEMA:2014	Change in noise by more than 3dB

5. BACKGROUND NOISE SURVEY

5.1.1 A background noise survey was carried out from approx. 12:53 on Wednesday 22nd to 07:00 on Wednesday 29th September 2021. Noise monitoring was undertaken at location MP1

within the rear external amenity space of No 58 The Westering (photograph in Appendix A page 40) at a height of 1.5m and away from any reflecting surfaces, such as the garden shed.

5.1.2 The sound level meter was set to record all broadband and statistical A weighted metrics including L90 and Leq as well as and one third octave band measurements. Measurements were simultaneously made of 100m/s, 1 second and 1 minute time intervals. Measurements were obtained using the following instrumentation complying with the Type 1 specification of IEC 60651, IEC 61260 and IEC 61672;

- Bruel and Kjaer 2250 Integrated SLM Serial Nos 2827259
- Bruel and Kjaer 4231 Field Calibrator 3001533

5.1.3 The equipment was calibrated using a B&K 4231 field calibrator both before and after the survey and no significant drift was observed. Full calibration certificates are available upon request. Measurements were supplemented with timed audio recordings to enable post measurement analysis.

5.1.4 Weather conditions were considered favourable for the majority of the monitoring period, with very limited precipitation and low but variable wind speeds, however conditions during 27/09/2021 and from 9am to mid-night on 28/09/2021 were unfavourable with variable wind speeds with high wind gusts and periods of precipitation. Theses periods have therefore been removed from the background noise assessment. Further meteorological data is contained in Appendix C.

5.2 Noise Survey Results

5.2.1 Table 6 details the ambient and background noise measurement results at MP1 (rear garden of 58 The Westering) in the absence of radar noise for the 1hour day (07:00-23:00) and evening (19:00-23:00) periods and the 15minute night-time (23:00-07:00) situations as per the guidelines in BS4142:2014. Background noise level frequency distribution charts are presented in Appendix B.

5.2.2 The evening background frequency distribution (Figure 14) does not exhibit a normal distribution pattern and therefore 34dB has been used, after applying professional judgement, in the BS4142 assessment.

Table 6. MP1 Ambient & Background Day & Eve & Night Results -58 The Westering - Long Term Sept 2021

MP1	LAeq,1hour Range	LAeq,1hour Mode	LA90,1hour Range	LA90,1hour Mode
Day	35-59	46	32-44	38
Eve	35-52	39	32-38	37
	LAeq,15min Range	LAeq,15min Mode	LA90,15min Range	LA90,15min Mode
Night	24-50	34	25-45	32

5.2.3 Tables 7 details the 400 Hertz on third octave band ambient and background measurement results for location MP1.

Table 7. MP1 400 Hertz Ambient & Background Day, Eve & Night-Time Results -58 The Westering - Long Term Sept 2021

MP1	400Hz LZeq,1hour Range	400 Hz LZeq,1hour Mode	400 Hz LZ90,1hour Range	400 Hz LZ90,1hour Mode
Day	28-50	32	24-36	30
Eve	28-41	32	24-31	28
	400Hz LZeq,15min Range	400 Hz LZeq,15 min Mode	400 Hz LZ90,15min Range	400 Hz LZ90,15min Mode
Night	18-38	28	16-34	26

5.2.4 The noise climate around the site consists of distant traffic noise, periodic airport mobile and static plant and equipment noise at various locations, including periods of high noise from aircraft engine testing within a ground running enclosure (GRE), and aircraft taking off and landing.

A further background survey was undertaken at MP8 (see location map Figure 2 on page 23) regarding the H17 proposed relocation of the radar tower and this is discussed further in Section 10 of this report.

6. RADAR NOISE ASSESSMENT

6.1.1 Following the initial attended noise survey undertaken in September 2021 it was considered necessary to undertake further assessment closer to the H16 radar noise in order to more accurately establish the impact and effect from the H16 radar motor noise at residential receptors in the vicinity to it.

6.1.2 Therefore a further survey, both attended and unattended, was undertaken on Wednesday 10th November 2021. Measurements were undertaken at various positions at residential receptors, close to the radar tower, and inside and outside the radar motor cabin enclosure, replicating those previously undertaken by Noise Consultants Ltd surveys. Measurements were also undertaken with radar turned off and on during the day and also for an hour period between 10pm to 11pm when background and ambient sound levels had reduced.

6.1.3 The weather conditions during the November survey were more conducive for assessment with very still wind conditions, cloud cover 6 to 8 Oktas and no precipitation during the assessment periods, although there had been some rain in the morning before the assessment started with some wet road conditions, which dried out during the day and evening.

6.1.4 Audio recordings were enabled throughout the assessment period with audio recording set at 16bit high resolution and the peak recording level set according to the environment the measurements were undertaken within. Measurement locations are detailed in Table 8 and Figure 4 below.

Table 8. Measurement Locations

Location	Description
MP1	Background Survey 1 (from 22/09/2021) - End of rear garden of 58 The Westering
MP2	Front garden of 58 The Westering (10/11/2021)
MP3	Front First Floor Bedroom 58 The Westering (10/11/2021)
MP4	24m from base of radar (LHS) (10/11/2021)
MP5	24m from base of radar (RHS) (10/11/2021)
MP6	Various measurements made inside and outside the motor room of radar at height of 33/35m.
MP7	Background Survey 2 (from 01/11/2021) - Field 200m from H16 Radar (to the south west between Barnes Close / Barnwell Drive)
MP8	Boundary of residential properties within same field as above. (background noise survey)

Figure 4. Measurment Location Map

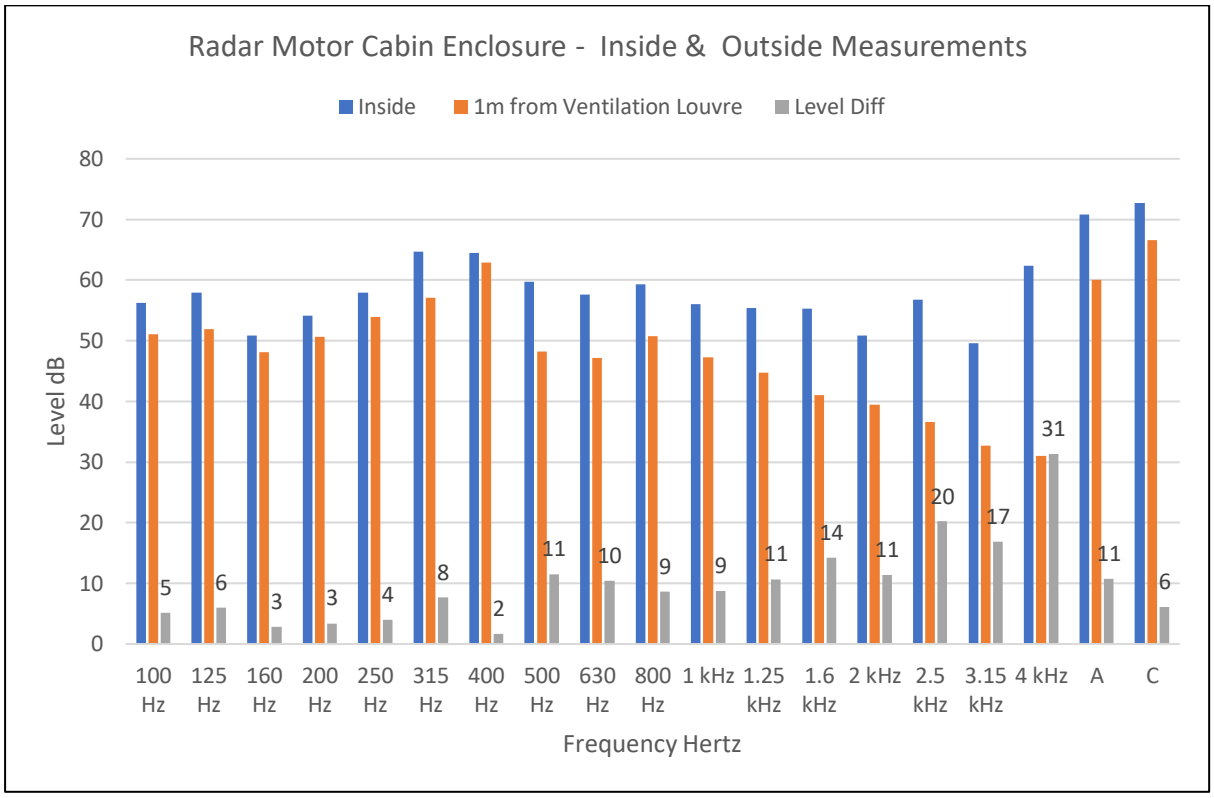
6.2 Radar Source Noise Level Assessment

6.2.1 Measurements were undertaken inside and outside of the H16 radar motor enclosure (MP6) for short periods, representative as close to source and are detailed in Table 9 below and Figure 5 below.

Table 9. Radar Motor Room Assessment (MP6) Table

Location	LAeq dB(A)	400Hz dB(Z)
Internal Motor Enclosure	71	65
1m from motor enclosure louvre (external)	60	63
Level Difference	11	2
Internal Motor Enclosure	71	65
1m from motor enclosure door (external	57	55
Level Difference	14	10

Figure 5. Radar Motor Cabin Enclosure Inside & Outside Frequency Spectrum Comparison



6.2.2 The measurements indicate that the measured level difference from inside to outside provides a 11 to 14 dB(A) reduction at the ventilation louvre and enclosure door respectively and a 2 to 10 decibel reduction in the 400 Hertz one third octave band level. Discussion with Noise Consultants Ltd indicate that the measurements are consistent with those undertaken by Hoare Lea (consultants also working for Marshalls Airport advising on retrospective mitigation measures) during their most recent noise survey.

6.2.3 The relatively minimal measured sound level reduction in the 400 Hertz one third octave band at 1m from the ventilation louvre of the motor enclosure is considered potentially to be the main source of the tonal noise that residents have complained of and it should be possible through acoustic engineering solutions to improve the sound level reduction performance of the ventilation louvre overall and specifically at 400 Hertz. It is recommended that specialist acoustic engineer is consulted to discuss the practicability of such

improvements, as this will have implications regarding potential Best Practical Means (BPM) Defence. Suggested acoustic engineering expert Richard Coleman of Acoustical Control Engineers Ltd

6.2.4 Further specific narrow band analysis of the tonal element of the noise is presented in Figures 6 and 7 below and indicates a tonal component at 378.1 Hertz at 1m from the louvre and internally within the first floor bedroom of 58 The Westering, this is consistent with the findings of both the airports' and residents' acoustic consultants.

Figure 6. FFT Analysis 1m from Ventilation Louvre

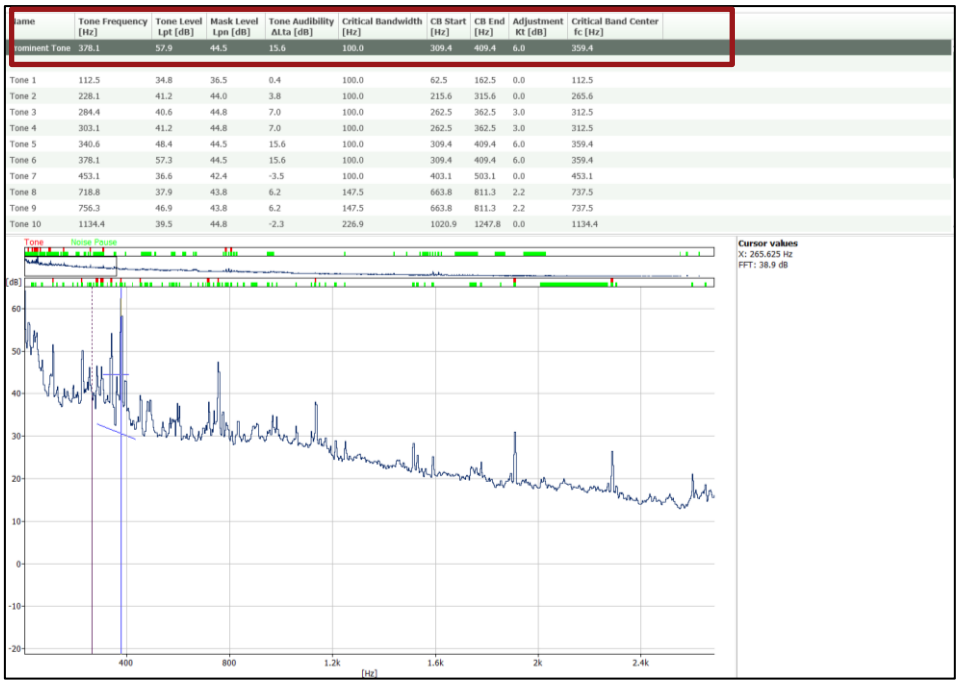
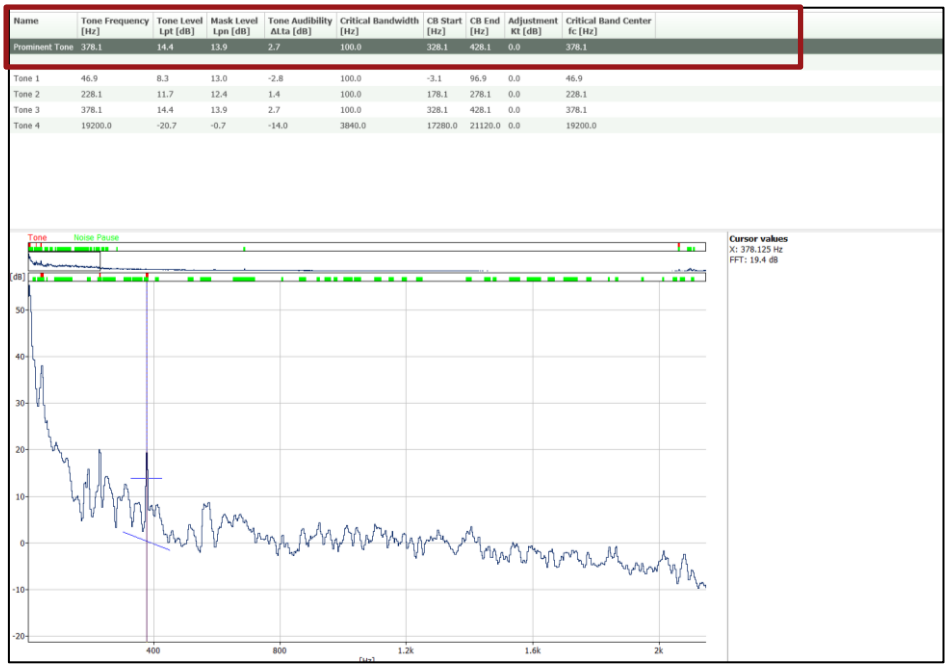


Figure 7. FFT Analysis FF Bedroom 58 The Westering



6.3 Noise Mitigation Effect

6.3.1 Table 10 below compares the pre second stage and post second stage of mitigation works as measured sound levels at MP4, 24m from the radar base and MP2, outside 58 The Westering. The pre second stage mitigation measurements have been taken from Table 4 of the Noise Consultants Ltd report reference J1133A/1F1 dated 11th February 2021.

6.3.2 The measured level difference indicates a 4dB(A) to 12dB(A) measured level difference and a 8dB to 13dB level difference in the 400 Hertz one third octave band. It is clear from the NCL report that the 400 Hertz component of the measured level was dominant with the radar on situation (over 10dB higher radar on) therefore the dominant tonal feature. Therefore it is evident that there has been a significant noise level reduction in the 400 Hertz one third octave band of over 10 decibels, which will equate to a perceived halving of the 400 Hertz tonal noise level with the pre and post mitigation situations.

6.3.3 It is less clear how this has resulted in the change in LAeq,T measured noise level as the difference between radar on /off at MP2 in the NCL report was less than 2dB and there is no indication of L90 metrics which may have provided further information to establish a more accurate level change.

Table 10. Comparison of Pre and Post (Second Stage) Mitigation Measured Noise level at MP2 and MP4

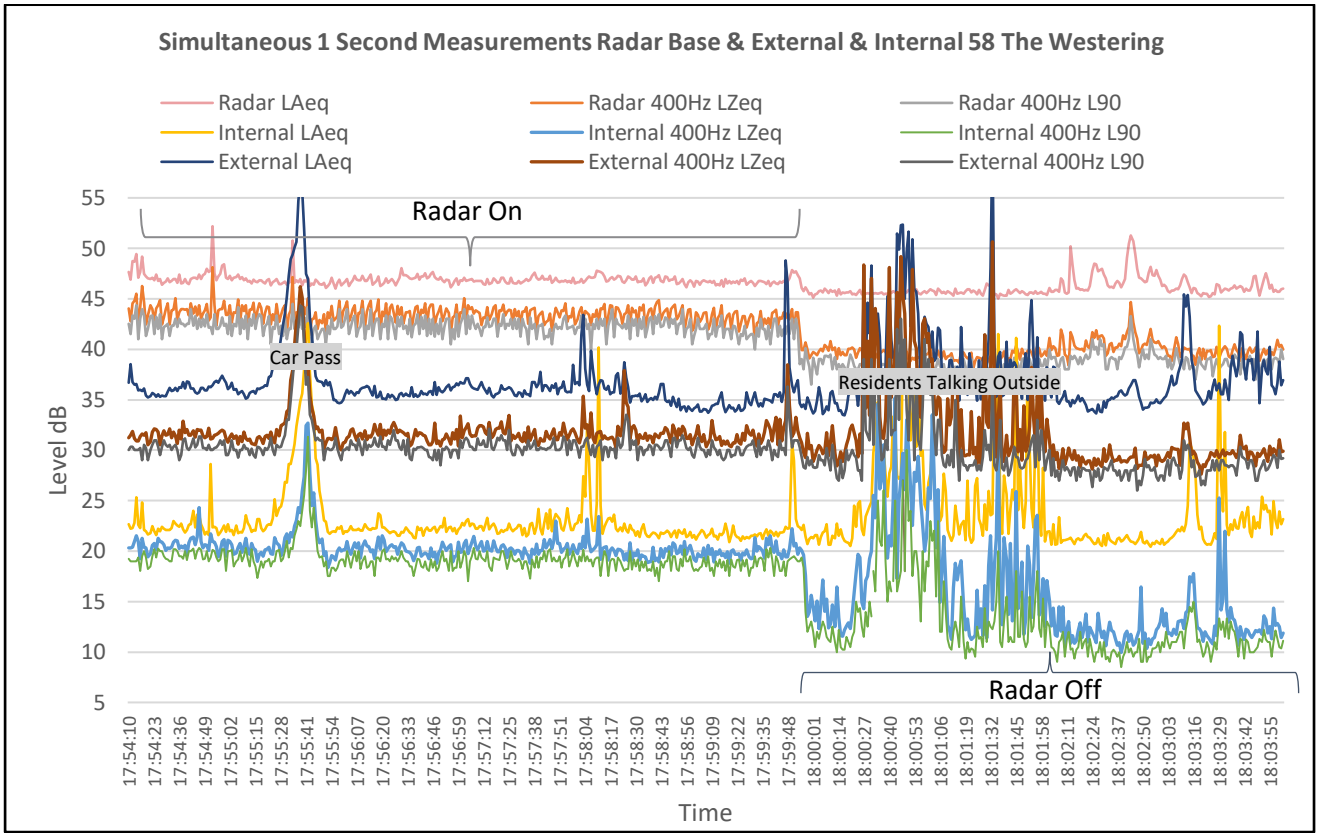
Location	LAeq	400Hz LZeq
Radar 24m Pre Mitigation	49	51
Radar 24m Post Mitigation	45	43
Measured Level Difference	4	8
58 The Westering Pre Mitigation	44	42
58 The Westering Post Mitigation	32	29
Measured Level Difference	12	13

6.4 Residential Noise Survey Results -November 2021

6.4.1 Figure 8 below presents simultaneous 1 second measurements undertaken at the following locations from 17:54 to 18:04 on Wednesday 10th November 2021. The radar was switched off at approximately 18:00

- MP5 24m from the radar base,
- MP3 internally within the first floor bedroom (window partially open) and
- MP2 externally on the front garden area of 58 The Westering.

