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SILFIELD NEW PRIMARY SCHOOL

Plant Noise Assessment – Revision A

SILFIELD NEW PRIMARY SCHOOL
Plant Noise Assessment

Client: NPS Group

Engineer: Create Consulting Engineers Limited
15 Princes Street,
Norwich,
Norfolk,
NR3 1AF

Tel: 01603 877010
Email: enquiries@createce.co.uk
Web: www.createce.co.uk

Report By: Mat Tuora, BSc (Hons), MIoA

Checked By: Jody Blacklock, BEng (Hons), CEng, MIOA, MCIBSE

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Contents

Appendices

Plans

Our assessment has been based on drawings and information provided to us by NPS Group, including the following drawings:

Title	Revision	Drawing number
School Site, Location Plan	-	22269/SSLP/01
Proposed site plan	P2	NPS-ZZ-00-DR-A-011
Roof Plan	P1	NPS-00-00-DR-M-008

Registration of Amendments

Revision and Date	Amendment Details	Revision Prepared By	Revision Approved By
Rev A 14/03/2024	Updated to reflect change plant specification.	SW	MT

1.0 INTRODUCTION

1.1 Create Consulting Engineers Ltd have been appointed by the NPS Group to undertake an assessment of plant noise break out to the surrounding area for a new primary school in Silfield, Wymondham.

1.2 The development comprises a two storey 'model school'. This report is limited to the assessment of plant noise break out and an outline assessment for noise break into the school. A detailed acoustic design review will be included in a separate report.

1.3 This report contains:

- a summary of the guidance and standards
- an overview of the site and the results of our site survey;
- a brief review of internal noise break in for compliance with BB93;
- a review of plant noise to the surrounding area.

1.4 Recommendations given in this report are for acoustic purposes only. It is the Client's responsibility to ensure that any work carried out complies with other regulations.

1.5 A glossary of acoustic terms used in this report is provided in Appendix A.

2.0 POLICY, STANDARDS AND CRITERIA

National Policy

2.1 A summary of the National Planning Policy Framework, National Planning Practice Guidance and the Noise Policy Statement for England is provided in Appendix B of this report.

2.2 The normal method for assessing plant noise to the surrounding area is to assess any potential impact in accordance with BS 4142. We have therefore based our assessment on this guidance, which is further detailed below:

Standards and Guidance

BS 4142 (2014) +A1 (2019) Methods for Rating and Assessing Industrial and Commercial Sound

2.3 The British Standard 4142 (2014) describes methods for rating sound of an industrial and/or commercial nature to assess its likely effects on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

2.4 BS 4142 specifies that an initial estimate of the impact of the specific sound can be obtained by subtracting the measured background sound level from the rating level and then considering the following:

- *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; and*
- *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.*

2.5 The rating level is defined in BS 4142 as the sound level of the source plus any penalties for the characteristic features of the sound, such as tonality and impulsivity among others. Acoustical characteristics and associated penalties are shown in Table 2.1:

Acoustic Character	Subjective Level	Correction
Tonality	Just perceptible	+2 dB
	Clearly perceptible	+4 dB
	Highly Perceptible	+6 dB

Acoustic Character	Subjective Level	Correction
Impulsivity	Just perceptible	+3 dB
	Clearly perceptible	+6 dB
	Highly Perceptible	+9 dB
Intermittency	Readily distinctive	+3 dB
Other sound characteristics	Readily distinctive	+3 dB

Table 2.1: Acoustical Characteristics for Determining the Rated Sound Level

2.6 The above correction values are based on the subjective nature of the sound; however BS 4142 also provides detailed guidance on objectively calculating the correction factors, which are included within Annexes C, D and E of the British Standard.

2.7 This latest version of the British Standard states that the most relevant background sound level should be applied for the most relevant time period and should reflect the period which is being assessed. This can include the use of statistical analysis or averaging to calculate the most applicable background sound level.

3.0 EXISTING ENVIRONMENT, SITE PROPOSALS AND MEASUREMENT SURVEY

3.1 The application site is located to the east of Wymondham, Norfolk, and to the west of the A11.

3.2 The Wymondham railway station is also located to the west of the site.

3.3 The proposed site location and surrounding area is shown below.

Figure 3.1: Proposed site location and surrounding area

3.4 The information provided shows the school will be situated in the middle of the site and that the land directly to the south of the school is allocated for new housing.

