



79-89

Northumberland
Avenue, Reading

Noise Impact Assessment

October 2022



Ref: 22-9964

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1. Executive Summary

An assessment has been carried out of the present noise climate at **79-89 Northumberland Avenue, Reading**. The proposed scheme involves development of the site to create an additional 12 residential units to an existing mixed commercial and residential site by a 2 storey upwards extension.

The site is located in an area of mixed commercial and residential use. On the ground floor of the existing buildings are two takeaway businesses, and a general store, hairdressers, private ultrasound business and a charity shop. The takeaway business are Dilwar (No. 87) which is open 1200 hrs – 2200 hrs 7 days a week and Bo Wah (No. 85) which is open 1700 hrs – 2300 hrs 7 days a week. There are also residential properties above the commercial units at first floor level. Plant associated with the commercial units are currently located at ground/first floor level facing east towards the rear car park and consist of 2 extract fans and 5 condenser units. The extract fans rise slightly above the existing walkway to the 1st floor flats and face away from the flats. Further to the east at the rear of the car park is an existing substation. To the west of the site is Northumberland Avenue and beyond that are residential houses.

The assessment is based on the results of a detailed noise measurement survey that has been carried at the proposed development site and has considered the advice of local and national planning policy and best practice guidance. A detailed assessment of existing plant noise has been carried out and it has been identified that, although adverse impacts are possible, significant adverse impacts from plant noise are not likely.

Good acoustic design has been shown by orientation of all bedrooms facing Northumberland Avenue where there would be no plant noise affecting the proposed units.

It has been identified that the requirements of the Local Authority in respect of internal noise levels can only be achieved through careful consideration of the building envelope. We note that this does not necessitate that the windows be sealed shut but requires that an alternate primary means of ventilating the properties is provided (as defined by the Building Regulations Approved Document F). In carrying out our assessment, Syntegra have therefore made the following assumptions:

- **The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.**
- **A typical double glazing system in a 4/12/6 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 28 dB R_w .**
- **Appropriately specified acoustic trickle vents, with a $D_{n,e,w}$ of at least 34 dB, or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.**
- **Purge ventilation (as defined in Approved Document F) through open windows.**
- **Mitigation of overheating through open windows acceptable from an acoustic perspective.**

Overall, it has been shown that, through careful consideration of the building envelope construction, the proposed development should avoid future residents being exposed to harmful levels of noise. It can therefore be concluded that significant adverse impacts on the health or quality of life of those future residents would be avoided, in line with the aims of the NPPF, NPSE and PPG-Noise.

2. Introduction

This report has been prepared to support the planning application for the proposed development at **79-89 Northumberland Avenue, Reading**. The proposed scheme involves development of the site to create an additional 12 residential units to an existing mixed commercial and residential site by a 2 storey upwards extension.

The report assesses, through on-site noise measurements, the impact of the existing noise climate on the proposed development.

A glossary of acoustic terminology is provided in **Appendix 1**.

The site is located in an area of mixed commercial and residential use. On the ground floor of the existing buildings are two takeaway businesses, and a general store, hairdressers, private ultrasound business and a charity shop. The takeaway business are Dilwar (No. 87) which is open 1200 hrs – 2200 hrs 7 days a week and Bo Wah (No. 85) which is open 1700 hrs – 2300 hrs 7 days a week. There are also residential properties above the commercial units at first floor level. Plant associated with the commercial units are currently located at ground/first floor level facing east towards the rear car park and consist of 2 extract fans and 5 condenser units. The extract fans rise slightly above the existing walkway to the 1st floor flats and face away from the flats. Further to the east at the rear of the car park is an existing substation. To the west of the site is Northumberland Avenue and beyond that are residential houses.

The location of the proposed development site is provided in **Figure 2.1**. Site layouts showing the residential units to be added to the site are provided in **Figure 2.2** and **Figure 2.3**. A photograph of the plant area is provided in **Figure 2.4** to show the orientation of the extract fans.