Figure 8. Simultaneous 1 Second Measurements Radar Base & External & Internal 58 The Westering



6.4.2 Table 11 below presents the representative measured level for the three locations with the radar on and radar off situations

Table 11. Comparison of Measurements Radar On Radar Off 18:00

	Radar RHS MP5				58 Westering External				58 Westering Internal			
	LAeq	LA90	400Hz LZeq	400Hz L90	LAeq	LA90	400Hz LZeq	400Hz L90	LAeq	LA90	400Hz LZeq	400Hz L90
Radar On	47	46	44	42	36	35	32	30	23	22	20	19
Radar Off	46	45	39	38	35	33	31	28	21	20	12	10
Level Diff	1	1	5	4	1	2	1	2	2	2	8	9

6.4.3 The measurements indicate that there is a minimal sound level reduction of between 1 to 2 decibels in the LAeq and LA90 metrics between the radar on/off situations at all three locations.

6.4.4 There is a more prominent sound level reduction in the 400 Hertz Leq & L90 one third octave bands for measurements undertaken at the radar base of 4 to 5 decibels and internally at 58 The Westering of 8 to 9 decibels with a less prominent change in level at the external monitoring location of 2 to 1 decibels in 400 Hertz Leq & L90 respectively . Although the relative level difference internally may equate to a near perceived doubling of the 400 Hertz level, the absolute level is only 20dB which is just over 10 decibels above the threshold of hearing for 400 Hertz and is considered to be a relatively low level unlikely to be considered a significant adverse impact.

6.4.5 Aural assessment during attended measurements and analysis of the audio recordings indicated that H16 radar motor noise was clearly audible with a prominent mid tone feature at the MP5 radar base location. Radar noise was audible at a lower level at the external location at MP2 58 The Westering with the tonal component of the noise distinctive and audible but at relatively low level. The acoustic environment both before and after the radar was switched off, was relatively quiet with some distant traffic noise and periodic neighbour noise including passers by and local traffic. Noise from the airport was also periodically audible including vehicle movements. Aural assessment within the first floor bedroom indicated that the tonal component of radar noise was just audible above the prevailing acoustic environment, however this was at a low level and the councils EHO Greg Kearney reported that he had to concentrate to distinguish the radar noise against the underlying ambient noise which I concurred with. Comparison between attended aural assessment and aural audio recording analysis indicated that the radar noise was more distinctive during attended assessment compared to audio play back, even at increased amplification. There was periodic noise from household activities during the assessment period, however the bedroom acoustic environment was considered to be typically very quiet.

6.4.6 Figure 9 below presents the 1 second time profile from 21:57 to 22:05 at MP3 inside within the first bedroom 58 The Westering (window partially open) when the Radar was switched on at 22:00. Figure 10 presents the same time period for MP2 external front drive area of 58 The Westering and Table 12 presents a comparison of measured levels with the radar on and off situations during a representative minute during this time period. Note that levels fluctuated by +/-1dB in the three one minutes periods before and after the radar was turned on and it is considered that Table 12 is representative of the overall change in noise level effect.

Figure 9. MP3 First Floor Bedroom 58 The Westering Time Profile of Radar 21:57 too 22:05

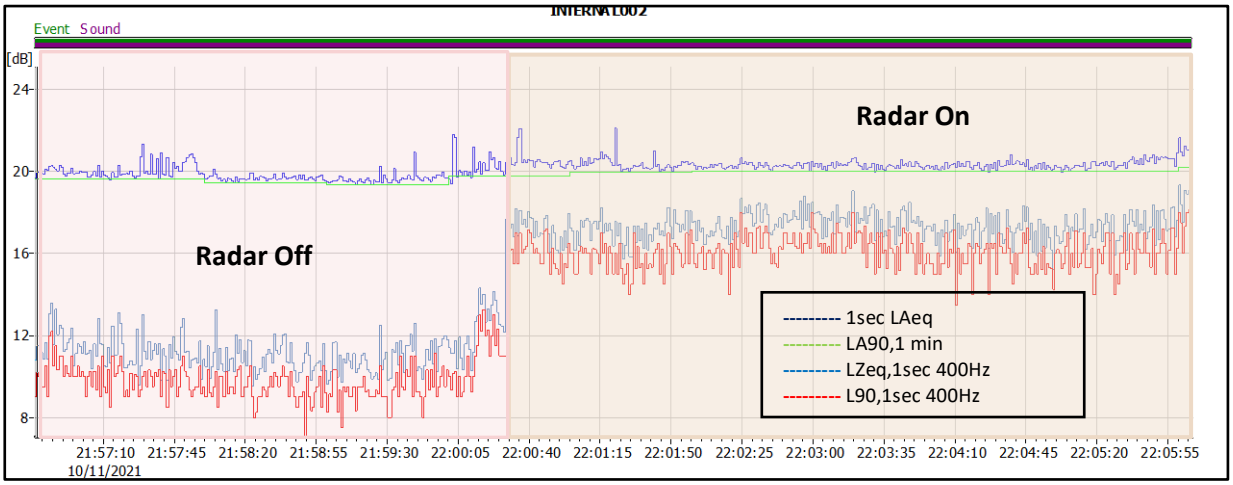


Figure 10. MP2 External Front Garden 58 The Westering Time Profile 21:57 to 22:05

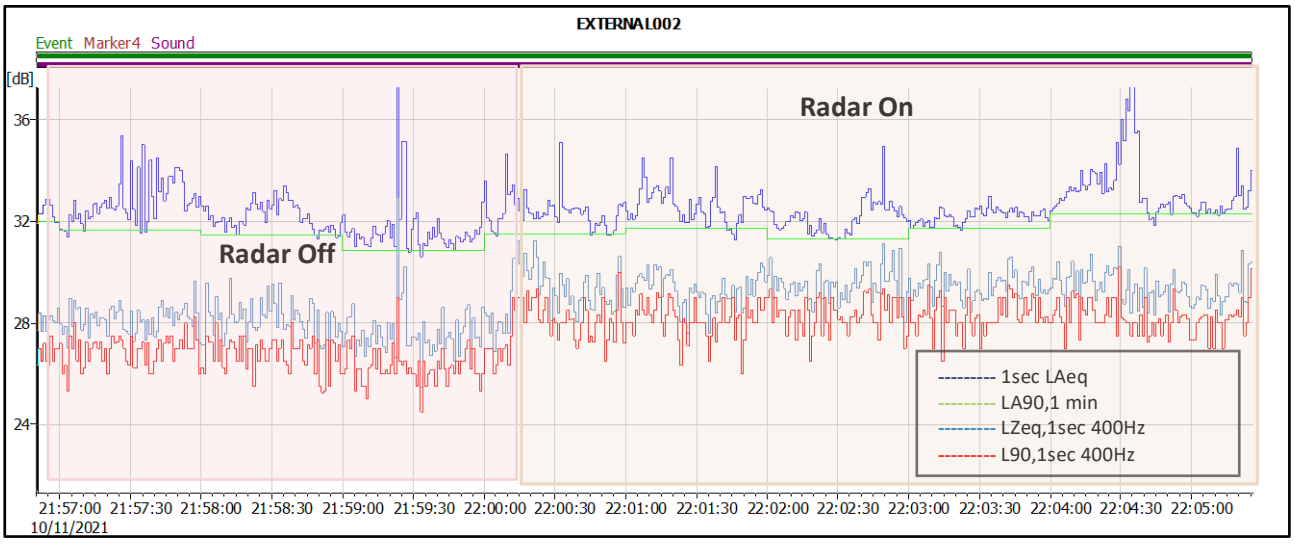


Table 12. Comparison of Measurements H16 Radar Off and On 22:00

	58 Westering External				58 Westering Internal			
	LAeq	LA90	400Hz LZeq	400Hz L90	LAeq	LA90	400Hz LZeq	400Hz L90
Radar On	32	32	29	27	20	20	18	16
Radar Off	32	32	28	27	20	19	11	9
Level Diff	0	0	1	0	0	1	7	7

6.4.7 Attended aural assessment during this time indicated that within the first floor bedroom assessment was similar to the earlier in person assessment, with the tonal component of radar noise audible above the prevailing acoustic environment, however this was at a low level and concentration was required to distinguish the radar noise against the underlying ambient noise. Externally the tonal component of the radar noise was perceptible but less prominent due to greater contribution to the perceived sound level from other ambient noise sources. Aural audio analysis indicated that the radar noise was more distinctive in person compared to audio replay, even at increased amplification. There was periodic noise from household activities during the assessment period, however the bedroom acoustic environment was considered to be typically very quiet.

7. ASSESSMENT OF H16 AND PROPOSED H17 RADAR NOISE

7.1 BS4142 Assessment

7.1.1 A BS4142 assessment of the daytime, evening and night-time situations have been undertaken and the results presented in Table 13 below. Background measurements undertaken from the September survey (MP1 rear garden of 58 The Westering) have been applied for day , evening and night and a separate BS4142 assessment applying the November evening background measurements (MP2 front drive 58 The Westering) also undertaken. Further detailed BS4142 assessment results are presented at Appendix B.

7.1.2 The difference between the measured level and the residual level at MP5 24m from the radar base (35m source height = 42m hypotenuse) is only 2 decibels and therefore BS4142 suggests that measurements are undertaken closer to the source where there is less contribution from the residual level. However, measurements undertaken at 1.5m from the ventilation louvre indicated a level of 61dB(A) which equates to a MP2 receiver level at 142m of 21decibels, which is significantly below the measured level. It is therefore considered that other noise breakout attributable to the radar is contributing to the measured receiver level. This could be evaluated if it was possible to measure at a greater distance i.e. 10-15m from the radar motor cabin at a height of 35m. This is not practicable and therefore measurements at the radar base has been used for assessment purposes.

7.1.3 It is possible to validate the propagation by undertaking assessment of the 400 Hertz LZeq one third octave band level as this is 5dB higher when the radar is in operation and as such has less contribution from other extraneous noise from the airport. Applying residual contribution and distance propagation corrections, based on the hypotenuse to the radar motor housing and the distance to the MP2 receiver location of 142m, this equates to a level of 32dB 400 Hertz which is 4dB below the measured level, which also has a contribution from the residual level which was only 1 dB lower than the measured level. Therefore this gives a level of confidence in the propagation predictions from MP5 to the receiver location and specifically the 400 Hertz predictions.

Table 13. H16 BS4142 Assessment 58 The Westering (MP2). [6]

Situation	BS4142 Outcome $L_{Ar,Tr}$ - $L_{A90,T}$	Significance of Outcome
Day	-4*	The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context
Eve	0* to +3*	
Night	+2*	

*Longer term background survey applied (MP1 free field)

*Shorter term background noise survey applied (MP2 free field)

Note 2dB character correction applied

7.1.4 The BS4142 outcome for the daytime situation indicates a rating level minus background level of -4dB. The outcome for the evening and night-time situations ranges from 0 to +3 dependent upon the background survey level applied. With respect to significance a rating level difference of equal to or less than the background level indicates a low adverse impact, which decrease in significance as the negative difference increases.

7.1.5 The evening and night-time outcome of +3 and +2 respectively, results in a significance outcome less than an adverse impact but higher than low significance.

7.1.6 BS4142 states Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following

[6] Further detailed BS4142 assessment results are presented at Appendix B

> *11 (1) Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night*
>
> *11 (2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it*

7.1.7 With regard to the above the absolute level of radar noise both measured and predicted is 32dB(A) at the receptor location and shows no level change with or without the radar in operation. There is some uncertainty with both measured and predicted level due to the contribution from residual noise at both the receptor and the proxy locations and it is likely that the absolute level may be marginally lower than 32 decibels. The absolute level is therefore considered to be relatively low for both daytime and night-time situations. With respect to the character of the radar noise compared to the residual noise character it is evident that there is a relatively large change in 400 Hertz LZeq & L90 one third octave band at the internal location, with the radar on and off situations, however, the absolute internal level at 400 Hertz is 21dB(A) with a Noise Rating Level of 21 and these are objectively low levels and therefore unlikely to cause significant adverse noise impact or any other unacceptable residual adverse impact.

7.2 Community Reaction to Criteria for External Noises.

7.2.1 Assessment of the internal Noise Rating Level against the NR Community Reaction criteria is presented in Table 14 below.

Table 14. H16 Noise Rating (NR) Community Reaction Table

Location	NR	NR Guideline Day	NR Guideline Night	Outcome
58 The Westering First Floor Bedroom (MP3 window Partially Open	21	30	25	Below Adverse Noise Impact level

7.3 BS8233 Assessment

7.3.1 Assessment against the absolute guideline levels in BS8233:2014 is presented in Table 15 below.

Table 15. H16 BS8233 Assessment (58 The Westering FF Bedroom)

Location	LAeq	Guideline Day LAeq,T	Guideline Night LAeq,T	Outcome
58 The Westering First Floor Bedroom (window partially open 12-15dB attenuation)	17-20	35	30	Below Maximum Guideline Level

7.4 Assessment at the Closest Property (22 Sunnyside)

7.4.1 Cambridge City Council were unable to facilitate an attended assessment at the closest property to the radar tower, at No 22 Sunnyside and it is understood that these residents have not made a specific complaint regarding the tonal radar noise. However, it is possible to predict the noise at this location using measurement data gathered during the assessment and the background noise measurements provided by the applicants noise consultant and Noise Consultants Ltd for the planning consultation for relocation of the radar. Table 16 below details the outcome of the BS4142 assessment at this location. Further detailed BS4142 assessment results are presented at Appendix B

7.4.2 A 4dB character correction has been applied to this situation as the tonal noise from the H16 Radar was clearly audible at the perimeter of the site with 22 Sunnyside. A 3dB facade correction has also been applied to the background measurement results provided by Marshall's acoustic consultants as the measurement position was within 1 meter of a façade. It may be argued that the effect of the location screened background levels from airport site, to some extent which may counteract the façade effect, however a worst case has been applied as the measurement position is not in strict accordance with BS4142 measurement guidelines.

Table 16. H16 BS4142 Assessment (22 Sunnyside)

Situation	BS4142 Outcome $L_{Ar,Tr}$ - $L_{A90,T}$	Significance of Outcome
Day	+5	Indication of adverse impact dependent upon context
Night	+8	Indication of adverse impact dependent upon context

7.4.3 Predicted internal noise assessment comparison against BS8233 absolute guideline levels is detailed in Table 16 below. It is not possible to accurately predict, with the data available, the internal Noise Rating level without measurement.

Table 17. H16 BS8233 Assessment 22 Sunnyside

Location	Estimated LAeq	Guideline Day	Guideline Night	Outcome
22 Sunnyside Internal (window partially open 12-15dB attenuation)	25-28	35	30	Below Maximum Guideline Level

8. OPINION SUMMARY

8.1.1 Table 18 below details the summary of the H16 Radar noise impact assessment against the proposed significance criteria for external and internal day time, evening and night-time situations at Nos 58 The Westering. This indicates that none of the proposed significance thresholds of the relevant criteria have been exceeded and therefore the outcome of the objective assessment indicates radar noise represents an insignificant to a low adverse noise impact at this location.

Table 18. H16 Radar Noise Assessment Summary Table 58 The Westering

	EXTERNAL		INTERNAL		
Situation	BS4142	Noise Change	Community NR	BS8233	Significance Outcome
Day /Eve	-4 to +3	Up to 2dB	-9	-15 to - 12	Indication of insignificant to low adverse noise
Night	+2		-4	-10 to -7	

8.1.2 The aural assessment during attended measurements and analysis of the audio recordings indicates that radar motor noise is clearly audible with a prominent 400 Hertz one third octave band mid tone feature at the radar base location. Radar noise is also audible but, at a lower level at the external location at 58 The Westering with the tonal component of the noise audible but at a relatively low level and not sufficiently distinctive to immediately draw the listeners attention to it. Aural assessment within the first floor bedroom indicated that the tonal component of radar noise was just audible above the prevailing acoustic environment, however this was at a low level and considered that it would be unnecessary for the average person to modify their behaviour such as closing window or turning the radio or television up to overcome the tonal feature of the noise. Moreover, both myself and the EHO at CCC had to concentrate to fully distinguish the tonal element of the noise.

8.1.3 However, at the closest property to the radar tower (22 Sunnyside) the noise assessment predictions indicate that that radar noise immissions may have the potential to cause a greater degree of adverse impact externally and it is reasonable to assume that internal tonal noise would be elevated to a similar degree.

8.1.4 It is my professional opinion that the noise from the operation of the H16 radar tower is unlikely to cause a statutory nuisance to residents at 58 The Westering or other residential properties at a similar or greater distance from the radar tower. Noise from the operation of the radar tower however, has the potential to cause a greater degree of adverse impact to residents who live closer to it. However, without further investigation at and within theses receptor properties the likely existence or occurrence of a statutory nuisance under Section 79 of the Environmental Protection Act Part III 1990 cannot be confirmed.

9. BEST PRACTICABLE MEANS (BPM) DEFENCE

9.1.1 There is evidence (as detailed within and comparison of the data contained within the NCL report ref J1133A/1F1 dated 11/02/2021) that indicates that noise mitigation works have been undertaken to reduce noise immissions from the radar motor cabin enclosure and these have resulted in a measured level reduction, specifically at 400 Hertz one third octave band, which is the dominant tonal feature of the noise and that which residents have complained about and has caused disturbance to them.

9.1.2 The relevant date for deciding whether BPM have been used, is the date on which any abatement notice is served. As the council have not yet served such a notice, any works which have been undertaken by the Airport to mitigate the situation would be taken into account by the courts, upon any appeal of the notice, or for any subsequent prosecution for failure to comply with such an abatement notice.

9.1.3 It is also evident that the sound reduction performance of the radar motor enclosure, specifically at 400 Hertz, is still relatively low and it may be possible and practicable to enhance the performance of the ventilation louvre and so reduce the tonal component of the received noise immissions. This may also indicate that the noise breakout from the noise enclosure was only one element of the noise associated with the use of the radar, but it has been difficult for all consultants concerned thus far, to accurately determine all aspects of the radar noise due to its height and practicality of measuring closer to the source.

9.1.4 I am not an acoustic noise control engineering expert and therefore suggest that a consultancy is engaged to discuss this aspect of the case, as necessary, to inform CCC if further works are practicable in the current situation.

9.1.5 It is also understood that the H16 radar is currently not in full operation and the Airport have committed to only run commissioning tests for periods between 8am and 6pm and these are limited in frequency. Therefore, it could be argued that currently there is no 'state of affairs' to determine the existence of a statutory nuisance. However, if this position was to change due to failure of the existing AR15 radar it could be reasonably foreseen that a statutory nuisance 'could be established' if an ongoing state is considered to exist. This is a question for the CCC's legal advisors.

9.1.6 Ultimately it is up the courts to decide if Best Practicable Means have been undertaken to prevent or counteract the effects of the nuisance.