Figure 2.1: Site Location

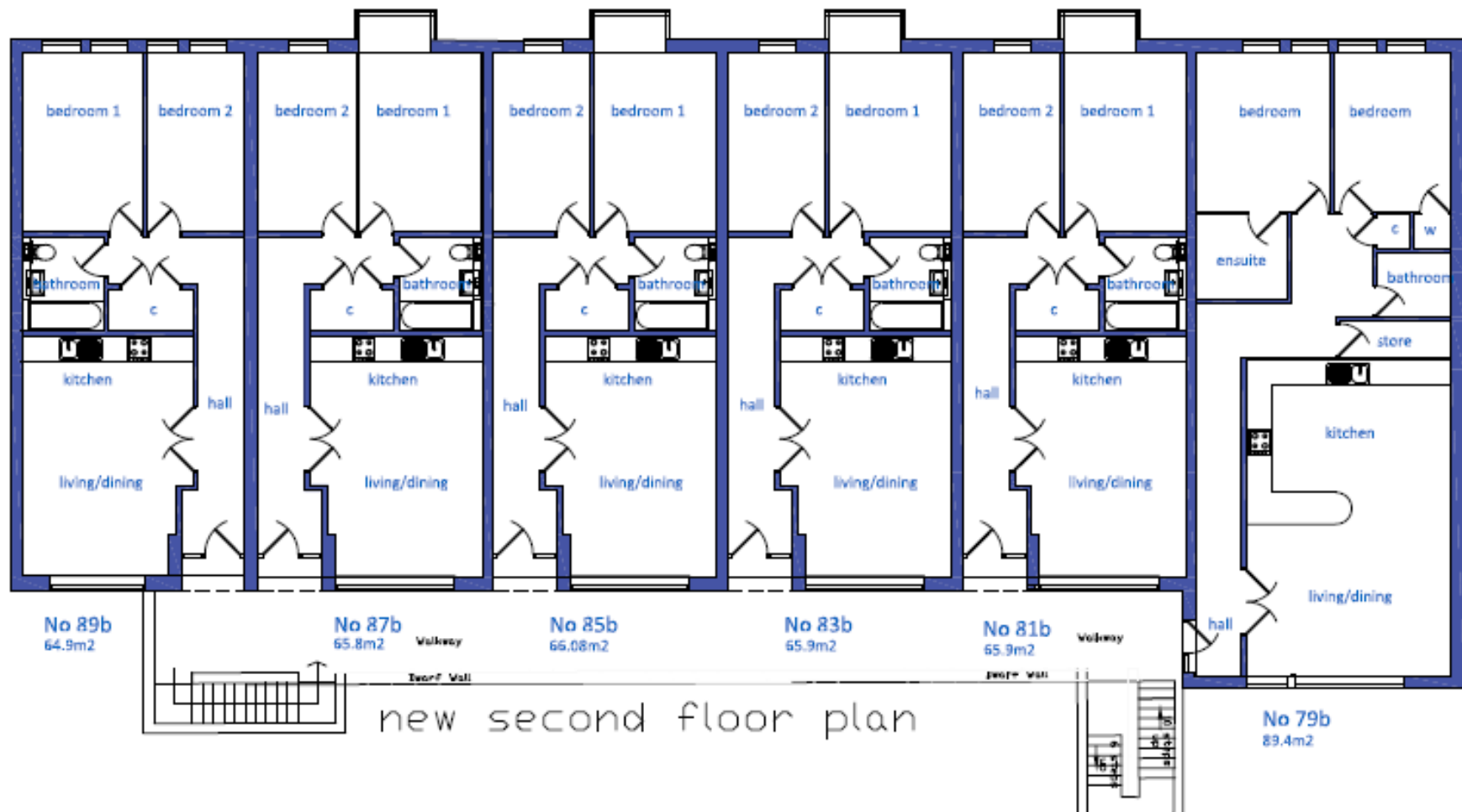


Figure 2.2: Proposed Second Floor Layout



Figure 2.3: Proposed Third Floor Layout

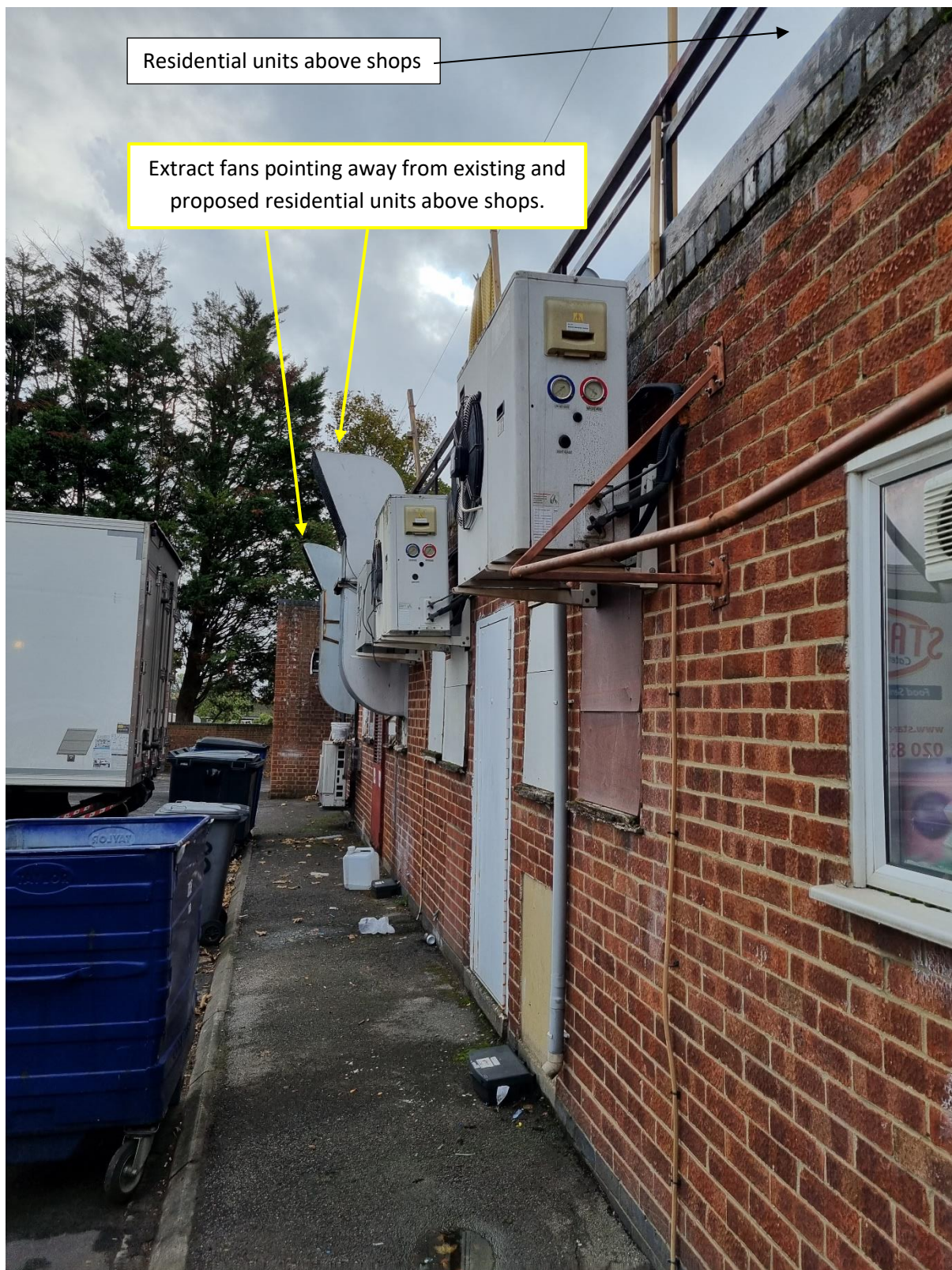


Figure 2.4: Existing Plant Area

3. Planning Policy

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was released in March 2012 and last updated in July 2021. The purpose of the planning system is to contribute to the achievement of sustainable development and to encourage good design. There are three dimensions to sustainable development: economic, social and environmental.

Central to the NPPF, paragraph 10 states: *'At the heart of the National Planning Policy Framework is a presumption in favour of [permitting] sustainable development'*. This is expanded upon in paragraph 11, where it is stated:

'...For decision-taking this means:

- *approving development proposals that accord with an up-to-date development plan without delay; or*
- *where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:*
 - *the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or*
 - *any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole'*

Paragraph 174 states *'Planning policies and decisions should contribute to and enhance the natural and local environment by... preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of... noise pollution...'*.

Paragraph 185 states: *'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life (see Explanatory Note to the Noise Policy Statement for England (DEFRA)).*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- *limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'*

3.2. Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) aims to *'through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.'*

3.3. Local Planning Policy

The site is located within the administrative boundary of Reading Borough Council (RBC).

Consultation advice has been received from Rebecca Moon, Senior Environmental Officer at RBC, dated 11th October 2022 (for application reference 221412), which states:

'I believe that a noise assessment is required to establish whether commercial noise will affect the proposed dwellings. I appreciate that one storey of residential dwellings exists already, however, the nature of the commercial units means that there is likely to be noisy mechanical plant on site such as refrigeration condenser units and kitchen extraction which can impact on properties higher off the ground depending on where the plant is installed. In addition, no evidence has been submitted to demonstrate that noise does not currently impact on the existing properties.'

Syntegra have further liaised with Ms. Moon and received the following advice in respect of plant noise in an email dated 19th October 2022:

'Measured noise levels will be assessed to external noise assessment to BS4142:2014 – A.1:2019, with a contextual assessment of internal levels to BS8233:2014. The BS8233:2014 are to be revised downwards for allowance that the noise from the units is industrial and not anonymous as per the criteria of BS8233:2014.

Ventilation requirements will be dependent on final internal layouts.

If the noise is determined to be an issue with windows open, we would request that reduction of the noise at source is considered if possible in the particular circumstances (screening, silencers, relocation of plant).

If the noise mitigation relies on closed windows, we normally require ventilation additional to trickle vents, with a 5 dB leeway on BS8233 values.'