10. H17 RADAR NOISE ASSESSMENT

10.1.1 Marshall Group Properties Ltd have made a planning application reference 21/03224/FUL for

> *Site West of Hangar 17 (Proposed Replacement Radar)*
>
> *Site West of Hangar 16 (Radar to be relocated)*
>
> *Site on Southside of the Airport known as AR15 (Radar to be removed).*

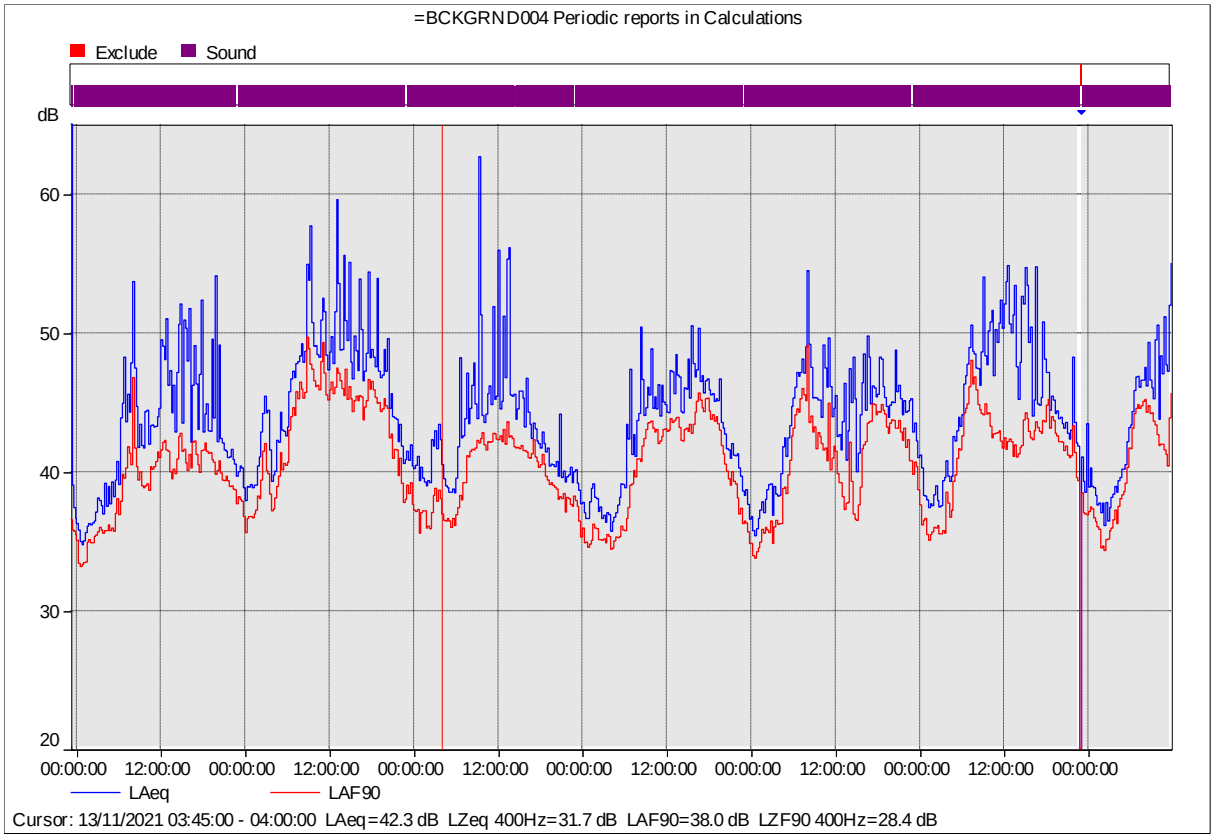
Full details of the application can be found using the hyperlink https://applications.greatercambridgeplanning.org/online-applications/simpleSearchResults.do?action=firstPage

10.1.2 CCC have requested that I provide an opinion on the proposed relocation of the radar to the H17 location. The following section of the report details the results of a background noise survey undertaken at location MP8 and the outcome of the BS4142 assessment applying the results from the background noise survey and measurements made at the base of the radar and predicted back to location MP8.

10.1.3 A background noise survey was undertaken from mid-night on the 11/11/2021 to 11:45am on the 17/11/2021. The H16 radar was in operation from 8am to 6pm on Thursday 11th and Friday 12th November 2021 and these times have been excluded from the background noise survey. The location of MP8 measurement position is identified on the Google aerial photograph at Figure 4 and was on the perimeter of the field with the back of properties on Barnes Close/Peverel Rd. The microphone was at a height of approx.1.5m and in a free field location at least 3.5m way from reflecting surfaces.

10.1.4 Figure 11 presents 15minute LAeq and L90 measurements results from mid-night on the 11/11/2021 to 11:45am on the 17/11/2021. The result follow a typical diurnal pattern with the lowest background and ambient noise levels typically between 00:45 and 04:00. There are two periods of night time elevated levels, the first is from 02:15 to 03:15 on 12/11/2021, analysis of periodic audio recordings indicates that noise is due to an unknown mechanical noise source as well as wind rustling leaves. The second is from 02:30 to 03:45 on 13/11/2021, analysis of audio recordings did not identify any specific source, however there was an increase in wind causing rustling of leaves in trees. These two periods have therefore been excluded from the background noise assessment. Daytime measured levels on Friday 12th November were also periodically higher when compared to other days, analysis of the periodic audio recordings indicates periodic helicopter noise from the airport and construction vehicle noise, source location unknown. (Friday daytime results have been excluded due to radar being in operation)

Figure 11. H17 Radar – MP8 LAeq,15min & L90,15min Time Profile (11/11/2021 to 17/11/2021)



10.1.5 Table 19 below details the ambient (LAeq,T) and background (LA90,T) noise measurement results at MP8 in the absence of radar noise for the 1hour day and evening periods and the 15minute night-time situations as per the guidelines in BS4142:2014. Further background frequency distribution charts are presented in Appendix B.

10.1.6 The evening background frequency distribution (Figure 17) does not exhibit a normal distribution pattern and therefore 38dB has been used, after applying professional judgement, in the BS4142 assessment

Table 19. MP8 Ambient & Background Day & Eve & Night Results

MP8	LAeq,1hour Range	LAeq,1hour Mode	LA90,1hour Range	LA90,1hour Mode
Day	40-57	45	37-47	43
Eve	40-50	45	37-45	43
	LAeq,15min Range	LAeq,15min Mode	LA90,15min Range	LA90,15min Mode
Night	35-48	39	33-45	36

10.1.7 Table 20 below details the 400Hertz on third octave band ambient (LZeq,T) and background (LZ90,T) measurement results for location MP8.

Table 20. MP8 400Hertz Ambient & Background Day & Eve & Night Results

MP1	400Hz LZeq,1hour Range	400 Hz LZeq,1hour Mode	400 Hz LZ90,1hour Range	400 Hz LZ90,1hour Mode
Day	28-47	32	24-38	30
Eve	28-43	36	24-34	31
	400Hz LZeq,15min Range	400 Hz LZeq,15 min Mode	400 Hz LZ90,15min Range	400 Hz LZ90,15min Mode
Night	25-41	31	23-37	28

10.1.8 Figure 12 below presents the 1 minute LAeq, LA90, 400 Hertz LAeq and 400 Hertz L90 time profile from 15:30 to 23:00 at location MP7 (200m from H16). The measurement results indicate that there is no measurable level change with the radar on and off situations which was confirmed by attended aural assessment at and before 18:00 and 23:00, where the radar noise was completely inaudible and the acoustic environment dominated by noise from the paint abatement plant at Marshalls Airport and local traffic noise on the A1134. The reduction in level over time is likely associated with the reduction in traffic flow into the evening from this arterial road and the corresponding reduction in traffic noise.

Figure 12. MP7 1minute Time Profile Radar On /Radar Off

10.2 H17 BS4142 Assessment

10.2.1 A BS4142 assessment of the daytime, evening and night-time situations, replicating the distance from the proposed H17 radar tower relocation, has been undertaken and the results presented in Table 21 below. The results from the background nose survey for MP8, detailed in Table 19 above, have been applied for assessment purposes. Further detailed BS4142 assessment results are presented at Appendix B.

Table 21. MP8 - H17 BS4142 Assessment Outcome

Situation	BS4142 Outcome $L_{Ar,Tr}$ - $L_{A90,T}$	Significance of Outcome
Day	-14	Indication of low adverse impact depending on context
Eve	-9	
Night	-7	

10.2.2 The results indicate a rating level minus background level of between -14 to -7 for day, evening and night respectively. BS4142 states

> *Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

10.2.3 BS4142 states Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following

> *11 (1) Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night*
>
> *11 (2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it*

10.2.4 With regard to the above the absolute level of radar noise it is predicted to be approx. 29dB(A) at the receptor location (MP8) which is significantly below the prevailing background and ambient acoustic conditions for daytime, evening and night time periods and shows no level change with or without the radar in operation. Aural assessment during the noise survey at MP7 approx. 200m from radar H16, indicated that the radar noise was completely inaudible in terms of absolute level and also regarding tonal components specifically at 400 Hertz. The time profile detailed in Figure 12 above for 400 Hertz LZeq and LZ90 1minute measurements indicates no level change between the radar on and radar off situations. There may be some uncertainty in BS4142 measurement outcome due to the use of the proxy location, however the negative level difference is large enough to indicate that there is confidence in the outcome of low adverse impact.

10.2.5 It is considered that the background and ambient prevailing conditions at location MP8 and for residents at Peverel Rd and Barnes Close are different and typically higher than those experienced by residents in The Westering and Sunnyside which are further away NE from the Airport boundary. This is due to the increased noise from local traffic on the A1134

Barnwell Rd and noise emissions from the paint abatement plant at Marshalls Airport, which both legitimately form part of the background noise level.

10.2.6 Comparison against the Greater Cambridge Shared Planning – Sustainable Design and Construction: Supplementary Planning Document (SPD, 2020) Table 3.11: New Noise Generating Development - External Noise Standards for "nonanonymous noise" SPD (2020) Noise Generating Development – External Noise Standards for "non anonymous noise" is presented in Table 22 below and indicates that the daytime and evening BS4142 outcomes results in a "no significance risk" and a "no observable effect" level. The night-time BS4142 outcome results in "minimal significance of risk" and within the range of "no observable effect" to the "lowest observable adverse effect level"

Table 22. MP8 -H17 BS4142 Outcome Comparison With GC SPD

			GREATER CAMBRIDGE SHARED PLANNING SPD		
Situation	BS4142 Outcome $L_{Ar,Tr}$ - $L_{A90,T}$	Noise Significance Risk	Noise Significance of Effect	BS4142 Outcome $L_{Ar,Tr}$ - $L_{A90,T}$	PLANNING ADVICE
Day /Eve	-14	NONE	NOEL	LAr,Tr – LA90,T ≤ -10	Sound Is Likely To Be Inaudible And Have No Discernible Impact On Health Or Quality Of Life. No Objection From A Noise Perspective And No Specific Noise Measures Required.
Night	-7	MINIMAL	NOEL TO LOAEL	LAr,Tr – LA90,T is > -10 & ≤ -5	Where the rating level of noise is below the Background noise level by at least 5dB, this Indicates that the proposed NGD is likely to be acceptable from a noise perspective. The LPA will seek this level of compliance in most noise sensitive areas and/or where there is a requirement to mitigate creeping background effects.

10.2.7 It is therefore considered that the relocation of the radar to H17 is unlikely to result in any unacceptable noise impact to the closest residential receptors in Peverel Rd and Barnes Close. For properties further away such as those on the southern side of Sunnyside and The Westerings the operational noise impact will be even lower due to the greater separation distance involved, and unacceptable adverse noise impact is not envisaged.

11. CONCLUSION

11.1.1 Three Spires Acoustics have undertaken an environmental noise and nuisance assessment of noise emissions from a radar tower, referred to as H16, at Cambridge City Airport, Newmarket Rd, Cambridge, CB5 8RX.

11.1.2 Two noise surveys have been undertaken in September and November 2021 to determine the noise emissions from the radar at source and at representative residential receptors in the vicinity of H16 radar tower and to determine the prevailing ambient and background noise levels at two locations which are relatively close to the radar tower. The noise surveys included attended and unattended measurements and were supplemented with audio recordings for post measurement analysis.

11.1.3 Relevant guidance and standards and significance criteria thresholds have been proposed and include both absolute, relative and change level criteria. Assessment against these standards and thresholds has been undertaken applying the measurement data obtained from the noise surveys. Aural assessment during attended measurements and also from analysis of audio recordings, has also been undertaken.

11.1.4 The outcome of the assessment at 58 The Westering, indicates that the radar noise immissions are below all the proposed significance criteria thresholds and therefore it is considered that objectively the radar noise does not cause an adverse or significant adverse impact. Aural assessment of the noise indicates that the noise is audible above the prevailing acoustic environment, however the noise is of a relatively low level and considered not sufficiently distinctive to immediately draw the receivers attention to it or result in significant modifying behaviour such as closing windows or increasing volume of TV or radio to mask out the noise.

11.1.5 However, as a full assessment was unable to be undertaken at the closest property to the radar tower (22 Sunnyside) a predictive assessment has been undertaken. This indicates that there is a likelihood that radar noise immissions may have the potential to cause a greater degree of adverse noise impact externally and it is reasonable to assume that internal tonal noise would be elevated to a similar degree.

11.1.6 It is my professional opinion, that the noise from the operation of the radar tower is unlikely to cause a statutory nuisance to residents at 58 The Westering or other residential properties at a similar or greater distance from the radar tower. Noise from the operation of the radar tower however, has the potential to a greater degree of adverse noise impact to residents who live closer to the radar tower. However, without further detailed noise level objective assessments at and within these closer receptor properties, including establishing representative background noise levels at these locations (levels are likely to be higher as closer to the Airport), the likely existence or occurrence of a statutory nuisance cannot be confirmed to a reasonable degree of confidence.

11.1.7 It is also my opinion that the noise mitigation measures provided by Marshalls Airport acoustic experts indicate that there has been significant reduction in noise from the

operation of the radar, specifically at 400 Hertz one third octave band, which is the dominant tonal feature of the noise and which residents have complained of and has caused disturbance to them.

11.1.8 It is also evident that the sound reduction performance of the radar motor cabin enclosure, specifically at 400 Hertz is still relatively low and it may be possible and practicable to enhance the performance of the ventilation louvre and so reduce the tonal component of the received noise immissions further. I am not an acoustic noise control engineering expert and therefore suggest that a consultancy is engaged to discuss this aspect of the case, as necessary, to inform CCC if further works are practicable.

11.1.9 However, when also considering statutory nuisance the current operation of H16 radar tower must be taken into account i.e. the radar tower is only currently operating as a back up to H15 radar and its use is limited in duration and frequency, with self imposed restrictions (8am to 6pm) implemented by Marshalls Airport. This however, is unlikely to be the long term situation due to obsolescence of H15 radar and eventually H16 could become the primary radar. Therefore it maybe argued that the current state of affairs does not amount to a statutory nuisance due to the current limited usage but there is a potential for a likely occurrence of radar H16 to give rise to a statutory nuisance at closer properties should there be a need to permanently use H16 following a failure or partial failure of H15. There is also the backdrop of the planning to relocate H16 to H17, however this may not be a consideration of nuisance as this is a separate legislative regime with no certainty of outcome. Ultimately it is up the courts to decide if Best Practicable Means have been undertaken to prevent or counteract the effects of the nuisance.

11.1.10 Regarding the relocation of the radar tower to location H17, the outcome of the noise assessment indicates that the background and ambient acoustic environment are different and higher than those experienced by residents in The Westering and Sunnyside. This is due to the increased noise from local traffic on Barnwell Rd A1134 to the west and noise emissions from the paint abatement plant at Marshalls Airport, on the corner of Hanger 17, which in my opinion both legitimately form part of the background noise level.

11.1.11 The objective assessment indicates that noise emissions from the proposed H17 radar location is unlikely to cause any unacceptable adverse or significant adverse noise impact and measurements showed no noise level change with the radar off/on situations. The aural assessment indicates that noise from the radar during the assessment was inaudible at approx. 200m when in operation.

11.1.12 It is therefore considered that the relocation of the radar to the H17 location is a suitable alternative to the current H16 location and the evidence indicates is very unlikely to result in adverse noise impact to closest residential properties in Barnes Close / Peverel Rd which will be approx. 200m from the proposed H17 radar. For properties further away such as those on the southern side of Sunnyside and The Westerings the operational noise impact of the proposed H17 radar will be even lower due to the greater separation distance involved, and unacceptable adverse noise impact is not envisaged.

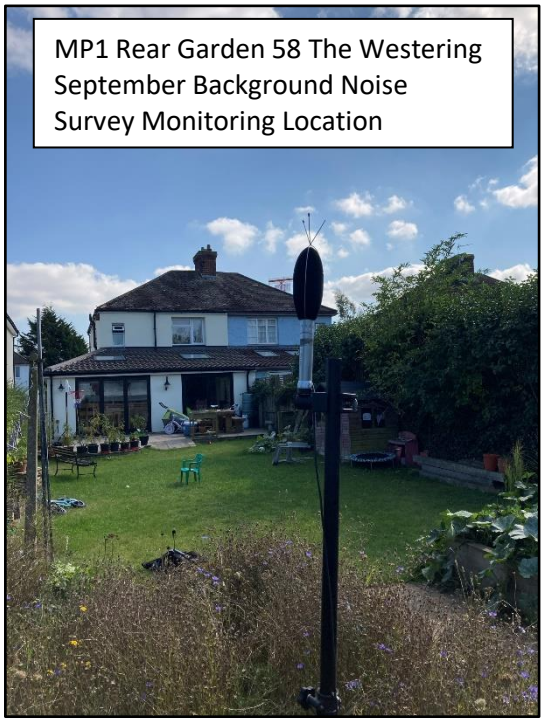
Expert's declaration.

I confirm that the evidence presented in this report is objective, unbiased and within my expertise. I understand that my overriding duty is to the court and that this duty overrides any obligation to the person from whom I have received instructions or by whom I am paid. I have prepared this report in accordance with that understanding. The evidence which I have prepared is true and is given in accordance with the guidance of my professional institution.

Statement of truth.

I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.

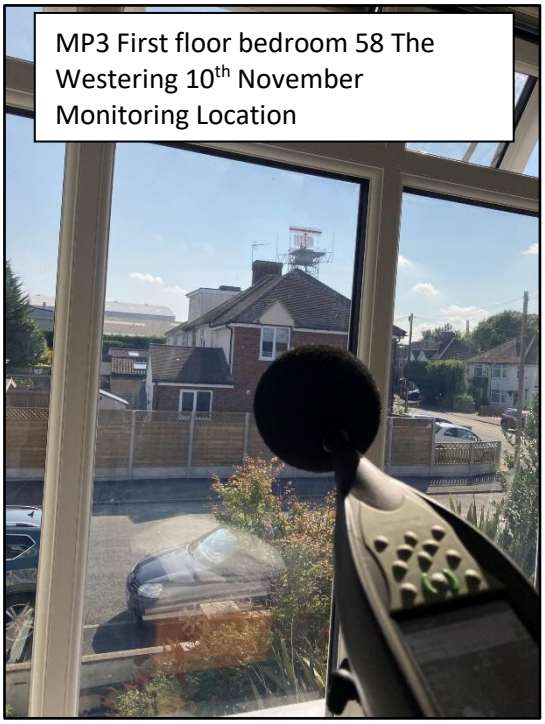
Appendix A: Photographs



MP1 Rear Garden 58 The Westering September Background Noise Survey Monitoring Location

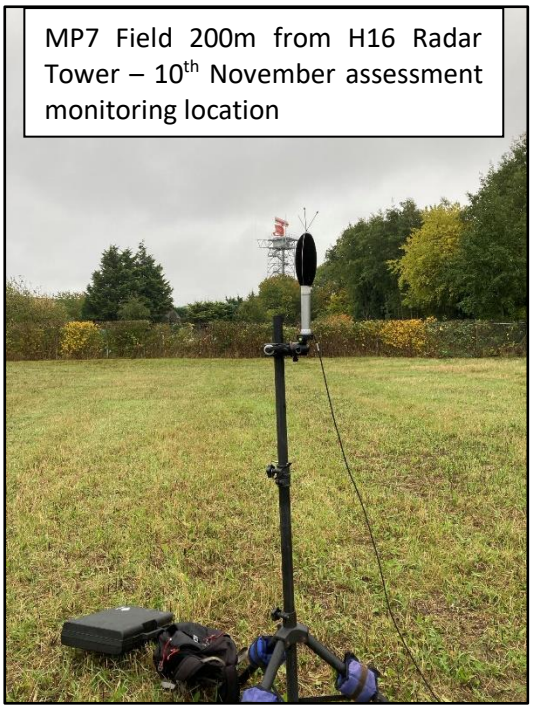
MP2 Front Driveway 58 The Westering 10th November Assessment Monitoring Location

MP4 24m from Radar Tower base



MP3 First floor bedroom 58 The Westering 10th November Monitoring Location

NB- SLM was at least 1m from window (photograph visual parallax distorts distance perception)


MP7 Field 200m from H16 Radar Tower – 10th November assessment monitoring location


Radar motor enclosure housing and ventilation louvre

Appendix B: Detailed BS4142 Assessment Calculations

Table 23. H16 BS4142 -58 The Westering (Day) – September Background Survey Results

58 The Westering MP1 BS4142 Assessment Day	Results	Clause	Detail
Measured ambient sound level	47	7.3.1	Radar noise measured at MP5 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background sound Level	38		Measured level at MP during the September 2021 survey
Contribution from residual level to measured level	$10lg(10^{4.7}-10^{4.5})=43$		Equation 4
Propagation to MP2 43-20Lg (142/42) =32	32		
Assessment made during the day time so the reference time interval is 1 hour		7.2	
Specific Noise 58 The Westering	32	7.3	
Acoustic feature correction	2	9.2	Subjective method applied 400 Hertz component just perceptible (2dB correction) at receptor location both externally and internally.
Rating Level	34	9.2	
Background Sound Level	38	8	
Excess of rating level over background sound level	(34-38) = -4dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates specific sound source having a low impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is -4 and is this instance the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment

Table 24. H16 BS4142 - 58 The Westering (Eve) – November Background Survey

58 The Westering MP1 BS4142 Assessment Evening	Results	Clause	Detail
Measured ambient level	47	7.3.1	Radar noise measured at MP5 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background Sound Level	31		Measured level on 10/11/2021 at MP2 from 20.00 to 22.00 radar off.
Contribution from residual level to measured level	$10lg(10^{4.7}-10^{4.5})=43$		Equation 4
Propagation to MP2 43-20Lg (142/42) =32	32		
Assessment made during the day time so the reference time interval is 1 hour		7.2	
Specific Noise	32	7.3	
Acoustic feature correction	2	9.2	Subjective method applied 400 Hertz component just perceptible (2dB correction) at receptor location both externally and internally.
Rating Level	34	9.2	
Background Sound Level	31	8	
Excess of rating level over background sound level	(34-31) = +3dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates less than adverse impact but higher than low impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is +3 and is this instance the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment and the use of relatively short back ground measurement period.