Policy EN16 from the Reading Borough Local Plan (adopted November 2019) is relevant to noise impact on the proposed development, and states:

"EN16: POLLUTION AND WATER RESOURCES

Development will only be permitted where it would not be damaging to the environment and sensitive receptors through land, noise or light pollution; where it would result in no deterioration in, or ideally enhance, ground and surface water quality; and where adequate water resources, sewerage and wastewater treatment infrastructure will be in place to support the proposed development prior to occupation.

Proposals for development that are sensitive to the effects of noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution.

Development will only be permitted on land affected by contamination where it is demonstrated that the contamination and land gas can be satisfactorily managed or remediated so that it is suitable for the proposed end use and will not impact on the groundwater environment, human health, buildings and the wider environment, during demolition and construction phases as well as during the future use of the site."

4. Guidance Documents

4.1. Planning Practice Guidance for Noise

The Planning Practice Guidance for Noise (PPG-Noise) was published in March 2014 and last updated in July 2019. The PPG provides advice on how to determine the noise impact on development:

'Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.'

The document goes on to provide a definition for the levels of noise exposure at which an effect may occur:

'Significant observed adverse effect level: *this is the level of noise exposure above which significant adverse effects on health and quality of life occur.*

Lowest observed adverse effect level: *this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*

No observed effect level: *this is the level of noise exposure below which no effect at all on health and quality of life can be detected.'*

It is important to understand that as the PPG-Noise does not provide any advice with respect to specific noise levels/ limits for different sources of noise, it is appropriate to consider other sources of advice and guidance documents when considering whether new developments would be sensitive to the prevailing acoustic environment.

4.2. Professional Practice Guidance on Planning & Noise.

The Professional Practice Guidance (ProPG) on Planning and Noise for New Residential Development was published in May 2017 by the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH). The document has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England and provides numerical acoustic standards in line with the objectives of the Government's planning and noise policy. As a collaboration between the ANC, IOA and CIEH the document has been designed to encourage a good acoustic design process and aims to protect people from the harmful effects of noise.

The ProPG notes that it *'does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate'*.

The ProPG advocates a two-stage approach, first providing an initial noise risk assessment of the proposed development site before undertaking a systematic approach to the noise impact assessment. The results of the initial noise risk assessment are an indication as to how detailed the noise impact assessment will need to be in order to satisfactorily assess all acoustic challenges.

4.2.1. Stage 1: Initial Site Noise Risk Assessment

The initial noise risk assessment compares the site noise levels (which can be obtained by measurement or prediction, or a combination of the two, as appropriate) against a risk scale and determines the risk of adverse effects from noise at the site. The purpose of the initial noise risk assessment is to provide an indication of the level of acoustic challenges at the site. In general, the higher the level of risk identified, the greater the level of detail that will be required within the noise impact assessment in order to satisfactorily demonstrate that adverse impacts will be minimised to an acceptable level.

The initial risk assessment and associated notes are provided in Figure 1 of the ProPG and reproduced in **Table 4.1**.

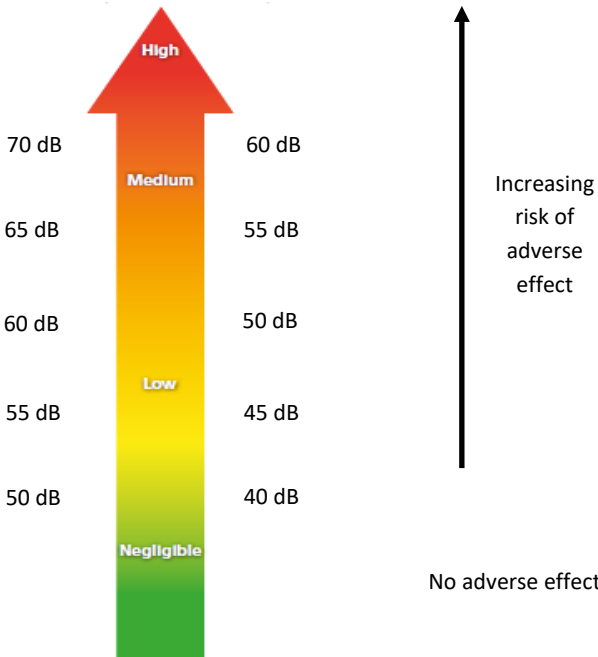
Noise Risk Assessment		Potential Effect Without Noise Mitigation	Pre-Planning Application Advice
Indicative Daytime Noise Levels, $L_{Aeq,16hr}$	Indicative Night-time Noise Levels, $L_{Aeq,8hr}$		
 Increasing risk of adverse effect No adverse effect		High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed Acoustic Design Statement (ADS). Applicants are strongly advised to seek expert advice. As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development. At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development. These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.	
Notes:			
a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures. b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is “not dominant”. c. $L_{Aeq,16hr}$ is for daytime 0700 hrs – 2300 hrs, $L_{Aeq,8hr}$ is for night-time 2300 hrs – 0700 hrs. d. An indication that there may be more than 10 noise events at night (2300 hrs – 0700 hrs) with $L_{Amax,F} > 60$ dB means that the site should not be regarded as negligible risk.			

Table 4.1: Stage 1: Initial Site Risk Assessment

Where sites are exposed to industrial or commercial noise that is considered to be “dominant” then an assessment in line with BS 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ should be carried out.

4.2.2. Stage 2: Full Assessment

4.2.2.1. Stage 2: Element 1 – Good Acoustic Design Process

Following a good acoustic design process is an implicit part of achieving good design as required by Government planning and noise policy. It is imperative that acoustic design is considered at an early stage of the development process and the aim should be to avoid “unreasonable” acoustic conditions and prevent “unacceptable” acoustic conditions.

Good acoustic design does not simply mean compliance with the recommended internal and external noise criteria. Instead, an integrated solution should be provided whereby the optimal acoustic outcome is achieved, without design compromises that will adversely affect living conditions and the quality of life of residents or other sustainable design objectives and requirements.

A good acoustic design should consider (in this order):

- *‘Maximising the spatial separation of noise sources and receptors.*
- *Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.*
- *Using topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.*
- *Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.*
- *Using the layout of the scheme to reduce noise propagation across the site.*
- *Using the orientation of buildings to reduce the noise exposure of noise-sensitive rooms.*
- *Using the building envelope to mitigate noise to acceptable levels.’*

4.2.2.2. Stage 2: Element 2 – Internal Noise Level Guidelines

The ProPG contains Figure 2, which is a table with associated notes drawing on the advice contained within BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’, the World Health Organization’s Guidelines for Community Noise 1999 (WHO guidelines) and current best practice. This table is reproduced in **Table 4.2**.

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form.

Table 4.2: ProPG Internal Noise Level Guidelines

4.2.2.3. Stage 2: Element 3 – External Amenity Area Noise Assessment

The ProPG considers the advice provided within BS 8233:2014 and the PPG-Noise in respect of external amenity areas, and presents the following advice, which is selected from both documents, in order to carry out a full assessment of noise levels:

- 'If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.'*
- 'The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.'*
- 'These guideline values may not be achievable in all circumstances where development might*

be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.'