Table 25. H16 BS4142 - 58 The Westering (Night) –September Background

58 The Westering MP1 BS4142 Assessment Night	Results	Clause	Detail
Measured ambient level	47	7.3.1	Radar noise measured at MP5 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background Sound Level	32		Measured level at MP1 during the September 2021 survey. Modal level.
Contribution from residual level to measured level	$10lg\ (10^{4.7}-10^{4.5})$ =43		Equation 4
Propagation to MP2 43-20Lg (142/42) =32	32		
Assessment made during the night time so the reference time interval is 15minutes		7.2	
Specific Noise	32	7.3	
Acoustic feature correction	2	9.2	Subjective method applied 400 Hertz component just perceptible (2dB correction) at receptor location both externally and internally.
Rating Level	34	9.2	
Background Sound Level	32	8	
Excess of rating level over background sound level	(34-32) = +2dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates less than adverse impact but higher than low impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is +2 and is this instance the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment

Table 26. H16 BS4142 - 58 The Westering (Eve) –September Background Survey

58 The Westering MP1 BS4142 Assessment Eve	Results	Clause	Detail
Measured ambient level	47	7.3.1	Radar noise measured at MP5 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background Sound Level	34		Measured level at MP1 during the September 2021 survey. Modal level = 37, limited data set therefore professional judgement applied = 34dB(A).
Contribution from residual level to measured level	$10lg\ (10^{4.7}-10^{4.5})$ =43		Equation 4
Propagation to MP2 43-20Lg (146/42) =32	32		Hypotenuse to MP2 = 146m
Assessment made during the day time so the reference time interval is 1 hour		7.2	
Specific Noise	32	7.3	
Acoustic feature correction	2	9.2	Subjective method applied 400 Hertz component just perceptible (2dB correction) at receptor location both externally and internally.
Rating Level	34	9.2	
Background Sound Level	34	8	
Excess of rating level over background sound level	(34-34) = 0dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates specific sound source having a low impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is 0 and is this instance the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment

Table 27. H16 BS4142 Assessment - 22 Sunnyside (Day)

22 Sunnyside MP1 BS4142 Assessment Day	Results	Clause	Detail
Measured ambient level	47	7.3.1	Radar noise measured at 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background Sound Level	42-3dB =39		Hoare Lea Background Survey location LT1 - Facarde correction of 3dB applied as meaurment position within 1m of builing facarde. (see Fig B1 of REP-1010962-5A-DF-20210520-Environmental sound survey data - Rev 00
Contribution from residual level to measured level	$10lg(10^{4.7}-10^{4.5})$ =43		Equation 4
Propagation to 22 Sunnyside 43-20Lg (63/42) =40	40		Hypotenuse to 22 Sunnyside =63m
Assessment made during the day time so the reference time interval is 1 hour		7.2	
Specific Noise	40	7.3	
Acoustic feature correction	4	9.2	Estimated subjective method applied 400 Hertz component clearly perceptible (4dB correction) at receptor location
Rating Level	44	9.2	
Background Sound Level	39	8	
Excess of rating level over background sound level	(44-39) = 5dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates less than adverse impact but higher than low impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is +5 and is this instance the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment and reliance on third party background assessment results

Table 28. H16 BS4142 Assessment -22 Sunnyside (Night)

22 Sunnyside MP1 BS4142 Assessment Night	Results	Clause	Detail
Measured ambient level	47	7.3.1	Radar noise measured at 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background Sound Level	39-3dB= 36		Hoare Lea Background Survey location LT1 - Facarde correction of 3dB applied as meaurment position within 1m of builing facarde. (see Fig B1 of REP-1010962-5A-DF-20210520-Environmental sound survey data - Rev 00
Contribution from residual level to measured level	$10lg(10^{4.7}-10^{4.5})$ =43		Equation 4
Propagation to 22 Sunnyside 43-20Lg (63/42) =40	40		Hypotenuse to 22 Sunnyside =63m
Assessment made during the night time so the reference time interval is 15minute		7.2	
Specific Noise	40	7.3	
Acoustic feature correction	4	9.2	Subjective method applied 400 Hertz component clearly perceptible (4dB correction) at receptor location
Rating Level	44	9.2	
Background Sound Level	36	8	
Excess of rating level over background sound level	(44-36) = 8dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates adverse noise impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is +8 and is this instance the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment and reliance on third party background assessment results

Table 29. H17 BS4142 Assessment Location (Day)

H17 MP1 BS4142 Assessment Day	Results	Clause	Detail
Measured ambient level	47	7.3.1	Radar noise measured at 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background Sound Level	43		Measured level MP8 10/11/21 to 17/11/21. Modal level
Contribution from residual level to measured level	$10lg\,(10^{4.7}\text{-}10^{4.5})$ =43		Equation 4
Propagation to MP8 43-20Lg (203/42) =29	29		Hypotenuse to MP8 = 203m
Assessment made during the day time so the reference time interval is 1 hour		7.2	
Specific Noise	29	7.3	
Acoustic feature correction	0	9.2	No audible 400Hz tone audible at H17 field location at 200m
Rating Level	29	9.2	
Background Sound Level	43	8	Measured within field backing onto properties in Percival Rd 10th to 17th November 2021
Excess of rating level over background sound level	(29-43) = -14dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates low adverse noise impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is -14 and is considered large however the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment.

Table 30. BS4142 Assessment H17 Location (Eve)

H17 MP1 BS4142 Assessment Eve	Results	Clause	Detail
Measured ambient level	47	7.3.1	Radar noise measured at 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background Sound Level	38		Measured level at MP8 during the November 2021 survey. Modal level = 43, limited data set therefore professional judgement applied = 38dB(A).
Contribution from residual level to measured level	$10lg\,(10^{4.7}\text{-}10^{4.5})$ =43		Equation 4
Propagation to MP8 43-20Lg (203/42) =29	29		Hypotenuse to MP8 = 203m
Assessment made during the day time so the reference time interval is 1 hour		7.2	
Specific Noise	29	7.3	
Acoustic feature correction	0	9.2	No audible 400Hz tone audible at H17 field location at 200m
Rating Level	29	9.2	
Background Sound Level	38	8	Measured within field backing onto properties in Percival Rd 10th to 17th November 2021
Excess of rating level over background sound level	(29-38) = -9dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates low adverse noise impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is -9 and is considered large however the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment.

Table 31. BS4142 Assessment H17 Location (Night)

MP1 BS4142 Assessment Night	Results	Clause	Detail
Measured ambient level	47	7.3.1	Radar noise measured at 24m from the base and clearly measurable and audible tonal component at 400Hz . Period considered representative of typical conditions. Source height is 35m hypotenuse =42m
Residual sound level	45		Measured at MP5 24m from the base when the radar was not in operation. Period considered representative of typical conditions.
Background Sound Level	36		Measured level MP8 10/11/21 to 17/11/21. Modal level
Contribution from residual level to measured level	$10lg\ (10^{4.7}-10^{4.5})$ =43		Equation 4
Propagation to MP8 43-20Lg (203/42) =29	29		Hypotenuse to MP8 = 203m
Assessment made during the day time so the reference time interval is 1 hour		7.2	
Specific Noise	29	7.3	
Acoustic feature correction	0	9.2	No audible 400Hz tone audible at H17 field location at 200m
Rating Level	29	9.2	
Background Sound Level	36	8	Measured within field backing onto properties in Percival Rd 10th to 17th November 2021
Excess of rating level over background sound level	(29-36) = -7dB		The context is the operation of a radar at Marshalls Airport located in close vicinity of existing residential properties . The sensitive receptor locations are external amenity garden areas and internal living spaces. **Assessment indicates low adverse noise impact**
Uncertainty of the assessment			The excess of the rating level over the background sound level is -7 and is considered large however the uncertainty of the measurement may have an effect on the significance to the outcome of the assessment due to the use of the a proxy location for source assessment.

Appendix C: Measurement Results (background noise frequency distribution charts)

Table 32. MP1 September 2021 Survey 1hour Background and Ambient Noise Monitoring Data

Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
22/09/2021 13:00	46	38	38	31	24/09/2021 09:00	47	38	41	33	26/09/2021 11:00	59	50	37	27
22/09/2021 14:00	50	44	41	33	24/09/2021 10:00	47	39	39	32	26/09/2021 12:00	51	46	38	29
22/09/2021 15:00	46	41	41	33	24/09/2021 11:00	43	37	39	30	26/09/2021 13:00	46	38	38	28
22/09/2021 16:00	50	44	40	32	24/09/2021 12:00	46	39	40	31	26/09/2021 14:00	48	43	38	29
22/09/2021 17:00	47	39	39	31	24/09/2021 13:00	47	41	38	30	26/09/2021 15:00	47	37	38	29
22/09/2021 18:00	44	35	40	30	24/09/2021 14:00	47	41	39	30	26/09/2021 16:00	50	42	38	28
22/09/2021 19:00	50	35	40	31	24/09/2021 15:00	47	41	38	30	26/09/2021 17:00	46	38	37	28
22/09/2021 20:00	44	35	40	30	24/09/2021 16:00	52	41	38	30	26/09/2021 18:00	46	34	37	28
22/09/2021 21:00	41	34	38	30	24/09/2021 17:00	48	36	37	29	26/09/2021 19:00	46	36	38	29
22/09/2021 21:15	41	36	38	29	24/09/2021 18:00	44	32	37	29	26/09/2021 20:00	40	33	37	28
22/09/2021 21:30	46	38	38	30	24/09/2021 19:00	45	35	37	30	26/09/2021 21:00	40	32	36	28
22/09/2021 21:45	40	33	38	30	24/09/2021 20:00	44	35	38	31	26/09/2021 22:00	38	31	35	26
22/09/2021 22:00	39	31	37	29	24/09/2021 21:00	43	34	38	31	28/09/2021 07:00	46	36	41	33
22/09/2021 22:15	39	32	36	28	24/09/2021 22:00	39	33	37	30	28/09/2021 08:00	45	37	40	32
22/09/2021 22:30	39	32	37	29	25/09/2021 07:00	45	31	36	27					
22/09/2021 22:45	43	37	36	29	25/09/2021 08:00	44	31	36	28					
23/09/2021 07:00	49	39	44	36	25/09/2021 09:00	43	30	34	25					
23/09/2021 08:00	48	38	43	35	25/09/2021 10:00	44	29	34	25					
23/09/2021 09:00	50	44	42	34	25/09/2021 11:00	50	37	34	25					
23/09/2021 10:00	48	39	43	34	25/09/2021 12:00	50	41	37	29					
23/09/2021 11:00	48	42	42	34	25/09/2021 13:00	46	34	36	26					
23/09/2021 12:00	46	38	42	32	25/09/2021 14:00	44	35	35	27					
23/09/2021 13:00	47	40	41	32	25/09/2021 15:00	45	36	34	24					
23/09/2021 14:00	43	35	39	30	25/09/2021 16:00	52	37	35	26					
23/09/2021 15:00	49	42	38	30	25/09/2021 17:00	54	39	35	25					
23/09/2021 16:00	48	42	38	30	25/09/2021 18:00	42	34	33	24					
23/09/2021 17:00	51	41	38	30	25/09/2021 19:00	40	29	34	25					
23/09/2021 18:00	46	35	38	30	25/09/2021 20:00	37	29	34	26					
23/09/2021 19:00	52	41	37	28	25/09/2021 21:00	37	30	33	25					
23/09/2021 20:00	39	32	37	28	25/09/2021 22:00	35	28	32	24					
23/09/2021 21:00	39	32	36	28	26/09/2021 07:00	47	31	36	27					
23/09/2021 22:00	38	31	35	27	26/09/2021 08:00	46	30	36	27					
24/09/2021 07:00	47	36	41	33	26/09/2021 09:00	44	30	36	27					
24/09/2021 08:00	45	35	40	32	26/09/2021 10:00	45	32	37	28					

Table 33. MP8 November 2021 Survey 1hour Background and Ambient Noise Monitoring Data

BCKGRND004				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
11/11/2021 00:00	36	29	33	27
11/11/2021 01:00	36	30	34	28
11/11/2021 02:00	37	31	35	29
11/11/2021 03:00	38	32	36	30
11/11/2021 04:00	38	32	36	30
11/11/2021 05:00	40	32	36	30
11/11/2021 06:00	45	33	38	31
11/11/2021 07:00	46	35	41	32
11/11/2021 08:00	49	41	40	32
11/11/2021 09:00	43	33	39	31
11/11/2021 10:00	43	34	39	31
11/11/2021 11:00	44	35	41	32
11/11/2021 12:00	50	44	42	32
11/11/2021 13:00	46	39	40	32
11/11/2021 14:00	49	44	41	32
11/11/2021 15:00	49	43	41	33
11/11/2021 16:00	49	42	41	33
11/11/2021 17:00	49	40	41	32
11/11/2021 18:00	44	37	42	32
11/11/2021 19:00	50	43	41	31
11/11/2021 20:00	45	38	40	31
11/11/2021 21:00	41	33	39	31
11/11/2021 22:00	41	33	38	30

BCKGRND005				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
11/11/2021 23:00	40	33	37	30
12/11/2021 00:00	39	31	36	29
12/11/2021 01:00	39	33	37	30
12/11/2021 02:00	44	36	39	33
12/11/2021 03:00	43	35	38	33
12/11/2021 04:00	41	35	38	33
12/11/2021 05:00	43	37	41	34
12/11/2021 06:00	46	39	42	36
12/11/2021 07:00	48	40	45	37
12/11/2021 08:00	51	45	46	38
12/11/2021 09:00	54	48	47	39
12/11/2021 10:00	49	40	46	37
12/11/2021 11:00	50	39	46	36
12/11/2021 12:00	50	42	46	36
12/11/2021 13:00	55	51	47	37
12/11/2021 14:00	54	48	46	37
12/11/2021 15:00	48	42	45	36
12/11/2021 16:00	51	43	45	35
12/11/2021 17:00	51	42	45	35
12/11/2021 18:00	50	39	46	35
12/11/2021 19:00	48	39	45	34
12/11/2021 20:00	47	40	43	33
12/11/2021 21:00	44	34	41	31
12/11/2021 22:00	42	32	38	29

BCKGRND006				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
12/11/2021 23:00	41	32	38	28
13/11/2021 00:00	40	30	37	27
13/11/2021 01:00	40	30	37	27
13/11/2021 02:00	41	32	36	28
13/11/2021 03:00	43	32	38	29
13/11/2021 04:00	39	30	37	27
13/11/2021 05:00	39	29	36	27
13/11/2021 06:00	44	30	38	28
13/11/2021 07:00	45	32	40	29
13/11/2021 08:00	46	33	42	31
13/11/2021 09:00	57	40	42	31
13/11/2021 10:00	45	33	42	30
13/11/2021 11:00	48	40	42	30
13/11/2021 12:00	52	44	42	30
13/11/2021 13:00	53	43	42	30
13/11/2021 14:00	45	35	42	29
13/11/2021 15:00	45	35	42	29
13/11/2021 16:00	44	31	41	29
13/11/2021 17:00	43	32	41	29
13/11/2021 18:00	42	31	40	28
13/11/2021 19:00	41	31	39	27
13/11/2021 20:00	42	36	38	26
13/11/2021 21:00	40	28	38	26
13/11/2021 22:00	40	29	38	26

BCKGRND007				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 40
13/11/2021 23:00	39	27	36	24
14/11/2021 00:00	37	26	35	23
14/11/2021 01:00	38	27	35	24
14/11/2021 02:00	37	29	35	26
14/11/2021 03:00	37	29	35	27
14/11/2021 04:00	36	28	35	26
14/11/2021 05:00	39	28	36	26
14/11/2021 06:00	44	29	37	27
14/11/2021 07:00	42	31	40	29
14/11/2021 08:00	47	32	41	30
14/11/2021 09:00	47	34	43	31
14/11/2021 10:00	45	32	43	30
14/11/2021 11:00	45	32	43	30
14/11/2021 12:00	46	34	43	30
14/11/2021 13:00	47	36	44	32
14/11/2021 14:00	45	34	43	30
14/11/2021 15:00	48	40	43	30
14/11/2021 16:00	48	36	45	33
14/11/2021 17:00	46	36	45	32
14/11/2021 18:00	46	34	44	31
14/11/2021 19:00	45	36	43	31
14/11/2021 20:00	42	32	40	28
14/11/2021 21:00	41	30	39	27
14/11/2021 22:00	40	28	37	24

BCKGRND008				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
14/11/2021 23:00	38	28	36	26
15/11/2021 00:00	36	27	34	25
15/11/2021 01:00	37	29	35	25
15/11/2021 02:00	39	30	36	28
15/11/2021 03:00	38	31	36	29
15/11/2021 04:00	41	32	37	29
15/11/2021 05:00	43	34	40	31
15/11/2021 06:00	46	36	44	34
15/11/2021 07:00	48	38	45	35
15/11/2021 08:00	51	41	44	33
15/11/2021 09:00	45	34	42	32
15/11/2021 10:00	47	36	41	31
15/11/2021 11:00	47	37	41	30
15/11/2021 12:00	43	32	40	29
15/11/2021 13:00	44	35	38	26
15/11/2021 14:00	47	39	37	26
15/11/2021 15:00	44	37	37	28
15/11/2021 16:00	48	41	43	33
15/11/2021 17:00	46	37	44	34
15/11/2021 18:00	47	39	44	34
15/11/2021 19:00	45	35	43	32
15/11/2021 20:00	46	41	43	34
15/11/2021 21:00	45	37	43	34
15/11/2021 22:00	45	38	41	32

BCKGRND009				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
15/11/2021 23:00	42	36	40	31
16/11/2021 00:00	40	34	37	30
16/11/2021 01:00	38	31	35	30
16/11/2021 02:00	38	33	36	31
16/11/2021 03:00	39	33	36	31
16/11/2021 04:00	40	34	37	32
16/11/2021 05:00	43	37	41	34
16/11/2021 06:00	46	39	43	36
16/11/2021 07:00	49	40	47	38
16/11/2021 08:00	47	40	45	37
16/11/2021 09:00	51	46	44	37
16/11/2021 10:00	50	45	43	35
16/11/2021 11:00	51	45	42	33
16/11/2021 12:00	53	47	42	32
16/11/2021 13:00	51	44	41	33
16/11/2021 14:00	50	44	42	33
16/11/2021 15:00	52	46	43	34
16/11/2021 16:00	50	44	43	34
16/11/2021 17:00	48	41	43	34
16/11/2021 18:00	46	36	44	34
16/11/2021 19:00	44	36	43	33
16/11/2021 20:00	43	35	42	32
16/11/2021 21:00	45	37	41	32
16/11/2021 22:00	42	34	39	30

BCKGRND010				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
16/11/2021 23:00	41	35	37	30
17/11/2021 00:00	39	33	37	30
17/11/2021 01:00	38	31	36	28
17/11/2021 02:00	37	31	35	28
17/11/2021 03:00	38	32	36	30
17/11/2021 04:00	39	33	37	31
17/11/2021 05:00	40	34	39	32
17/11/2021 05:23	43	35	40	33
17/11/2021 06:23	46	37	44	35
17/11/2021 07:23	47	39	45	35
17/11/2021 08:23	47	38	44	36
17/11/2021 09:23	49	42	43	34
17/11/2021 10:23	48	41	41	32
17/11/2021 11:23	52	44	42	31

Table 34. MP8 November 2021 15minute Background and Ambient Noise Monitoring Data