- iv. *'Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process'*
- v. *'Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
 - *A relatively quiet façade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
 - *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
 - *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
 - *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.'*

4.2.2.4. Stage 2: Element 4 – Assessment of Other Relevant Issues

The final element of Stage 2 is an assessment of 'other relevant issues' and the ProPG suggests that the following issues are considered before making any final conclusions with respect to noise impacts:

- i. *'compliance with relevant national and local policy'*
- ii. *'magnitude and extent of compliance with ProPG'*
- iii. *'likely occupants of the development'*
- iv. *'acoustic design v. unintended adverse consequences'*
- v. *'acoustic design v. wider planning objectives'*

The ProPG notes that *'not all of the issues listed above will arise in every planning application and some may already have been addressed as an inherent part of good acoustic design. In addition, LPAs [Local Planning Authorities] may wish to add other relevant issues depending on local circumstances and priorities.'*

4.3. British Standard 4142:2014

British Standard 4142:2014 "Methods for rating and assessing industrial and commercial sound" provides a method for the measurement and rating of industrial type noise sources and background noise levels outside dwellings. The rating level (defined in the BS) is used to rate the noise source outside residential dwellings (this is defined as the "specific sound level").

The rating level is determined by assessing the character of the noise and applying an acoustic feature correction if appropriate. Corrections are applied for the tonality and intermittency of the noise source which can both make noise more noticeable.

The initial assessment described in BS 4142 to determine whether an adverse impact is likely is based on establishing the difference between the rating level and the background noise level outside the residential property of interest. The British Standard states that the following points should be considered:

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *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.*

5. Baseline Noise Levels

In order to determine the extent to which the site is currently affected by noise, a detailed measurement study has been carried out at the site. Noise at the front of the site comprised road traffic noise. To the rear of the site, the existing extract fans associated with the commercial units dominated the noise climate during opening hours.

The noise measurements utilised Norsonic 140 and Svantek 307 Type 1 Precision Sound Level Meters with current certificates of calibration, the full list of equipment is detailed in **Appendix 3**. Before and after the measurement period the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB). Noise Measurements were carried out in consecutive 5 minutes periods with a 1 second resolution.

Measurements were carried out between 1100 hrs on Thursday 20th October 2022 and 1300 hrs on Wednesday 26th October 2022.

During the noise measurement survey temperatures were up to 19°C during daytime dropping to a low of approximately 9°C at night. Wind speeds were between 2 m/s and 5 m/s over the duration of the survey, with some occasional stronger gusts. Cloud cover was noted to be 100% during setup and collection. Some precipitation was noted during the survey, including a heavy storm during Sunday 23rd October 2022. Any periods of time that look unusually weather affected have been removed from the analysis of data.

Noise measurements were carried out between 1500 hrs on Tuesday 25th October 2022 and 1300 hrs on Wednesday 26th October 2022 at Measurement Position 1 (MP1) in a free field location at 1.5m elevation at the rear of the site, approximately 13m to the east of the existing plant area and 8m west of the substation. Further measurements over the preceding weekend had been carried out but it was not possible to use the data due to an equipment failure. As the opening hours of the take-away premises are the same 7 days a week and the noise climate was subjectively dominated by extract fan noise during opening hours, the period of measurements is considered by Syntegra to be representative of the typical noise climate at the site. Noise at MP1 was dominated by plant noise during daytime hours from approximately 1200 hrs to 2200 hrs, dropping to a lower level from 2200 hrs – 2300 hrs which aligns with the opening hours of the respective takeaway premises and the higher noise levels are therefore very likely to be from extract fans.

Noise measurements were carried out between 1100 hrs on Thursday 20th October 2022 and 1645 hrs on Sunday 23rd October 2022 at Measurement Position 2 (MP2) in a free field location at 2.5m elevation just to the north of the site on a lamppost overlooking Northumberland Avenue. Due to unusually low noise levels on the afternoon of Thursday 20th October, potentially due to a road closure (Syntegra have not been able to verify this but did try to via an online search), that period of time has been removed from the analysis of data.

The noise monitoring positions are shown in **Figure 5.1**.



Figure 5.1: Noise Monitoring Locations

Table 5.1 below displays a summary of the measured noise levels and detailed measurement results are presented in **Appendix 4**.

Measurement Position	Period (hours)	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)	L_{A90} (dB)
MP1	Daytime (0700 – 2300)	57	80	48
	Night-time (2300 – 0700)	48	63	34
MP2	Daytime (0700 – 2300)	65	82	51
	Night-time (2300 – 0700)	58	80	37

Table 5.1: Summary of Free Field Semi-Permanent Noise Levels

Note: The average noise levels stated are logarithmic for L_{Aeq} . The $L_{Amax,F}$ noise levels stated are the arithmetic average of the hourly noise levels during the daytime (0700 hrs – 2300 hrs) and the 10th highest $L_{Amax,F,5min}$ noise level at night (2300 hrs – 0700 hrs), as noted in Table 4.2. The L_{A90} noise levels stated are they most typical $L_{A90,5min}$ during the measurement period (a detailed analysis is presented in Appendix 4).

5.1. Plant Noise Levels

Syntegra have also carried out plant noise level measurements of plant which was active whilst on site. The extract fan for Dilwar (no. 87) was active and dominating the noise levels at the rear of the site. The time history graph for MP1 demonstrates that this plant clearly dominates the noise climate when operational (during the opening hours of the commercial unit). Noise measurements were

carried out in front of the extract point, above the extract hood and behind the extract hood to determine the tonality of the plant.

Additional noise level measurements were carried out of an active condenser unit. It is noted that the extract fan from Dilwar was also audible and therefore these noise measurements will be slightly contaminated by the additional noise source.

A very low level hum from the substation was just audible in close proximity to the substation, however no noise level measurements have been carried out as it was impossible to get a clean reading near to the noise source and the low frequency hum was subjectively inaudible at the proposed receptor location.

The noise measurements utilised the same Norsonic 140 Type 1 Precision Sound Level Meter that was utilised for the main noise measurement survey detailed above.

The measured sound pressure level of the units is provided in **Table 5.2**, with detailed noise levels for the close proximity measurements provided in **Appendix 5**.

Plant	Measurement Position	Sound Pressure Level L _{pA} (dB)	Commentary
Dilwar Extract Fan	MP1 – Calculated to approx. 1m from extract point	79	Calculated using standard distance attenuation for point source (20*log ₁₀ (x), distance 13m.)
Dilwar Extract Fan	0.5m from extract point	82	-
Dilwar Extract Fan	1m above extract hood	65	-
Dilwar Extract Fan	1m behind extract hood	59	Towards the existing residential units.
Condenser	1m above condenser	62	Potentially slightly contaminated by noise from extract fan.

Table 5.2: Measured and Calculated Plant Noise Levels

It can be identified, from **Table 5.2**, that the assumption of MP1 noise levels being dominated by extract fan noise during the daytime is true as the calculated noise level at the extract point is approximately equal to the noise level measured at 0.5m from the extract point. Allowing for façade reflections, this would be an even closer match.

5.2. Future Receptor Noise Levels

Noise levels on each façade of the proposed residential units have been determined from the measured noise levels presented in **Tables 5.1** and **5.2** above.