BCKGRND004					BCKGRND005					BCKGRND006					BCKGRND007				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
10/11/2021 23:09	78	64	37	28	11/11/2021 23:00	40	32	38	29	12/11/2021 23:00	42	31	39	29	13/11/2021 23:00	40	28	38	25
10/11/2021 23:24	39	31	36	28	11/11/2021 23:15	40	33	38	30	12/11/2021 23:15	41	31	38	28	13/11/2021 23:15	39	27	38	25
10/11/2021 23:39	37	30	36	28	11/11/2021 23:30	40	33	38	30	12/11/2021 23:30	42	33	39	29	13/11/2021 23:30	39	27	36	24
10/11/2021 23:54	37	30	35	28	11/11/2021 23:45	39	32	37	29	12/11/2021 23:45	40	31	38	28	13/11/2021 23:45	38	27	35	24
11/11/2021 00:00	36	29	35	27	12/11/2021 00:00	38	31	36	29	13/11/2021 00:00	40	31	37	28	14/11/2021 00:00	38	27	36	24
11/11/2021 00:15	36	29	33	27	12/11/2021 00:15	39	32	37	29	13/11/2021 00:15	40	30	37	28	14/11/2021 00:15	37	26	35	23
11/11/2021 00:30	35	29	33	27	12/11/2021 00:30	39	32	37	30	13/11/2021 00:30	41	31	37	27	14/11/2021 00:30	37	26	35	23
11/11/2021 00:45	35	28	33	27	12/11/2021 00:45	39	31	37	29	13/11/2021 00:45	39	29	36	26	14/11/2021 00:45	37	25	35	23
11/11/2021 01:00	35	29	33	27	12/11/2021 01:00	39	31	37	29	13/11/2021 01:00	40	30	37	27	14/11/2021 01:00	38	26	35	24
11/11/2021 01:15	36	29	34	27	12/11/2021 01:15	39	33	37	31	13/11/2021 01:15	40	30	37	28	14/11/2021 01:15	39	27	35	24
11/11/2021 01:30	36	31	35	29	12/11/2021 01:30	39	33	37	31	13/11/2021 01:30	39	29	37	28	14/11/2021 01:30	39	28	36	26
11/11/2021 01:45	36	31	35	29	12/11/2021 01:45	40	34	38	32	13/11/2021 01:45	39	30	36	27	14/11/2021 01:45	38	28	36	26
11/11/2021 02:00	36	31	35	29	12/11/2021 02:00	41	34	38	32	13/11/2021 02:00	39	31	36	27	14/11/2021 02:00	38	29	36	26
11/11/2021 02:15	36	31	35	29	12/11/2021 02:15	43	36	39	33	13/11/2021 02:15	39	31	36	27	14/11/2021 02:15	37	28	35	26
11/11/2021 02:30	36	32	35	30	12/11/2021 02:30	44	38	42	35	13/11/2021 02:30	42	33	37	29	14/11/2021 02:30	37	29	35	26
11/11/2021 02:45	37	32	35	30	12/11/2021 02:45	45	37	42	35	13/11/2021 02:45	42	31	38	29	14/11/2021 02:45	37	29	35	27
11/11/2021 03:00	38	32	36	30	12/11/2021 03:00	44	36	40	34	13/11/2021 03:00	43	32	39	29	14/11/2021 03:00	37	29	35	26
11/11/2021 03:15	38	33	36	31	12/11/2021 03:15	44	36	40	34	13/11/2021 03:15	42	31	38	29	14/11/2021 03:15	36	29	35	27
11/11/2021 03:30	38	32	36	30	12/11/2021 03:30	42	35	38	33	13/11/2021 03:30	43	33	39	29	14/11/2021 03:30	37	29	35	27
11/11/2021 03:45	37	32	36	30	12/11/2021 03:45	39	34	37	32	13/11/2021 03:45	42	32	38	28	14/11/2021 03:45	37	29	35	27
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BCKGRND008					BCKGRND009					BCKGRND010				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
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15/11/2021 09:30	45	34	43	32	16/11/2021 09:30	48	41	44	37	17/11/2021 09:30	49	42	43	34
15/11/2021 09:45	45	34	43	32	16/11/2021 09:45	50	45	44	37	17/11/2021 09:45	51	44	43	34
15/11/2021 10:00	44	34	42	31	16/11/2021 10:00	51	44	43	37	17/11/2021 10:00	44	35	42	33
15/11/2021 10:15	49	40	42	31	16/11/2021 10:15	52	47	42	35	17/11/2021 10:15	48	43	42	33
15/11/2021 10:30	47	33	42	31	16/11/2021 10:30	47	42	43	35	17/11/2021 10:30	47	37	42	32
15/11/2021 10:45	46	36	41	30	16/11/2021 10:45	50	45	43	35	17/11/2021 10:45	51	45	42	32
15/11/2021 11:00	50	42	45	37	16/11/2021 11:00	49	43	43	35	17/11/2021 11:00	48	41	41	31
15/11/2021 11:15	46	33	40	29	16/11/2021 11:15	51	45	43	34	17/11/2021 11:15	47	36	40	31
15/11/2021 11:30	44	32	41	29	16/11/2021 11:30	52	46	42	33	17/11/2021 11:30	52	45	44	32
15/11/2021 11:45	45	33	42	31	16/11/2021 11:45	50	45	42	32	17/11/2021 11:45	55	47	46	33
15/11/2021 12:00	46	34	41	31	16/11/2021 12:00	52	47	42	32					
15/11/2021 12:15	43	32	40	29	16/11/2021 12:15	54	49	42	31					
15/11/2021 12:30	43	31	39	29	16/11/2021 12:30	55	44	42	32					
15/11/2021 12:45	42	30	39	28	16/11/2021 12:45	51	44	42	32					
15/11/2021 13:00	44	28	38	26	16/11/2021 13:00	50	43	42	33					
15/11/2021 13:15	46	40	37	26	16/11/2021 13:15	51	45	41	33					
15/11/2021 13:30	41	31	38	26	16/11/2021 13:30	53	47	42	33					
15/11/2021 13:45	43	30	38	26	16/11/2021 13:45	48	40	41	32					
15/11/2021 14:00	47	40	42	34	16/11/2021 14:00	45	34	41	32					
15/11/2021 14:15	45	36	39	28	16/11/2021 14:15	48	41	42	33					
15/11/2021 14:30	48	39	37	25	16/11/2021 14:30	53	47	42	34					
15/11/2021 14:45	45	39	37	26	16/11/2021 14:45	52	45	44	35					
15/11/2021 15:00	40	30	37	26	16/11/2021 15:00	55	49	44	35					
15/11/2021 15:15	41	33	38	29	16/11/2021 15:15	53	47	44	36					
15/11/2021 15:30	44	36	39	31	16/11/2021 15:30	49	43	43	34					
15/11/2021 15:45	46	41	42	33	16/11/2021 15:45	50	42	42	34					
15/11/2021 16:00	49	43	42	33	16/11/2021 16:00	44	36	42	33					
15/11/2021 16:15	44	37	42	33	16/11/2021 16:15	45	36	43	34					
15/11/2021 16:30	50	36	44	34	16/11/2021 16:30	55	50	44	35					
15/11/2021 16:45	48	44	44	34	16/11/2021 16:45	45	36	43	33					
15/11/2021 17:00	45	38	44	34	16/11/2021 17:00	45	38	43	34					
15/11/2021 17:15	46	37	45	35	16/11/2021 17:15	45	36	43	34					
15/11/2021 17:30	46	37	45	35	16/11/2021 17:30	51	46	44	35					
15/11/2021 17:45	45	36	44	34	16/11/2021 17:45	48	39	44	34					
15/11/2021 18:00	46	35	44	33	16/11/2021 18:00	47	36	45	34					
15/11/2021 18:15	48	43	44	34	16/11/2021 18:15	47	37	45	34					
15/11/2021 18:30	48	40	45	34	16/11/2021 18:30	44	35	43	33					
15/11/2021 18:45	46	35	44	34	16/11/2021 18:45	45	36	44	34					
15/11/2021 19:00	45	35	44	33	16/11/2021 19:00	45	36	44	34					
15/11/2021 19:15	45	34	43	32	16/11/2021 19:15	44	35	43	33					
15/11/2021 19:30	44	34	43	32	16/11/2021 19:30	44	36	43	33					
15/11/2021 19:45	45	36	44	34	16/11/2021 19:45	44	35	42	32					
15/11/2021 20:00	45	36	44	34	16/11/2021 20:00	44	36	42	33					
15/11/2021 20:15	45	36	44	34	16/11/2021 20:15	43	34	42	32					
15/11/2021 20:30	49	45	43	34	16/11/2021 20:30	43	35	41	32					
15/11/2021 20:45	46	39	43	33	16/11/2021 20:45	44	35	42	32					
15/11/2021 21:00	46	38	44	35	16/11/2021 21:00	43	34	41	32					
15/11/2021 21:15	45	37	43	34	16/11/2021 21:15	42	34	41	32					
15/11/2021 21:30	44	36	42	34	16/11/2021 21:30	43	35	41	32					
15/11/2021 21:45	45	37	43	34	16/11/2021 21:45	48	41	43	33					
15/11/2021 22:00	44	36	42	33	16/11/2021 22:00	44	35	41	32					
15/11/2021 22:15	44	35	42	33	16/11/2021 22:15	42	33	40	31					
15/11/2021 22:30	45	37	41	31	16/11/2021 22:30	42	35	39	31					
15/11/2021 22:45	45	40	41	32	16/11/2021 22:45	40	34	38	30					

Table 35. MP1 September 2021 15minute Background and Ambient Noise Monitoring Data

EXTRRNAL003					EXTRRNAL004					EXTRRNAL005					EXTRRNAL006					EXTRRNAL007				
Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz	Start	LAeq	LZeq 400 Hz	LAF90.0	LZF90.0 400 Hz
22/09/2021 19:31	42	36	39	30	22/09/2021 23:00	38	34	36	29	23/09/2021 23:00	38	32	34	26	24/09/2021 23:00	39	32	37	29	25/09/2021 23:00	34	26	31	23
22/09/2021 19:45	41	33	39	30	22/09/2021 23:15	38	34	35	28	23/09/2021 23:15	38	32	33	24	24/09/2021 23:15	37	31	35	28	25/09/2021 23:15	33	25	31	22
22/09/2021 20:00	41	33	39	30	22/09/2021 23:30	38	34	35	27	23/09/2021 23:30	36	30	33	25	24/09/2021 23:30	40	34	38	31	25/09/2021 23:30	32	24	30	21
22/09/2021 20:15	40	32	38	30	22/09/2021 23:45	37	30	34	26	23/09/2021 23:45	34	28	31	25	24/09/2021 23:45	38	32	35	29	25/09/2021 23:45	29	21	27	18
22/09/2021 20:30	44	37	39	31	23/09/2021 00:00	38	32	35	27	24/09/2021 00:00	34	28	31	25	25/09/2021 00:00	36	30	35	28	26/09/2021 00:00	30	21	27	18
22/09/2021 20:45	40	33	38	30	23/09/2021 00:15	36	31	33	24	24/09/2021 00:15	38	32	31	27	25/09/2021 00:15	36	29	34	27	26/09/2021 00:15	29	23	26	17
22/09/2021 21:00	41	34	38	30	23/09/2021 00:30	34	27	32	24	24/09/2021 00:30	40	33	31	27	25/09/2021 00:30	35	30	33	27	26/09/2021 00:30	29	20	27	18
22/09/2021 21:15	41	36	38	29	23/09/2021 00:45	34	27	32	24	24/09/2021 00:45	41	33	30	25	25/09/2021 00:45	36	30	34	27	26/09/2021 00:45	28	19	26	17
22/09/2021 21:30	46	38	38	30	23/09/2021 01:00	35	28	32	24	24/09/2021 01:00	32	27	29	24	25/09/2021 01:00	38	32	33	27	26/09/2021 01:00	29	21	26	17
22/09/2021 21:45	40	33	38	30	23/09/2021 01:15	34	26	31	23	24/09/2021 01:15	31	26	29	24	25/09/2021 01:15	35	29	33	26	26/09/2021 01:15	37	26	25	16
22/09/2021 22:00	39	31	37	29	23/09/2021 01:30	34	27	32	24	24/09/2021 01:30	33	27	30	25	25/09/2021 01:30	34	28	32	26	26/09/2021 01:30	27	19	25	16
22/09/2021 22:15	39	32	36	28	23/09/2021 01:45	33	26	31	23	24/09/2021 01:45	34	28	31	25	25/09/2021 01:45	34	28	32	26	26/09/2021 01:45	27	19	25	16
22/09/2021 22:30	39	32	37	29	23/09/2021 02:00	33	25	31	23	24/09/2021 02:00	34	27	30	25	25/09/2021 02:00	34	28	31	25	26/09/2021 02:00	28	19	26	17
22/09/2021 22:45	43	37	36	29	23/09/2021 02:15	35	26	31	23	24/09/2021 02:15	34	27	29	24	25/09/2021 02:15	43	38	32	26	26/09/2021 02:15	27	18	25	16
					23/09/2021 02:30	33	25	31	22	24/09/2021 02:30	34	29	29	24	25/09/2021 02:30	33	28	31	26	26/09/2021 02:30	28	19	25	17
					23/09/2021 02:45	33	26	31	23	24/09/2021 02:45	32	27	30	25	25/09/2021 02:45	34	29	31	26	26/09/2021 02:45	27	18	25	16
					23/09/2021 03:00	34	26	32	24	24/09/2021 03:00	31	26	29	24	25/09/2021 03:00	33	28	31	25	26/09/2021 03:00	27	18	25	16
					23/09/2021 03:15	33	26	31	24	24/09/2021 03:15	34	28	30	25	25/09/2021 03:15	32	27	30	25	26/09/2021 03:15	30	21	25	16
					23/09/2021 03:30	33	27	31	24	24/09/2021 03:30	34	29	32	26	25/09/2021 03:30	32	28	30	25	26/09/2021 03:30	29	20	26	17
					23/09/2021 03:45	34	27	32	25	24/09/2021 03:45	37	31	34	28	25/09/2021 03:45	31	26	30	24	26/09/2021 03:45	28	20	26	18
					23/09/2021 04:00	35	29	33	26	24/09/2021 04:00	38	32	35	29	25/09/2021 04:00	32	27	30	24	26/09/2021 04:00	29	23	28	21
					23/09/2021 04:15	34	27	32	25	24/09/2021 04:15	37	31	35	29	25/09/2021 04:15	33	28	31	25	26/09/2021 04:15	29	23	28	21
					23/09/2021 04:30	34	28	32	26	24/09/2021 04:30	37	32	35	29	25/09/2021 04:30	34	30	32	26	26/09/2021 04:30	29	23	28	21
					23/09/2021 04:45	35	28	33	26	24/09/2021 04:45	36	30	34	27	25/09/2021 04:45	34	29	32	26	26/09/2021 04:45	29	24	28	22
					23/09/2021 05:00	36	30	34	27	24/09/2021 05:00	36	31	34	28	25/09/2021 05:00	33	29	32	26	26/09/2021 05:00	30	24	28	22
					23/09/2021 05:15	39	31	35	28	24/09/2021 05:15	37	31	35	29	25/09/2021 05:15	35	29	32	26	26/09/2021 05:15	32	28	28	21
					23/09/2021 05:30	38	31	36	29	24/09/2021 05:30	37	31	35	29	25/09/2021 05:30	35	28	32	25	26/09/2021 05:30	30	24	28	22
					23/09/2021 05:45	42	32	37	30	24/09/2021 05:45	40	31	36	29	25/09/2021 05:45	38	28	33	26	26/09/2021 05:45	32	25	29	23
					23/09/2021 06:00	48	33	39	31	24/09/2021 06:00	48	31	37	29	25/09/2021 06:00	48	28	34	26	26/09/2021 06:00	42	25	30	23
					23/09/2021 06:15	45	36	40	34	24/09/2021 06:15	46	32	38	30	25/09/2021 06:15	49	30	35	27	26/09/2021 06:15	50	28	32	25
					23/09/2021 06:30	46	36	42	34	24/09/2021 06:30	45	34	38	31	25/09/2021 06:30	48	29	34	26	26/09/2021 06:30	46	28	33	25
					23/09/2021 06:45	45	36	42	34	24/09/2021 06:45	48	34	39	31	25/09/2021 06:45	43	30	35	27	26/09/2021 06:45	43	29	34	26
					23/09/2021 07:00	48	40	44	35	24/09/2021 07:00	48	37	40	33	25/09/2021 07:00	43	32	36	28	26/09/2021 07:00	44	28	35	26
					23/09/2021 07:15	50	37	43	35	24/09/2021 07:15	46	35	41	33	25/09/2021 07:15	45	31	37	28	26/09/2021 07:15	49	30	37	27
					23/09/2021 07:30	49	38	44	36	24/09/2021 07:30	47	35	41	32	25/09/2021 07:30	48	30	37	27	26/09/2021 07:30	47	33	37	28
					23/09/2021 07:45	49	38	45	36	24/09/2021 07:45	47	35	42	33	25/09/2021 07:45	44	30	36	27	26/09/2021 07:45	47	31	36	28
					23/09/2021 08:00	50	38	44	36	24/09/2021 08:00	47	35	41	32	25/09/2021 08:00	46	29	36	27	26/09/2021 08:00	45	30	36	27
					23/09/2021 08:15	48	39	43	36	24/09/2021 08:15	44	36	40	31	25/09/2021 08:15	43	31	36	28	26/09/2021 08:15	47	29	35	27
					23/09/2021 08:30	47	37	42	35	24/09/2021 08:30	44	34	41	32	25/09/2021 08:30	44	32	37	30	26/09/2021 08:30	49	29	36	27
					23/09/2021 08:45	47	39	42	35	24/09/2021 08:45	46	35	40	32	25/09/2021 08:45	45	32	37	30	26/09/2021 08:45	44	30	36	27
					23/09/2021 09:00	54	49	48	40	24/09/2021 09:00	44	37	40	32	25/09/2021 09:00	42	32	36	30	26/09/2021 09:00	44	30	36	27
					23/09/2021 09:15	49	42	42	34	24/09/2021 09:15	47	37	41	34	25/09/2021 09:15	39	30	33	25	26/09/2021 09:15	47	29	36	27
					23/09/2021 09:30	44	35	41	33	24/09/2021 09:30	47	39	41	33	25/09/2021 09:30	46	30	35	26	26/09/2021 09:30	40	30	36	28
					23/09/2021 09:45	45	37	42	34	24/09/2021 09:45	48	39	42	34	25/09/2021 09:45	43	29	35	25	26/09/2021 09:45	39	30	36	28
					23/09/2021 10:00	47	40	43	34	24/09/2021 10:00	46	37	40	33	25/09/2021 10:00	43	30	34	24	26/09/2021 10:00	40	32	36	28
					23/09/2021 10:15	46	38	42	33	24/09/2021 10:15	46	34	39	31	25/09/2021 10:15	44	29	34	25	26/09/2021 10:15	42	31	37	28
					23/09/2021 10:30	48	37	43	34	24/09/2021 10:30	50	43	39	31	25/09/2021 10:30	45	28	34	25	26/09/2021 10:30	44	30	37	27
					23/09/2021 10:45	50	41	45	35	24/09/2021 10:45	46	37	40	32	25/09/2021 10:45	43	30	34	25	26/09/2021 10:45	49	34	38	28
					23/09/2021 11:00	47	38	45	35	24/09/2021 11:00	44	38	39	31	25/09/2021 11:00	43	29	35	25	26/09/2021 11:00	42	30	37	27
					23/09/2021 11:15	47	36	41	33	24/09/2021 11:15	43	38	38	29	25/09/2021 11:15	45	28	34	24	26/09/2021 11:15	40	30	36	27
					23/09/2021 11:30	50	46	42	34	24/09/2021 11:30	41	33	39	30	25/09/2021 11:30	53	40	35	25	26/09/2021 11:30	44	32	36	27
					23/09/2021 11:45	48	43	42	33	24/09/2021 11:45	49	42	39	30	25/09/2021 11:45	53	40	36	26	26/09/2021 11:45	65	57	38	29
					23/09/2021 12:00	47	41	43	34	24/09/2021 12:00	44	36	40	31	25/09/2021 12:00	52	35	36	26	26/09/2021 12:00	54	48	37	28
					23/09/2021 12:15	44	36	42	32	24/09/2021 12:15	46	38	40	31	25/09/2021 12:15	51	45	46	39	26/09/2021 12:15	46	38	39	29
					23/09/2021 12:30	47	39	42	33	24/09/2021 12:30	46	41	40	31	25/09/2021 12:30	46	36	38	30	26/09/2021 12:30	52	49	39	30
					23/09/2021 12:45	44	34	41	31	24/09/2021 12:45	46	39	41	31	25/09/2021 12:45	48	38	38	30	26/09/2021 12:45	43	36	39	30
					23/09/2021 13:00	45	36	41	31	24/09/2021 13:00	50	41	40	30	25/09/2021 13:00	50	36	37	28	26/09/2021 13:00	49	42	37	28
					23/09/2021 13:15	45	38	41	32	24/09/2021 13:15	44	39	37	28	25/09/2021 13:15	44	34	36	26	26/09/2021 13:15	44	35	38	28
					23/09/2021 13:30	46	40	43	34	24/09/2021 13:30	49	43	39	30	25/09/2021 13:30	44	33	36	25	26/09/2021 13:30	44	36	38	29
					23/09/2021 13:45	50	44	43	36	24/09/2021 13:45	41	33	39	30	25/09/2021 13:45	41	29	35	25	26/09/2021 13:45	43	36	38	28
					23/09/2021 14:00	43	35	41	32	24/09/2021 14:00	43	37	39	31	25/09/2021 14:00	41	35	35	26	26/09/2021 14:00	43	38	38	29
					23/09/2021 14:15	41	33	39	30	24/09/2021 14:15	49	43	38	29	25/09/2021 14:15	46	37	37	28	26/09/2021 14:15	41	32	37	28
					23/09/2021 14:30	46	37	39	30	24/09/2021 14:30	46	36	39	30	25/09/2021 14:30	45	32	36	29	26/09/2021 14:30	48	42	39	29
					23/09/2021 14:45	41	32	38	29	24/09/2021 14:45	47	44	39	30	25/09/2021 14:45	42	35	33	25	26/09/2021 14:45	51	48	40	30
					23/09/2021 15:00	46	39	38	30	24/09/2021 15:00	48	42	39	31	25/09/2021 15:00	47	36	35	24	26/09/2021 15:00	42	34	38	28
					23/09/2021 15:15	46	38	38	30	24/09/2021 15:15	51	44	38	30	25/09/2021 15:15	44	37	34	26	26/09/2021 15:15	48	36	38	29
					23/09/2021 15:30	51	45	38	30	24/09/2021 15:30	41	33	38	30	25/09/2021 15:30	45	38	34	24	26/09/2021 15:30	47	39	39	30
					23/09/2021 15:45	49	43	38	29	24/09/2021 15:45	40	33	37	30	25/09/2021 15:45	43	31	33	23	26/09/2021 15:45	48	40	40	31
					23/09/2021 16:00	44	36	38	29	24/09/2021 16:00	55	39	38	30	25/09/2021 16:00	54	38	34	25	26/09/2021 16:00	43	36	37	28
					23/09/2021 16:15	44	38	39	32	24/09/2021 16:15	47	34	37	30	25/09/2021 16:15	52	36	35	25	26/09/2021 16:15	54	43	38	29
					23/09/2021 16:30	51	47	47	42	24/09/2021 16:30	53	46	38	30	25/09/2021 16:30	52	37	37	27	26/09/2021 16:30	49	45	38	29
					23/09/2021 16:45	46	40	38	30	24/09/2021 16:45	42	34	38	30	25/09/2021 16:45	48	39	36	26	26/09/2021 16:45	47	36	38	28
					23/09/2021 17:00	43	32	38	29	24/09/2021 17:00	52	40	39	30	25/09/2021 17:00	47	36	36	26	26/09/2021 17:00	49	41	37	28
					23/09/2021 17:15	54	44	38	30	24/09/2021 17:15	46	33	38	29	25/09/2021 17:15	59	45	36	27	26/09/2021 17:15	44	38	37	28
					23/09/2021 17:30	52	44	40	31	24/09/2021 17:30	42	31	36	28	25/09/2021 17:30	44	31	35	26	26/09/2021 17:30	42	32	36	28
					23/09/2021 17:45	41	33	38	30	24/09/2021 17:45	46	34	37	28	25/09/2021 17:45	39	27	34	24	26/09/2021 17:45	46	38	36	27
					23/09/2021 18:00	45	34	39	30	24/09/2021 18:00	42	32	36	29	25/09/2021 18:00	39	28	33	24	26/09/2021 18:00	45	36	38	29
					23/09/2021 18:15	47	34	38	30	24/09/2021 18:15	43	32	37	29	25/09/2021 18:15	41	30	33	23	26/09/2021 18:15	49	35	38	29
					23/09/2021 18:30	43	33	38	30	24/09/2021 18:30	44	32	37	29	25/09/2021 18:30	39	30	33	24	26/09/2021 18:30	42	31	37	27
					23/09/2021 18:45	48	36	38	30	24/09/2021 18:45	46	33	37	30	25/09/2021 18:45	46	39	34	25	26/09/2021 18:45	44	32	37	28
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					23/09/2021 19:30	44	33	37	28	24/09/2021 19:30	46	35	38	30	25/09/2021 19:30	38	29	34	25	26/09/2021 19:30	42	34	39	28
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					23/09/2021 20:00	40	32	37	29	24/09/2021 20:00	42	37	38	31	25/09/2021 20:00	37	29	34	26	26/09/2021 20:00	42	34	38	29
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					23/09/2021 20:30	39	31	37	29	24/09/2021 20:30	43	35	39	32	25/09/2021 20:30	36	29	34	26	26/09/2021 20:30	40	33	37	29
					23/09/2021 20:45	39	33	36	28	24/09/2021 20:45	46	36	39	32	25/09/2021 20:45	36	29	33	25	26/09/2021 20:45	40	31	36	28
					23/09/2021 21:00	37	31	36	28	24/09/2021 21:00	46	35	38	31	25/09/2021 21:00	36	28	33	25	26/09/2021 21:00	39	31	37	28
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					23/09/2021 22:30	37	30	33	27	24/09/2021 22:30	40	34	37	31	25/09/2021 22:30	34	27	32	24	26/09/2021 22:30	37	28	34	26
					23/09/2021 22:45	39	31	35	27	24/09/2021 22:45	40	32	37	30	25/09/2021 22:45	34	29	31	24	26/09/2021 22:45	37	29	34	26