For the rear façade we have made the following assumptions:

- Daytime noise levels dominated by plant noise and calculated from the noise level measurement 1m above the extract hood of the Dilwar extract fan, using a standard distance propagation calculation for a point source, and assuming a distance of 4m to the closest residential window. This makes a very worst-case assumption of the noisiest item of plant being active all day – which is only true for the afternoon and evening period.
- Night-time noise levels assumed to be the same as measured at MP1.

For the front façade we have made the following assumptions:

- Daytime and night-time noise levels are dominated by road traffic noise and calculated by a standard distance correction from MP2, assuming line source propagation for L_{Aeq} and point source propagation for the L_{Amax} in line standard good acoustic practices. MP1 located approximately 3m from closest point of Northumberland Avenue and the proposed receptors will be located approximately 15m from the closest point of Northumberland Avenue.

Assessment noise levels are presented in **Table 5.3**.

Measurement Position	Period (hours)	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)
Rear Façade	Daytime (0700 – 2300)	53	-
	Night-time (2300 – 0700)	48	63
Front Façade	Daytime (0700 – 2300)	58	-
	Night-time (2300 – 0700)	51	66

Table 5.3: Assessment Noise Levels

6. External Plant Noise Assessment

6.1. Plant Noise Assessment

The background noise level and plant noise data presented in **Section 5** has been utilised to determine the noise impact at the nearest noise sensitive receptor when assessed using the methodology in BS 4142:2014.

Table 6.1 below summarises the BS 4142 assessment procedure carried out for the site.

Results	Rear Façade – Daytime 0700-2300	Relevant Clauses of BS 4142:2014	Commentary
Ambient Sound Level	57	7.3.2	Refer to Table 5.1
Residual Sound Level	Unknown	7.3.3	<i>The ambient noise level without the plant operating.</i> Refer to Table 5.1
Typical Background Sound Level L_{A90} (dB)	48	8.1, 8.2	Refer to Table 5.1
Specific Sound Level	53	9.1, 9.2	Refer to Table 5.3
Acoustic Feature Correction	+3	9.2	Refer to Section 6.2.1
Rating Level L_{Ar} (dB)	56	9.1	Specific Sound Level + Acoustic Feature Correction
Excess of Rating over Background Sound Level	+8	11	
	Assessment indicates between an <i>adverse impact</i> and a <i>significant adverse impact</i>	11	

Table 6.1: BS 4142 Assessment

Table 6.1 identifies that an assessment in line with BS 4142 indicates that **the noise level from the existing extract fan is at a level where there could potentially be between an *adverse impact* and a *significant adverse impact*.**

6.2. Context of the Noise Source

BS 4142 advises that the “context” of the noise needs to be considered to determine the results of the assessment. The noisiest extract fan is only active during the daytime between 1200 hrs to 2200 hrs.

Accordingly, despite the potential for adverse impacts during operational hours, this would not occur in the morning or after 2200 hrs, when people are likely to be relaxing before going to bed.

In consideration of the context of the noise source, the plant would not be expected to cause any significant adverse impacts on the health or quality of life of the nearest noise sensitive receptors.

6.3. Consideration of Uncertainty

The assessment has considered uncertainty by taking a cautious approach in terms of the likely noise levels from the activities and by taking conservative losses for the distance attenuation. The cautious approach means that the noise impact is more likely to be overstated, as opposed to understated, although it is not likely that the predicted noise levels would be significantly different from those stated within the report. Overall, it is unlikely that the conclusions of the assessment would be changed as a result of any uncertainty in the assessment process.

7. Initial Site Risk Assessment

The initial site risk assessment has been carried out by comparing the results of the noise measurement survey at MP2 against the criteria presented in **Table 4.1**. The noise data from MP1 has not been assessed as the noise climate is dominated by plant noise and is therefore not appropriate for this initial assessment. The outcome of the initial site risk assessment for the front façade is therefore presented in **Table 7.1**.

Assessment Position	Daytime Ambient Noise Level $L_{Aeq,16hr}$ (dB)	Initial Noise Risk Assessment (Daytime)	Night-time Ambient Noise Level $L_{Aeq,8hr}$ (dB)	Initial Noise Risk Assessment (Night-time)
Front Façade	58	Low	51	Low-Medium

Table 7.1: Initial Site Risk Assessment

The results of the initial site risk assessment based on the measured noise levels indicate that the site has a low to medium risk in terms of noise. The initial site risk assessment can therefore conclude that the site has a medium risk in terms of noise. The pre-application advice associated with this risk category is:

Medium: *‘As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an Acoustic Design Statement (ADS) which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.’*

8. Full Assessment

8.1. Good Acoustic Design

Good acoustic design has been shown by orientation of all bedrooms facing Northumberland Avenue where there would be no plant noise affecting the proposed units.

8.2. Internal Noise Level Assessment

Note 5 of **Table 4.2** suggests that internal noise levels should ideally be achieved in as many properties as possible with windows open. Due to the relatively high maximum noise levels present at the site, habitable rooms on all facades will not be able to achieve the requirement with windows open, and therefore the sound insulation of the building façade will be required to mitigate noise levels. We note that this does not necessitate that the windows be sealed shut but requires that an alternate primary means of ventilating the properties is provided (as defined by the Building Regulations Approved Document F). In carrying out our assessment, Syntegra have therefore made the following assumptions:

- The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.
- A typical double glazing system in a 4/12/6 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 28 dB R_w .
- Appropriately specified acoustic trickle vents, with a $D_{n,e,w}$ of at least 34 dB, or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.
- Purge ventilation (as defined in Approved Document F) through open windows.
- Mitigation of overheating through open windows acceptable from an acoustic perspective.

Table 8.1 identifies the likely L_{Aeq} and L_{Amax} internal noise levels, assuming windows closed, utilising the *Simple Calculation Method* described in BS 8233:2014.

The criteria to be achieved are those set out in the ProPG (refer to **Table 4.2**) for the front façade and the ProPG criteria minus 3 dB to account for the Acoustic Feature Correction used for the BS 4142 plant noise assessment detailed in **Section 6**. The adjusted criteria has been set to address the concerns of the Environmental Health Officer at RBC, as set out **Section 3.3**.

It can be seen that habitable rooms on all facades will achieve the identified criteria with closed windows and trickle vents for background ventilation.

Assessment Location	Period (hrs)	External Noise Levels (dB) (ref. Table 5.3)	Sound Insulation of Glazing (dBA)	Internal Noise Levels (dB)	Compliance with Identified Criteria
Ambient Noise Level L_{Aeq} (dB)					
Front Façade	Daytime (0700 – 2300)	58	28	30	[ProPG] ✓
	Night-time (2300 – 0700)	51		23	[ProPG] ✓
Rear Façade	Daytime (0700 – 2300)	53	28	25	[ProPG - 3] ✓
	Night-time (2300 – 0700)	48		20	[ProPG - 3] ✓
Maximum Noise Level L_{AFmax} (dB)					
Front Façade	Night-time (2300 – 0700)	66	28	38	[ProPG] ✓
Rear Façade	Night-time (2300 – 0700)	63	28	35	[ProPG - 3] ✓

Table 8.1: Internal Noise Levels

8.3. Assessment of Other Relevant Issues

The assessment has shown that a reasonable internal noise environment can be achieved, in line with the requirements of the Local Authority, BS 8233 and the ProPG through careful consideration of the building envelope and ventilation requirements. Whilst it would be ideal to achieve the internal level criteria with open windows, it is common to achieve the criteria relying on closed windows in noisier areas. Such as an approach is advocated in the PPG-Noise.

Overall, it has been shown that, through careful consideration of the building envelope construction, the proposed development should avoid future residents being exposed to harmful levels of noise. It can therefore be concluded that significant adverse impacts on the health or quality of life of those future residents would be avoided, in line with the aims of the NPPF, NPSE and PPG-Noise.

9. Conclusion

An assessment has been carried out of the present noise climate at **79-89 Northumberland Avenue, Reading**. The proposed scheme involves development of the site to create an additional 12 residential units to an existing mixed commercial and residential site by a 2 storey upwards extension.

The assessment is based on the results of a detailed noise measurement survey that has been carried out at the proposed development site and has considered the advice of local and national planning policy and best practice guidance.

A detailed assessment of existing plant noise has been carried out and it has been identified that, although adverse impacts are possible, significant adverse impacts from plant noise are not likely.

The initial site risk assessment identified that the site has a medium risk in terms of noise.

Good acoustic design has been shown by orientation of all bedrooms facing Northumberland Avenue where there would be no plant noise affecting the proposed units.

It has been identified that the requirements of the Local Authority in respect of internal noise levels can only be achieved through careful consideration of the building envelope. We note that this does not necessitate that the windows be sealed shut but requires that an alternate primary means of ventilating the properties is provided (as defined by the Building Regulations Approved Document F). In carrying out our assessment, Syntegra have therefore made the following assumptions:

- **The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.**
- **A typical double glazing system in a 4/12/6 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 28 dB R_w .**
- **Appropriately specified acoustic trickle vents, with a $D_{n,e,w}$ of at least 34 dB, or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.**
- **Purge ventilation (as defined in Approved Document F) through open windows.**
- **Mitigation of overheating through open windows acceptable from an acoustic perspective.**

Overall, it has been shown that, through careful consideration of the building envelope construction, the proposed development should avoid future residents being exposed to harmful levels of noise. It can therefore be concluded that significant adverse impacts on the health or quality of life of those future residents would be avoided, in line with the aims of the NPPF, NPSE and PPG-Noise.

Term	Description
'A'-Weighting	<i>This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.</i>
Decibel (dB)	<i>This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.</i>
$L_{Aeq,T}$	<i>The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.</i>
L_{A10}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.</i>
L_{A50}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.</i>
L_{A90}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.</i>
L_{Amax}	<i>The 'A'-weighted maximum sound pressure level measured over a measurement period.</i>

11. Appendix 2: Professional Statement

David Yates

David Yates is a full member of the Institute of Acoustics (MIOA) and has over ten years' experience in acoustic consultancy. David has particular expertise in environmental noise providing acoustic consultancy for residential and mixed use planning applications, plant noise and vibration, construction noise and the design of acoustic, noise and vibration control. David is also experienced in providing sound insulation testing and design advice. David is familiar with the application of all relevant standards associated with his work, including but not limited to, BS 4142, BS 8233, BS 7445, BS 6472, BS 5228, BS 140 series, BS 16283 series and BS 717 series. David manages the acoustic department and is responsible for maintaining Syntegra's ANC membership.

12. Appendix 3: List of Equipment

Equipment Type	Manufacturer	Serial Number	Calibration Certification Number	Date of Last Calibration Check
Nor-140 Type 1 Sound Level Meter	Norsonic	1406389	TCRT21/1767	November 2021
Nor-1225 Microphone	Norsonic	225519	TCRT21/1767	November 2021
Nor-1209 Preamplifier	Norsonic	20598	TCRT21/1767	November 2021
Nor-1251 Sound Calibrator	Norsonic	35115	TCRT21/1761	November 2021
SV307A Sound Level Meter	Svantek	116134	1502047-1	March 2022
ST30A Microphone	Svantek	114585	1502047-1	March 2022

13. Appendix 4: Detailed Noise Measurement Results

Measured Noise levels – MP1

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
1500-1600	58	69	59	58
1600-1700	59	87	59	58
1700-1800	60	85	62	58
1800-1900	58	73	58	58
1900-2000	60	94	62	58
2000-2100	59	90	59	58
2100-2200	59	76	60	58
2200-2300	54	73	58	44
2300-0000	45	62	47	39
1500-2300	59	81	60	56
2300-0000	45	62	47	39

25/10/2022 – MP1

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
0000-0100	46	83	48	40
0100-0200	43	59	47	36
0200-0300	44	77	47	36
0300-0400	44	65	47	37
0400-0500	44	53	46	38
0500-0600	53	83	47	40
0600-0700	51	87	57	43
0700-0800	52	76	53	48
0800-0900	51	70	53	49
0900-1000	53	84	54	49
1000-1100	51	70	53	50
1100-1200	54	84	56	50
1200-1300	60	86	61	59
0700-1300	55	78	55	51
0000-0700	48	72	48	38

26/10/2022 – MP1

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
1100-1200	67	92	67	66
1200-1300	66	90	66	65
1300-1400	61	88	65	42
1400-1500	41	68	42	40
1500-1600	41	58	42	40
1600-1700	42	60	43	41
1700-1800	42	64	43	41
1800-1900	48	72	51	39
1900-2000	54	79	55	53
2000-2100	57	86	58	56
2100-2200	58	86	60	56
2200-2300	57	75	58	57
2300-0000	57	77	57	55
0700-2300	60	77	54	50
2300-0700	57	77	57	55

20/10/2022 – MP2

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
0000-0100	60	89	62	53
0100-0200	52	77	53	46
0200-0300	52	77	54	50
0300-0400	48	73	49	47
0400-0500	55	80	56	54
0500-0600	57	76	58	56
0600-0700	61	78	62	59
0700-0800	65	83	66	63
0800-0900	66	103	68	64
0900-1000	64	82	65	63
1000-1100	64	86	65	64
1100-1200	65	88	67	64
1200-1300	65	84	65	64
1300-1400	65	87	65	64
1400-1500	65	88	66	65
1500-1600	67	92	69	65
1600-1700	68	87	69	67
1700-1800	67	84	68	66
1800-1900	66	83	66	66
1900-2000	66	81	66	65
2000-2100	65	81	65	65
2100-2200	64	90	65	63
2200-2300	63	81	63	62
2300-0000	61	80	61	61
0700-2300	66	86	66	64
2300-0700	58	79	57	53