Figure 13. **MP1 Daytime September Survey 2021 07:00-23:00 LA90,1hour Frequency Distribution Chart**

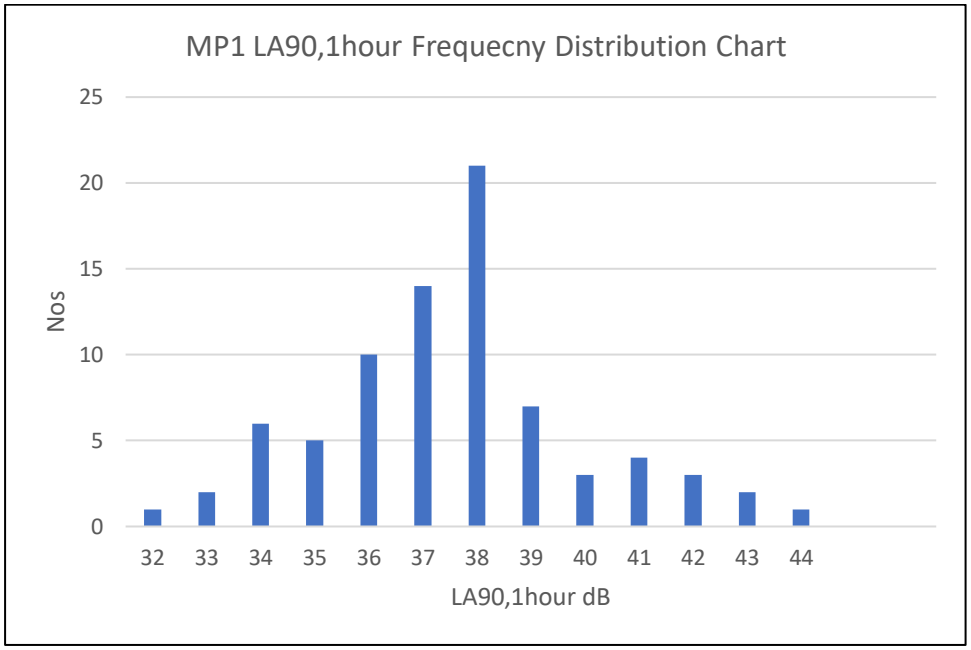


Figure 14. **MP1 September Survey 2021 Evening (19:00-23:00) LA90,1hour Frequency Distribution Chart**

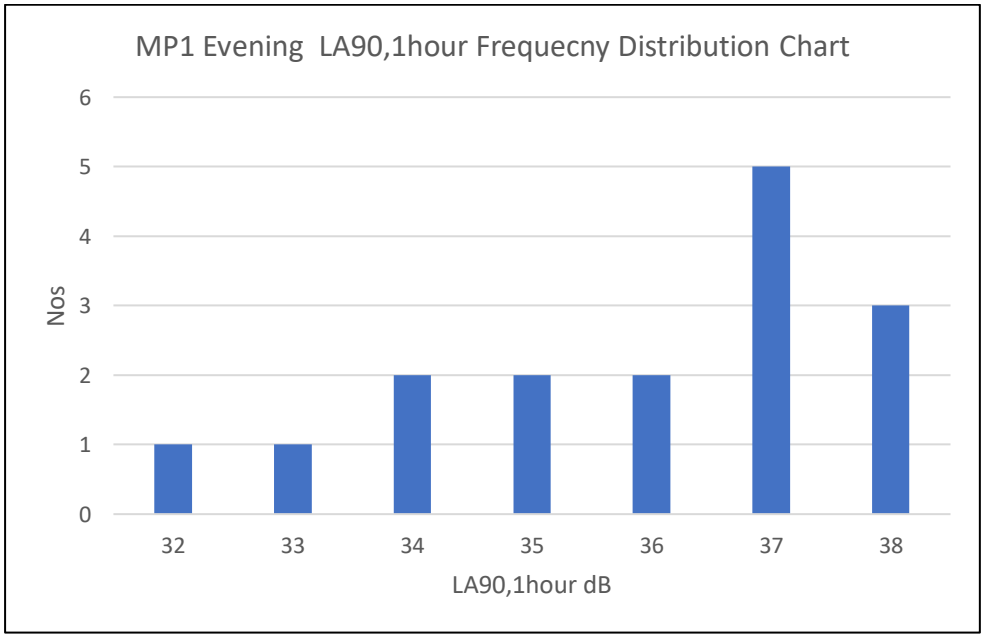


Figure 15. MP1 September Survey 2021 Night Time (23:00-07:00) LAeq,15minute Frequency Distribution Chart

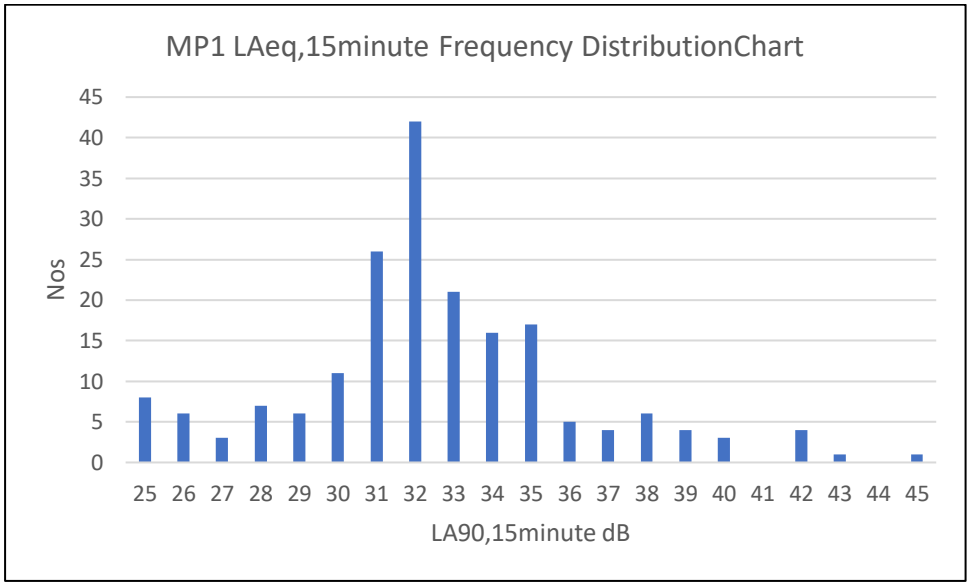


Figure 16. MP8 November 2021 Survey Daytime (07:00-23:00) LA90,1hour Frequency Distribution Chart

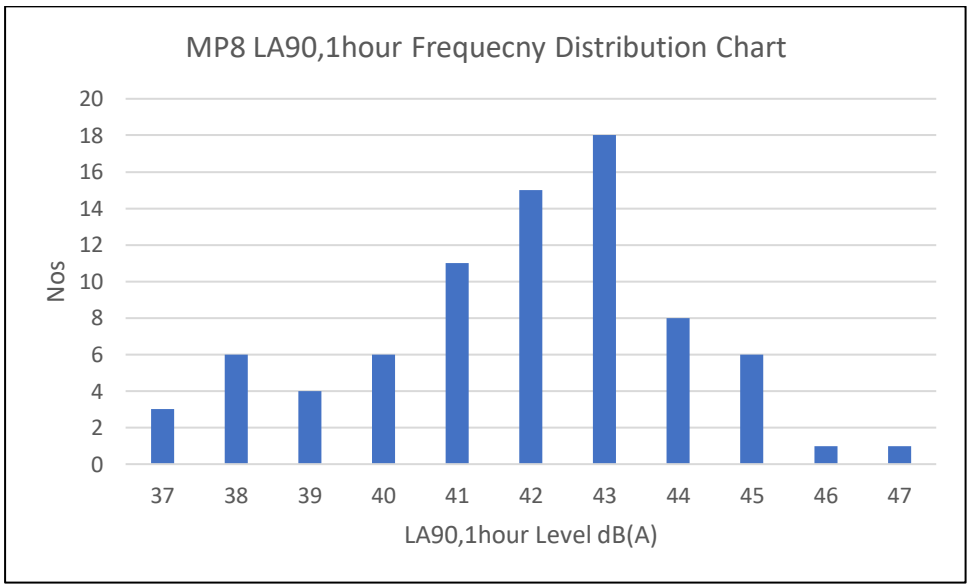


Figure 17. MP8 November Survey Evening (19:00-23:00) LA90,1hour Frequency Distribution Chart

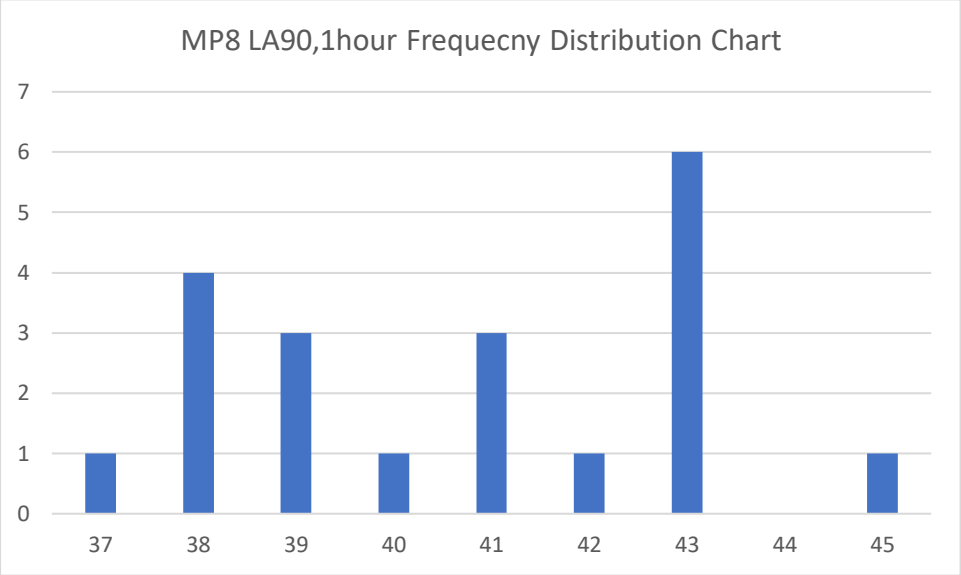
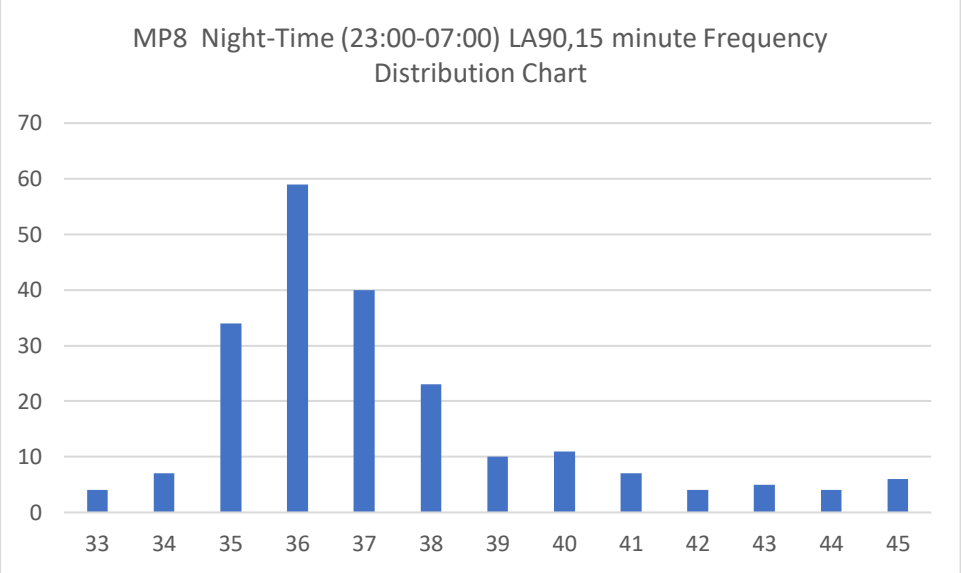
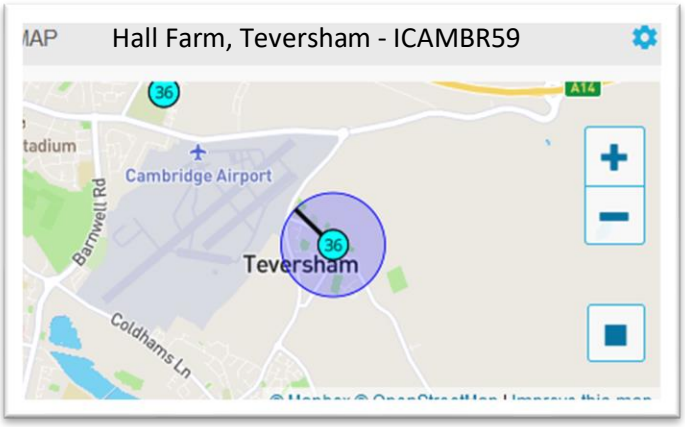
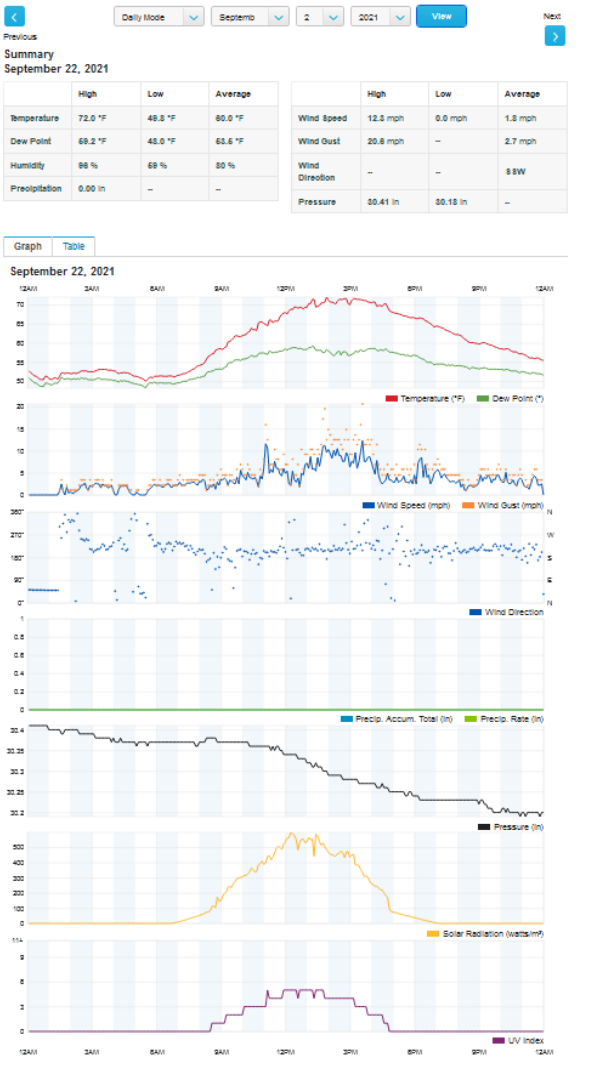


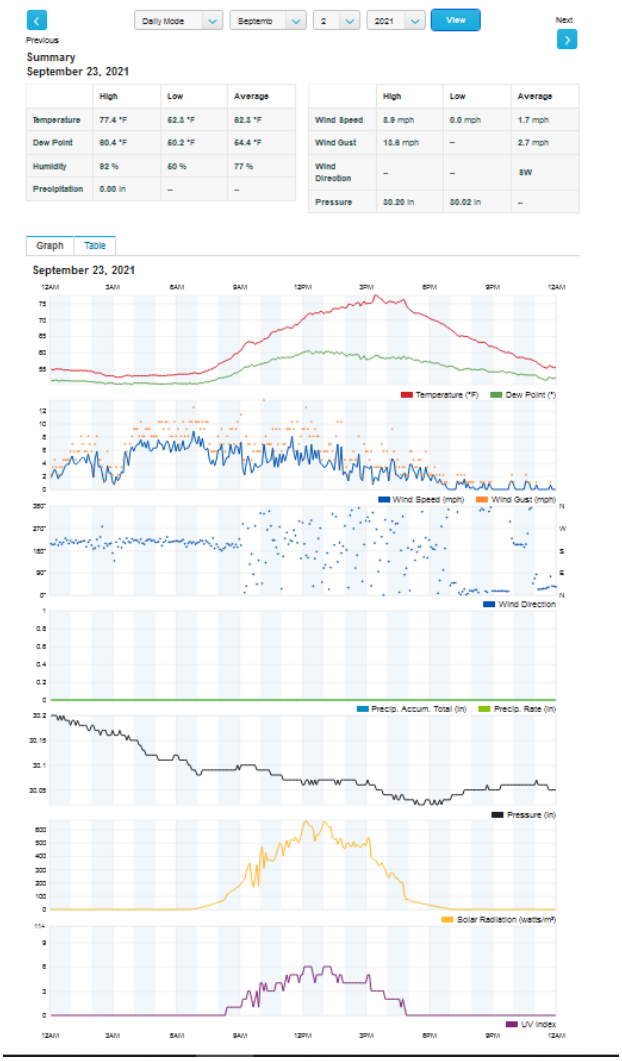
Figure 18. MP8 November 2021 Survey Night-Time (23:00-07:00) LA90,15 minute Frequency Distribution Chart

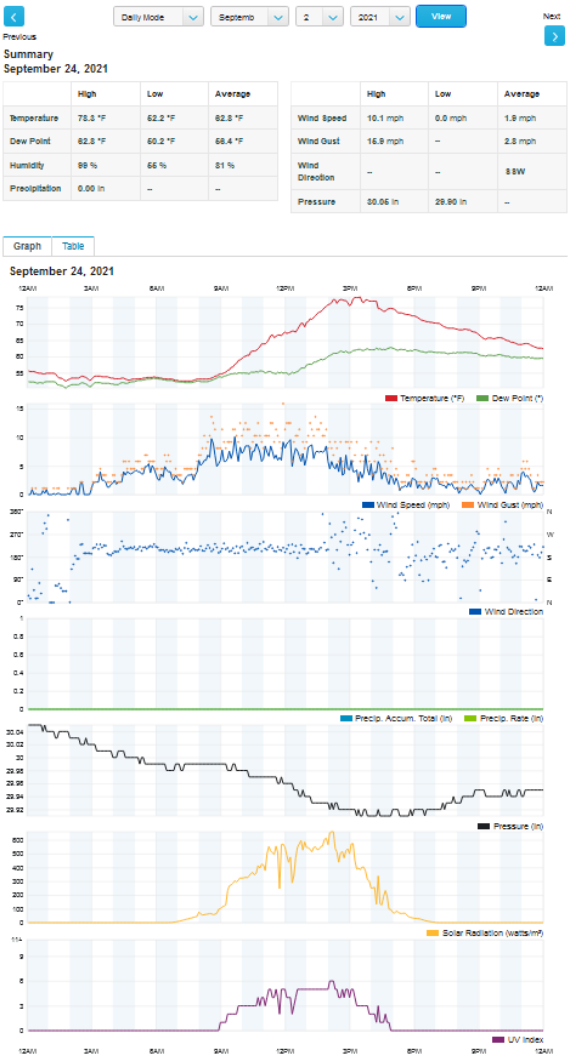


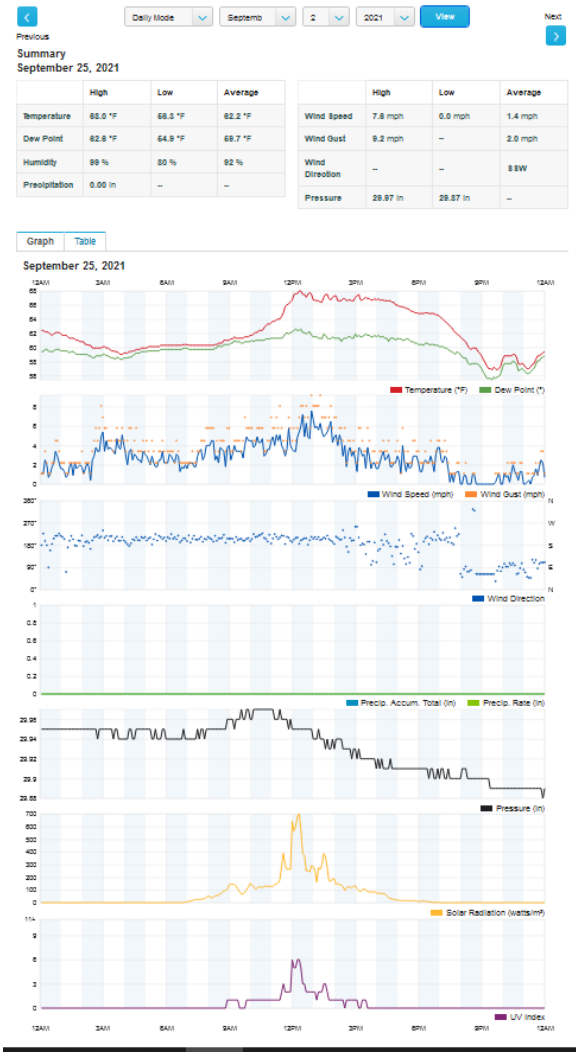
Appendix D: Meteorological Data



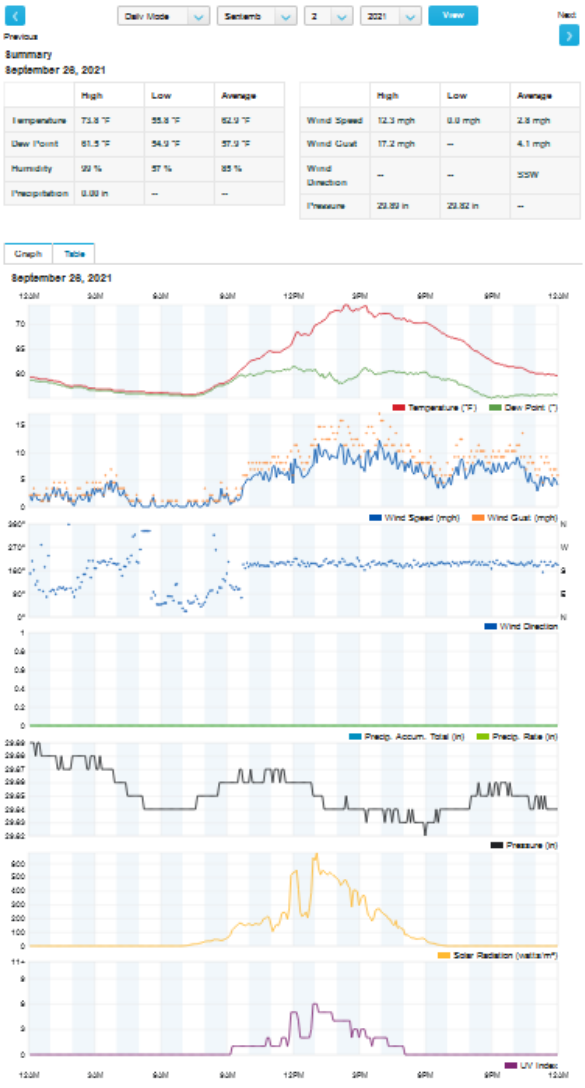


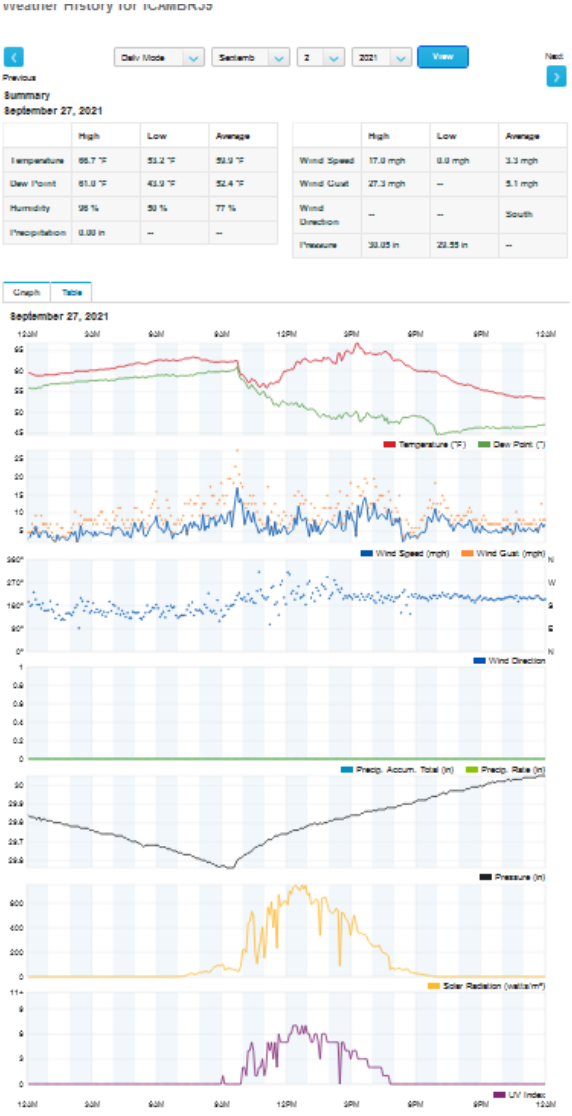


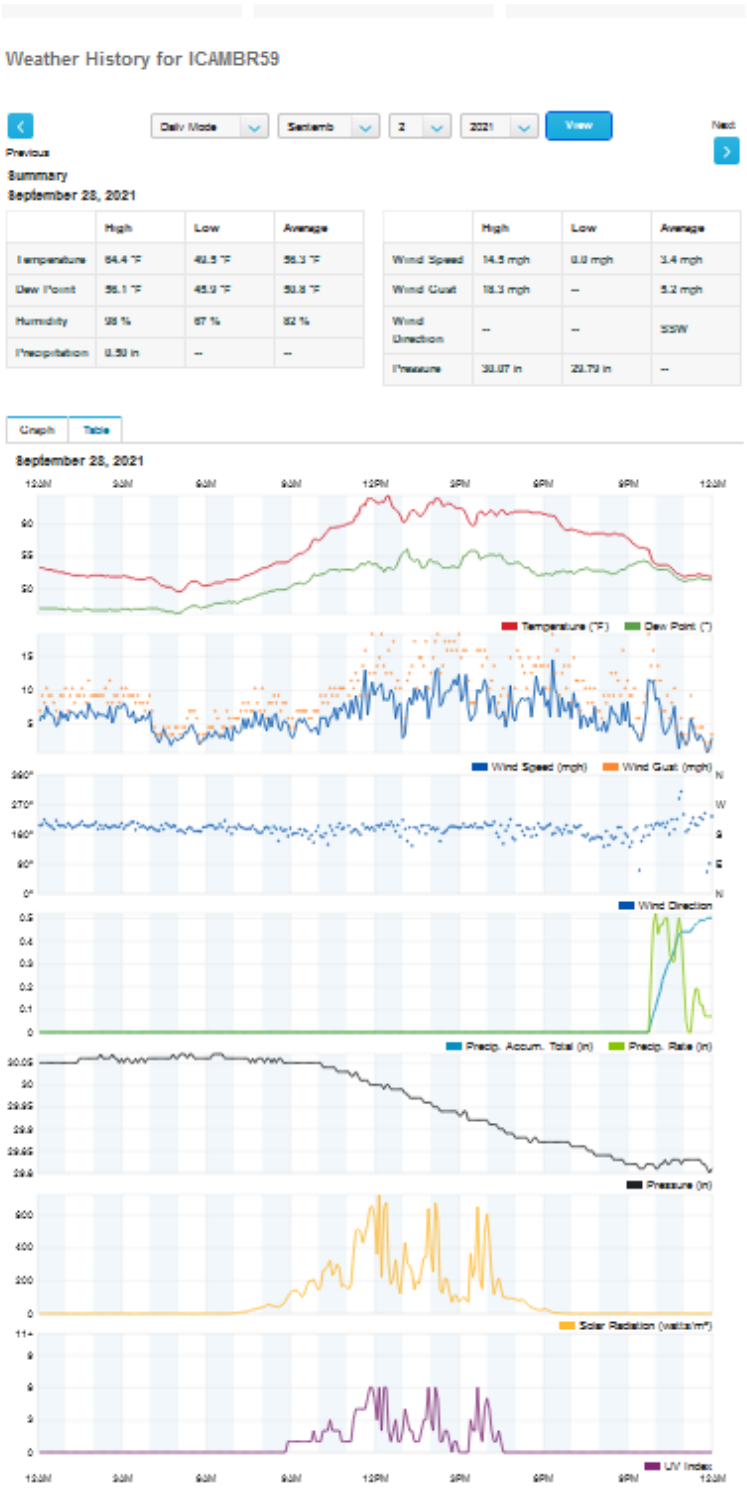

Daily Mode
Septemb
2
2021
View
Previous
Next
Summary
September 24, 2021
High
Low
Average
Temperature
78.0 °F
62.2 °F
68.8 °F
Dew Point
62.8 °F
60.2 °F
58.4 °F
Humidity
98 %
66 %
81 %
Precipitation
0.00 in
--
--
Wind Speed
10.1 mph
0.0 mph
1.9 mph
Wind Gust
16.9 mph
--
2.8 mph
Wind Direction
--
--
SSW
Pressure
30.06 in
29.90 in
--
Graph
Table
September 24, 2021
Temperature (°F)
Dew Point (°)
Wind Speed (mph)
Wind Gust (mph)
Wind Direction
Precip. Accum. Total (in)
Precip. Rate (in)
Pressure (in)
Solar Radiation (watts/m²)
UV Index


Daily Mode
Septemb
2
2021
View
Previous
Next
Summary
September 25, 2021
High
Low
Average
Temperature
68.0 °F
58.3 °F
62.2 °F
Dew Point
62.8 °F
54.9 °F
58.7 °F
Humidity
99 %
80 %
92 %
Precipitation
0.00 in
--
--
Wind Speed
7.8 mph
0.0 mph
1.4 mph
Wind Gust
9.2 mph
--
2.0 mph
Wind Direction
--
--
SSW
Pressure
29.97 in
29.87 in
--
Graph
Table
September 25, 2021
Temperature (°F)
Dew Point (°)
Wind Speed (mph)
Wind Gust (mph)
Wind Direction
Precip. Accum. Total (in)
Precip. Rate (in)
Pressure (in)
Solar Radiation (watts/m²)
UV Index

Weather History for ICAMBR59






Weather History for ICAMBR59
Previous
Daily Mode
September
2
2021
View
Next
Summary
September 28, 2021
High
Low
Average
Temperature
64.4 °F
49.5 °F
55.3 °F
Dew Point
56.1 °F
45.9 °F
50.8 °F
Humidity
98 %
67 %
82 %
Precipitation
0.50 in
--
--
Wind Speed
14.5 mph
0.0 mph
3.4 mph
Wind Gust
18.3 mph
--
5.2 mph
Wind Direction
--
--
SSW
Pressure
30.07 in
29.79 in
--
Graph
Table
September 28, 2021
Temperature (°F)
Dew Point (°)
Wind Speed (mph)
Wind Gust (mph)
Wind Direction
Precip. Accum. Total (in)
Precip. Rate (in)
Pressure (in)
Solar Radiation (watts/m²)
UV Index

Previous | Daily Mode | November | 1 | 2021 | View | Next

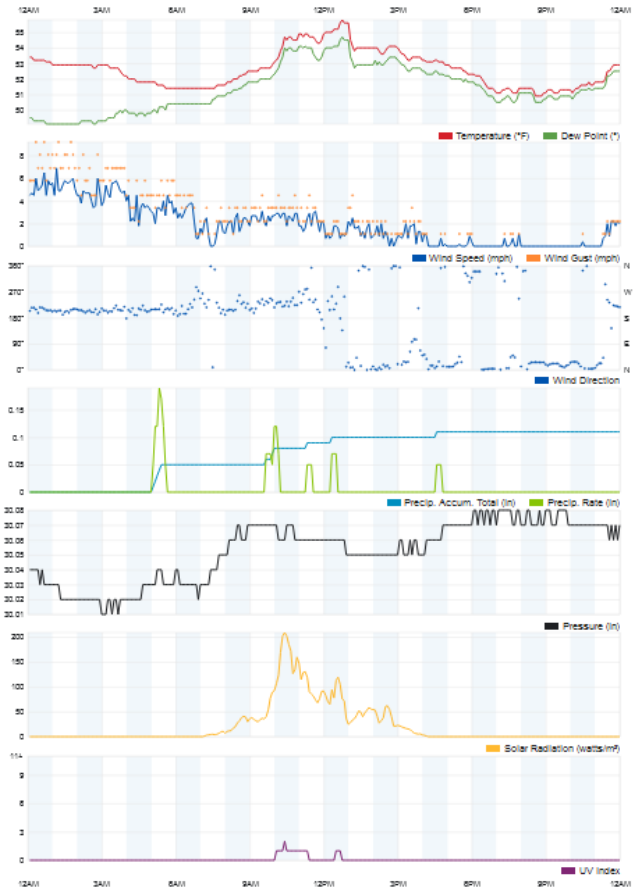
Summary
November 10, 2021

	High	Low	Average
Temperature	66.8 °F	60.8 °F	62.8 °F
Dew Point	64.7 °F	48.8 °F	61.3 °F
Humidity	99 %	88 %	96 %
Precipitation	0.11 in	--	--

	High	Low	Average
Wind Speed	6.9 mph	0.0 mph	1.0 mph
Wind Gust	9.2 mph	--	1.4 mph
Wind Direction	--	--	SSW
Pressure	30.08 in	30.00 in	--