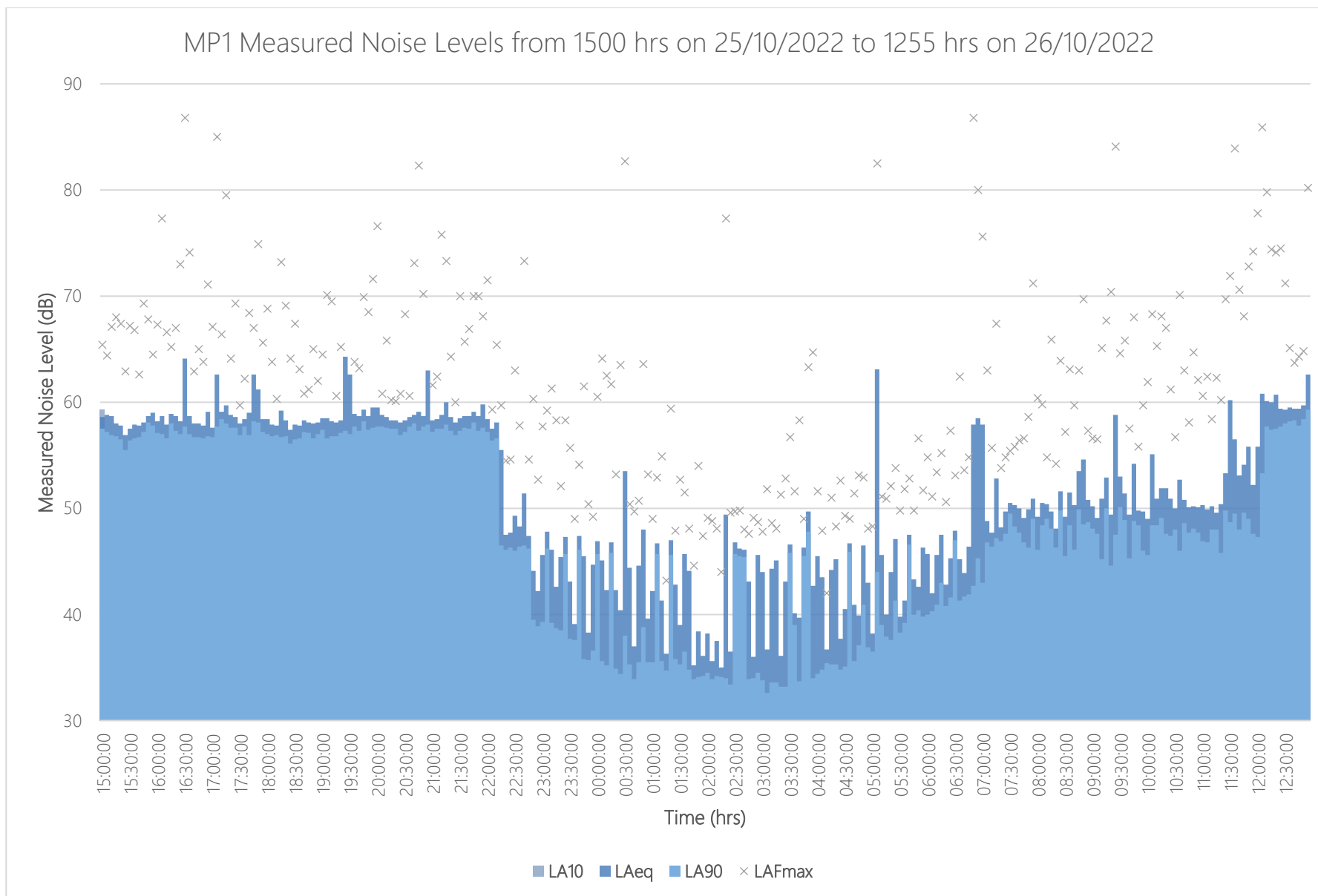
21/10/2022 – MP2

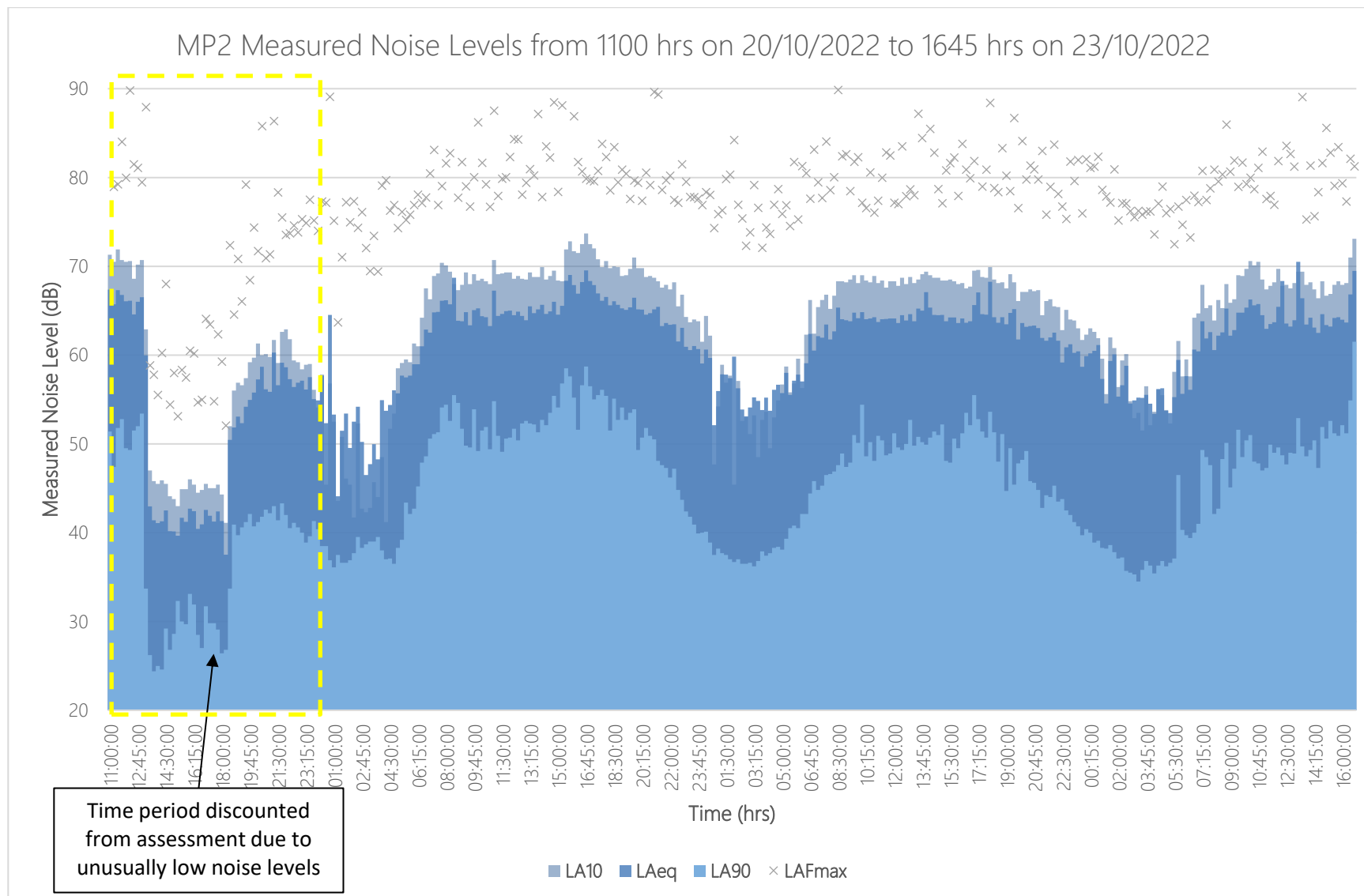
Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
0000-0100	59	78	60	54
0100-0200	57	80	58	56
0200-0300	57	84	59	53
0300-0400	55	79	55	54
0400-0500	56	79	56	54
0500-0600	57	82	58	56
0600-0700	60	81	61	57
0700-0800	62	84	63	61
0800-0900	64	90	65	62
0900-1000	64	83	65	64
1000-1100	64	81	65	64
1100-1200	64	83	64	64
1200-1300	64	84	64	64
1300-1400	65	87	65	64
1400-1500	65	93	67	64
1500-1600	64	82	64	64
1600-1700	64	84	64	64
1700-1800	66	95	67	65
1800-1900	66	88	67	64
1900-2000	64	87	65	62
2000-2100	63	84	64	63
2100-2200	62	83	63	62
2200-2300	61	84	62	60
2300-0000	60	82	61	59
0700-2300	64	86	65	63
2300-0700	58	81	59	55