Graph | Table

November 10, 2021



Previous | Daily Mode | November | 11 | 2021 | View | Next

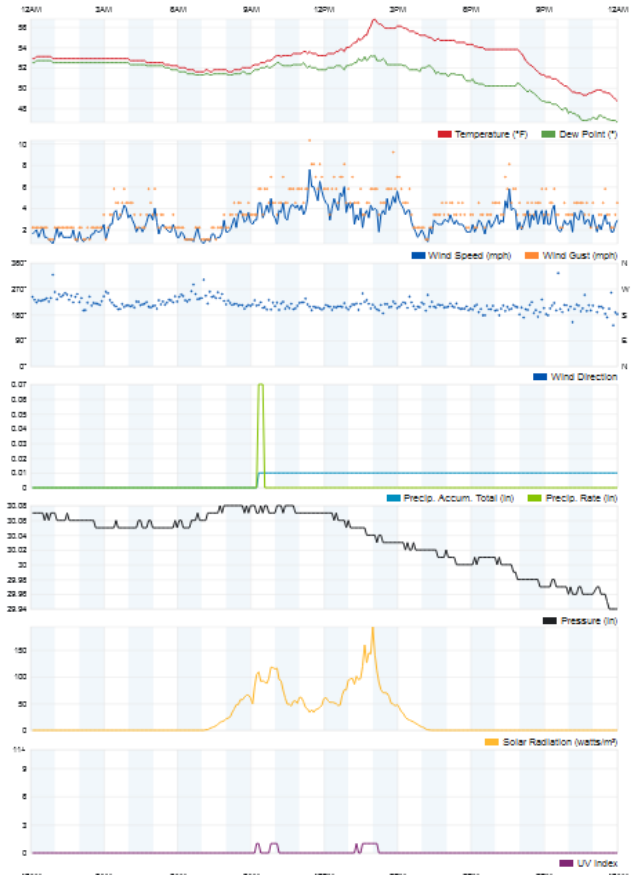
Summary
November 11, 2021

	High	Low	Average
Temperature	68.8 °F	48.4 °F	62.9 °F
Dew Point	68.2 °F	48.2 °F	61.2 °F
Humidity	99 %	88 %	94 %
Precipitation	0.01 in	--	--

	High	Low	Average
Wind Speed	7.8 mph	0.0 mph	1.6 mph
Wind Gust	10.3 mph	--	2.1 mph
Wind Direction	--	--	SSW
Pressure	30.08 in	29.93 in	--

Graph | Table

November 11, 2021



Weather History for ICAMBR59

Previous | Daily Mode | November | 1 | 2021 | View | Next

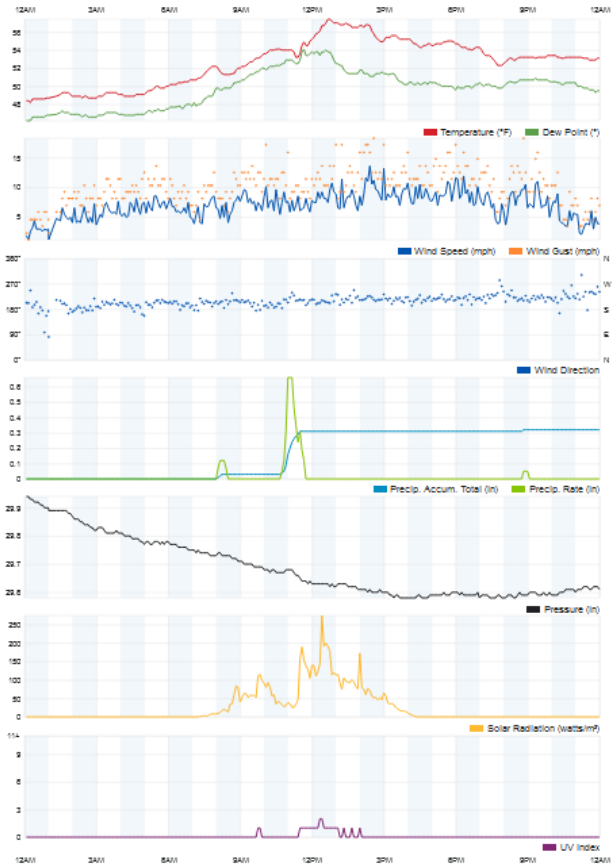
Summary
November 12, 2021

	High	Low	Average
Temperature	67.4 °F	48.2 °F	62.6 °F
Dew Point	64.1 °F	46.0 °F	49.7 °F
Humidity	97 %	80 %	90 %
Precipitation	0.32 in	--	--

	High	Low	Average
Wind Speed	13.8 mph	0.0 mph	4.0 mph
Wind Gust	18.3 mph	--	6.9 mph
Wind Direction	--	--	SSW
Pressure	29.94 in	29.67 in	--

Graph | Table

November 12, 2021



Weather History for ICAMBR59

Previous | Daily Mode | November | 1 | 2021 | View | Next

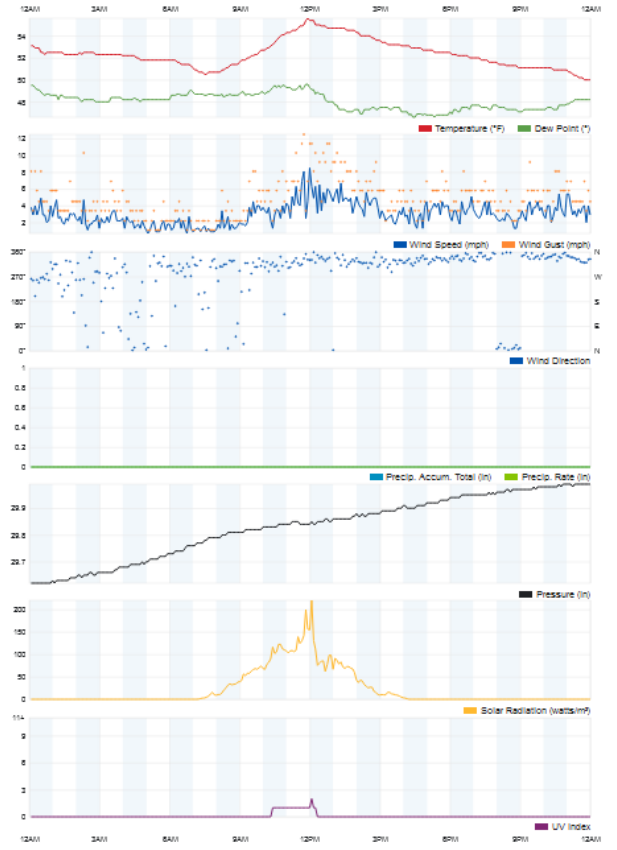
Summary
November 13, 2021

	High	Low	Average
Temperature	66.8 °F	49.3 °F	62.4 °F
Dew Point	49.8 °F	46.6 °F	48.0 °F
Humidity	84 %	76 %	86 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	8.6 mph	0.0 mph	1.2 mph
Wind Gust	12.6 mph	--	2.0 mph
Wind Direction	--	--	NW
Pressure	29.99 in	29.81 in	--

Graph | Table

November 13, 2021



Weather History for ICAMBR59

Previous | Daily Mode | November | 1 | 2021 | View | Next

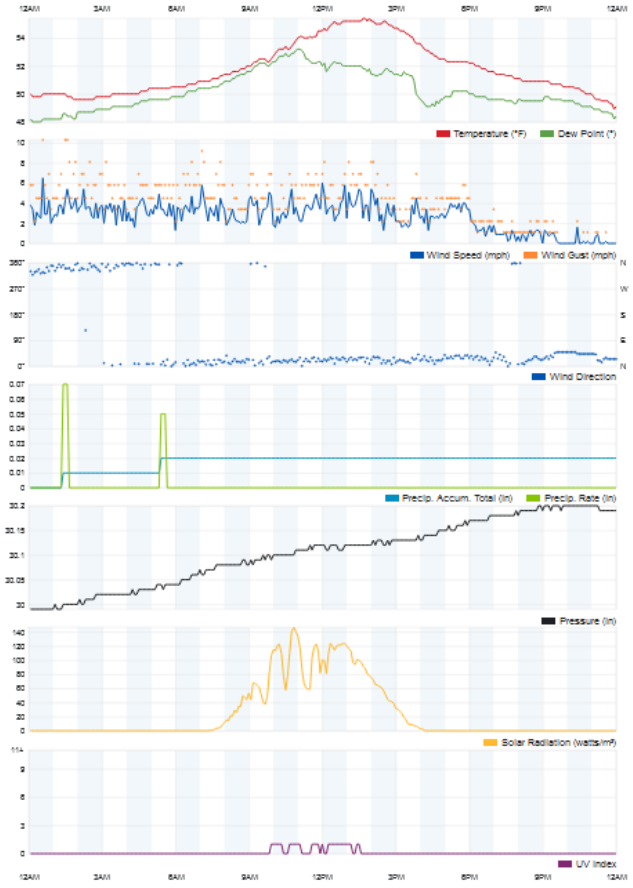
Summary
November 14, 2021

	High	Low	Average
Temperature	65.4 °F	43.8 °F	51.7 °F
Dew Point	53.2 °F	43.0 °F	50.1 °F
Humidity	99 %	88 %	94 %
Precipitation	0.02 in	--	--

	High	Low	Average
Wind Speed	6.6 mph	0.0 mph	1.1 mph
Wind Gust	10.3 mph	--	1.8 mph
Wind Direction	--	--	North
Pressure	30.20 in	29.98 in	--

Graph | Table

November 14, 2021



Weather History for ICAMBR59

Previous | Daily Mode | November | 1 | 2021 | View | Next

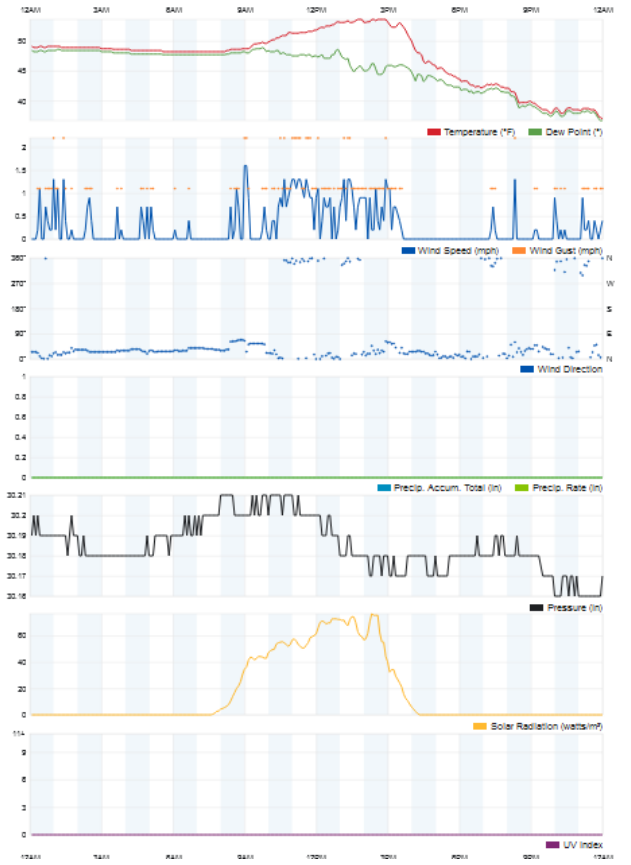
Summary
November 15, 2021

	High	Low	Average
Temperature	63.6 °F	38.9 °F	47.1 °F
Dew Point	48.9 °F	38.3 °F	45.1 °F
Humidity	89 %	69 %	83 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	1.8 mph	0.0 mph	0.1 mph
Wind Gust	2.2 mph	--	0.1 mph
Wind Direction	--	--	North
Pressure	30.21 in	30.16 in	--

Graph | Table

November 15, 2021



Weather History for ICAMBR59

Previous

Daily Mode | November | 1 | 2021 | View

Next

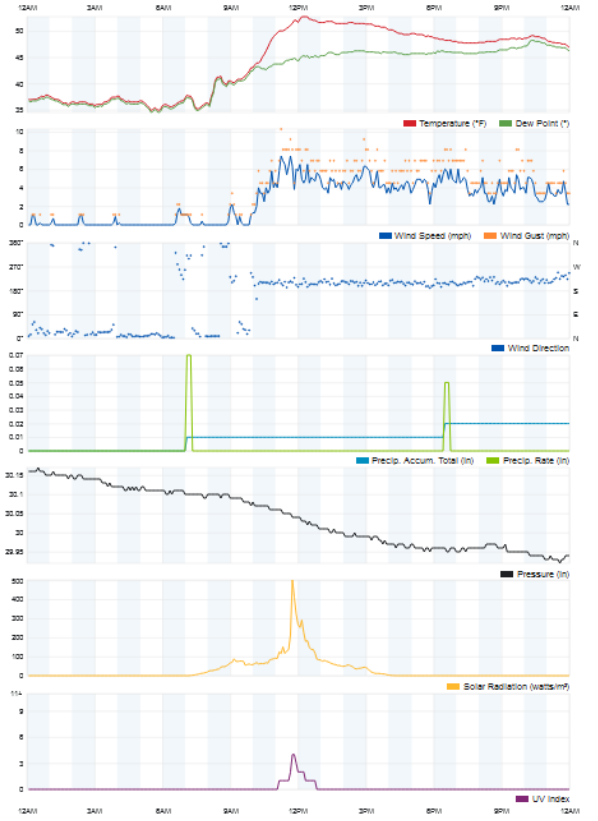
Summary
November 16, 2021

	High	Low	Average
Temperature	62.7 °F	34.6 °F	44.2 °F
Dew Point	48.2 °F	34.2 °F	41.8 °F
Humidity	99 %	74 %	92 %
Precipitation	0.02 in	--	--

	High	Low	Average
Wind Speed	7.4 mph	0.0 mph	1.8 mph
Wind Gust	10.3 mph	--	2.2 mph
Wind Direction	--	--	SSW
Pressure	30.17 in	29.92 in	--

Graph | Table

November 16, 2021



Weather History for ICAMBR59

Previous

Daily Mode | November | 1 | 2021 | View

Next

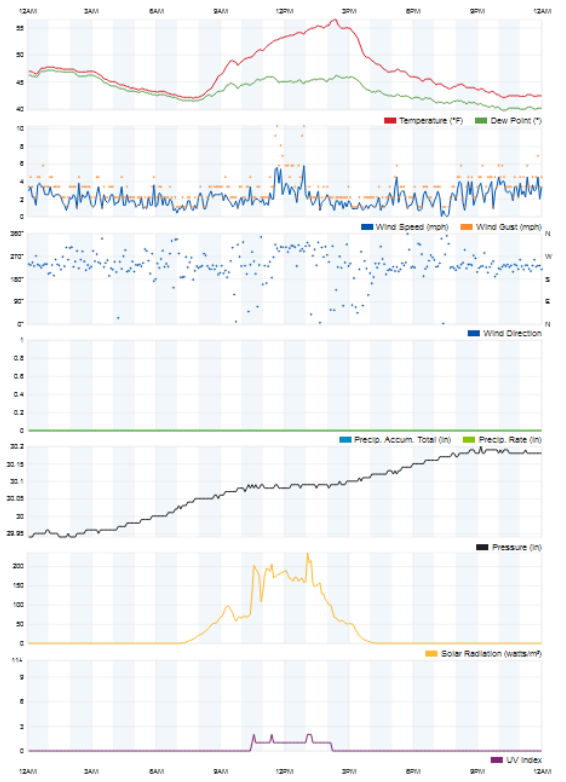
Summary
November 17, 2021

	High	Low	Average
Temperature	68.6 °F	41.9 °F	48.9 °F
Dew Point	47.1 °F	39.7 °F	43.5 °F
Humidity	88 %	66 %	83 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	6.8 mph	0.0 mph	0.9 mph
Wind Gust	10.3 mph	--	1.4 mph
Wind Direction	--	--	WSW
Pressure	30.20 in	29.93 in	--

Graph | Table

November 17, 2021



Appendix E: Glossary of Terms

'A' weighting (dB(A)): A frequency dependent correction which weights sound to correlate with the sensitivity of the human ear to sounds of different frequencies.

Ambient Noise: A measure of the typical noise (excluding any unusual events) present at a site, or in a room. This is usually described in terms of *L*Aeq,T.

Audible: Sound that can be heard or is perceptible by the human ear.

Background Noise: A measure of the underlying noise (excluding any unusual events) which is present at a site before a new noise source is introduced. This is usually described in terms of the *L*A90 level: the sound pressure level exceeded for 90% of the time.

Decibel (dB): A unit used for many acoustic quantities to indicate the level of sound with respect to a reference level.

External Amenity Space: An outdoor area near to a residential building which is designed and intended primarily for leisure and recreational use by the occupants of the dwelling. This will include gardens, patios, balconies, roof gardens and terraces.

Hertz (Hz): The tonal quality of a sound is described and measured in terms of the frequency content and is commonly expressed as octave or third octave bands, the latter being the division of the octave bands into three for finer analysis, across the frequency spectrum. The smaller the octave band or third octave band centre frequency number defined in terms of Hz, the lower the sound. For example 63 Hz is lower than 500 Hz and is perceived as a deeper sound. The attenuation due to air absorption and natural barriers increases with frequency i.e. low frequencies are always the most difficult to control

Inaudible: Sound that cannot be heard or is imperceptible to the human ear.

LA90,T: Sound pressure level exceeded for 90% of the measurement period "T" or 'background level'.

LAeq,T: Equivalent continuous sound pressure level measured over the time period "T"

LAmax: The maximum RMS A weighted sound pressure level

Music Noise Level (MNL): The Leq of music noise measured at a particular location.

Noise: Unwanted sound.

Noise assessment: A basic evaluation of an acoustic environment by a suitably qualified person to assist in the determination of a planning application..

Noise impact: the noise level of the source under consideration, and/or any change in noise levels due to the scheme, and/or the relationship between the noise level of the source under consideration and a descriptor of the existing noise climate; at a receptor or group of receptors.

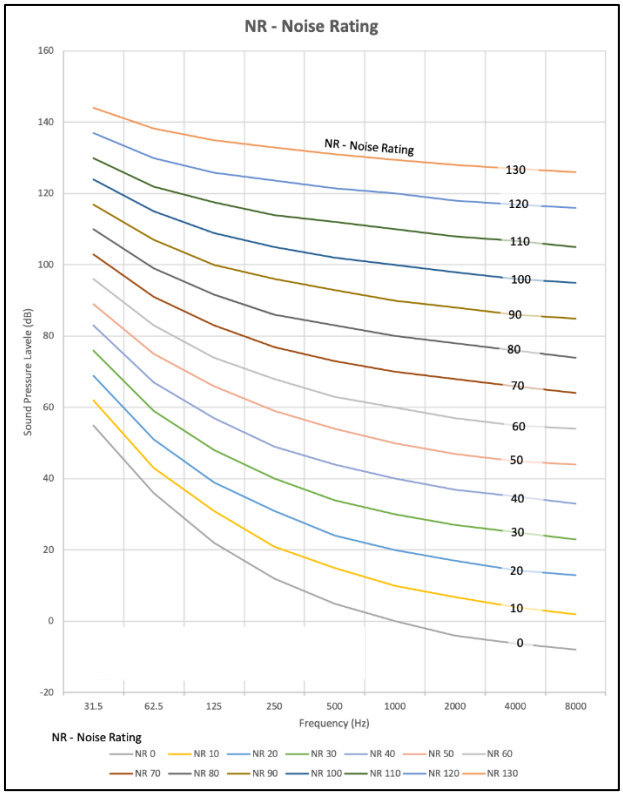
Noise effect: the consequence of the noise impact e.g. annoyance, sleep disturbance, speech interference, disruption of learning/teaching, health consequences, fauna displacement etc. Noise

impact and noise effect are related to each other and the noise effect is related to the magnitude of the noise impact as well as other factors e.g. sensitivity of the receptor, duration of the noise, how frequently it occurs, the time of day or night it occurs, whether the noise is temporary, reversible or permanent etc.

Noise Emission & Noise Immissions – Noise emissions are the sound emitted by a source. Noise immissions is the sound heard by an observer. The former is relatively independent of the environment in which the noise source is located (outdoors, in a room, etc.) Noise immissions may come from several sources and are always dependent on the environment in which the sources are located. The position of a source in a room, the size of the room, and the amount of sound absorption in the room all influence noise immissions. Outdoors, immissions levels can be influenced by the nature of the terrain, sound absorption by the ground, and wind and temperature gradients—among other effects.

Noise level (Lp): the logarithmic measure of the RMS sound pressure of a sound relative to a reference value that represents the threshold of hearing. It is measured in decibels (dB) e.g. Lp = 20 lg (p/po) dB re 20 µPa for air.

Noise Rating (NR) Level: is a graphical method for assigning a single-number rating to a noise spectrum. It can be used to specify the maximum acceptable level in each octave band of a frequency spectrum, or to assess the acceptability of a noise spectrum for a particular application.



Noise sensitive premises / developments: Principally comprising residential premises, hospitals, schools and hotels. Other premises and sites may be deemed to be noise sensitive depending upon circumstances.

Typical sound pressure levels