22/10/2022 – MP2

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
0000-0100	60	82	61	60
0100-0200	58	81	60	55
0200-0300	57	77	58	55
0300-0400	55	76	55	55
0400-0500	55	79	56	54
0500-0600	56	77	58	54
0600-0700	58	78	60	56
0700-0800	62	81	63	61
0800-0900	63	86	64	61
0900-1000	64	82	65	62
1000-1100	66	81	66	65
1100-1200	64	83	64	63
1200-1300	66	93	67	63
1300-1400	67	99	69	64
1400-1500	64	82	64	63
1500-1600	64	86	64	63
1600-1700	67	82	69	64
0700-2300	65	85	66	63
2300-0700	58	79	58	55

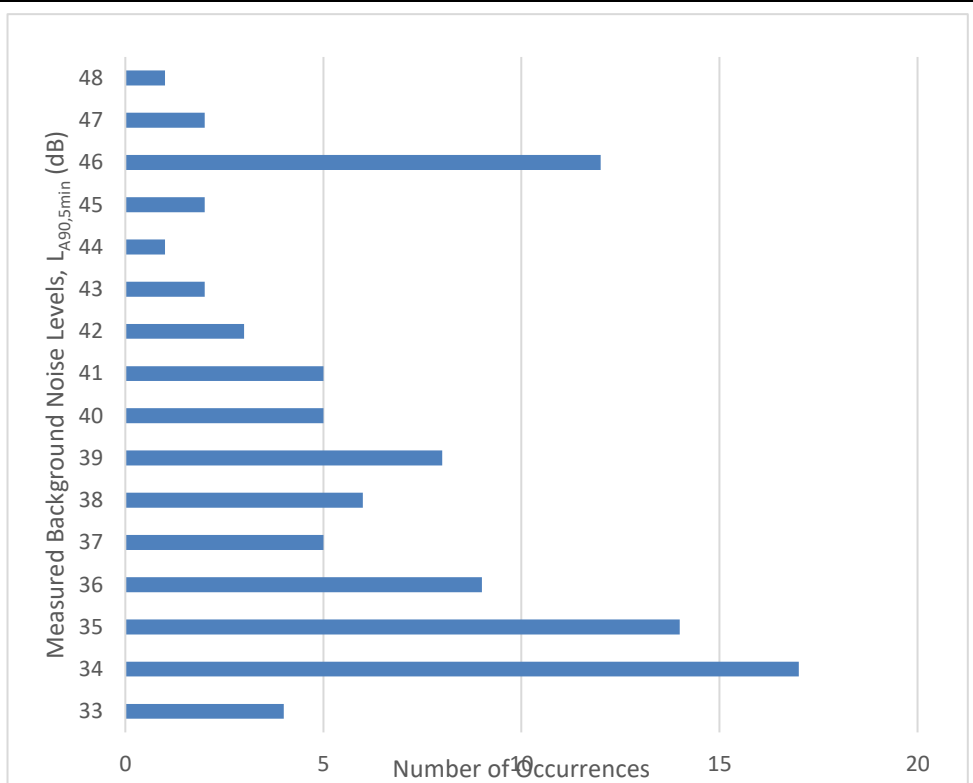
23/10/2022 – MP2





MP1 – Night-time (2300 hrs – 0700 hrs)

Measured L _{A90,5min} (dB)	Number of Occurrences
33	4
34	17
35	14
36	9
37	5
38	6
39	8
40	5
41	5
42	3
43	2
44	1
45	2
46	12
47	2
48	1



14. Appendix 5: Detailed Plant Noise Levels and Tonality Assessment

Unit and Measurement Position	Type of Data	Noise Levels (dB) in Octave Bands (Hz)														dB(A)
		25	31.5	40	50	63	80	100	125	160	200	250	315	400		
Dilwar Extract Fan 0.5m in front of extract point	SPL	80.3	78.5	76.8	74.7	73.5	75.1	75.8	81	75.2	70.8	71.7	70.6	65.9		82.4
		500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10,000	
		68.8	72.2	77.3	71.6	75.5	70.7	71.2	68.6	66.1	63.3	60.5	56.7	52.2	46.6	
Dilwar Extract Fan 1m above extract hood	SPL	25	31.5	40	50	63	80	100	125	160	200	250	315	400		64.9
		54.8	50.4	50.8	57.5	62.3	65.4	68.5	67.8	64.7	59.7	58.3	57.3	50.8		
		500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10,000	
		56.6	59.9	59.8	55	52.4	50.1	47.3	44.9	39.8	37.6	34.6	30.7	26.2	21.9	
Dilwar Extract Fan 1m behind extract hood	SPL	25	31.5	40	50	63	80	100	125	160	200	250	315	400		59.4
		56.1	51.8	52.4	57.5	58.5	62.2	68.5	68.4	57.6	57.1	53.4	51.6	48.7		
		500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	
		51.5	50.7	51	50	47.4	43.8	40.8	40.2	35.7	33.6	31.3	30.3	24.5	21.3	
Condenser Unit 1m above	SPL	25	31.5	40	50	63	80	100	125	160	200	250	315	400		61.6
		55.6	52.8	52.4	57.6	55.4	55.5	58	62.6	58.2	58.4	53.3	52.7	51.5		
		500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	
		52	54	53.1	51.4	51.4	49.4	48.8	48.9	47.1	45.7	42.9	43.2	41.6	38.7	

In order to assess tonality, the plant noise levels should be assessed using the 'Objective Method' detailed in BS4142:2014. The 'Objective Method' states: "for a discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by:

- 15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);
- 8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and
- 5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz)."

The 'Objective Method' for assessing tonality, as set out in BS 4142:2014, has determined that in front of the extract point there is a tone at 800 Hz, but this is not present above the extract hood or behind the extract hood or from the condenser. This accords with the subjective assessment on-site in which no tones were noted on the walkway in front of the existing residential units. The low frequency bias of the measurements above and behind the extract hood, however, suggest an audible "hum", which was also noted on site with the subjective assessment.