3.5 Existing housing is located to the North and South of the site with the land to the west currently being developed.

3.6 The proposed site layout and the existing and future housing is shown in figure 3.2.

Figure 3.2: Proposed site layout and closest receptors

3.7 We attended site on 8th April 2022 to undertake a site survey. During our survey we noted construction works in the surrounding area.

3.8 Aside from construction activities, the main source of noise was observed to be from the A11, which was constant throughout our survey.

3.9 Measurements during our attended survey would have been partially affected by construction activities and we, therefore, left a logging sound level meter close to the existing houses for a period of three days (including over a weekend) to help exclude this source of noise.

3.10 During the site visit we also took measurements at the location of the school building and at the location of the proposed sports pitch.

3.11 The measurement locations used for our survey are shown in figure 3.3:

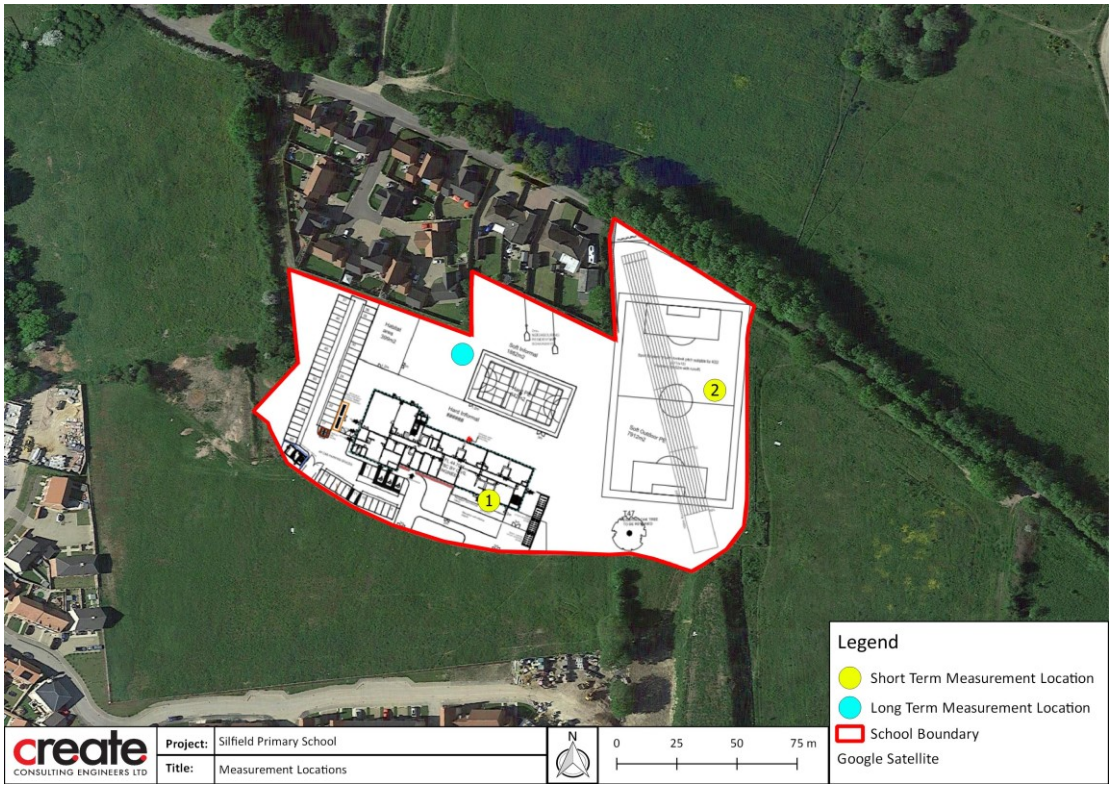

Figure 3.3: Measurement locations

3.12 All measurements were taken at a height of 1.7 m above ground in terms of, L_{eq}, L_{90} and A-weighted levels.

3.13 The equipment was calibrated at 113.9 dB at 1 kHz before the survey. There was no significant drift noted over the course of the survey. A summary of equipment used, and calibration information is contained in Appendix C of this report.

3.14 Weather over the course of our survey was dry with temperatures ranging between -0.2˚C and 23˚C. On occasions wind speeds were high (i.e., above 5 m/s). These periods of high wind have been excluded from our data analysis, particularly as the unattended equipment was located relatively close to a cluster of trees, which although had no foliage on at the time, would rustle and potentially impact the outcome of our assessment.

4.0 INTERNAL AMBIENT NOISE LEVELS

Background

4.1 Table 1 in BB93 sets the maximum internal noise limits for each type of space.

4.2 The internal ambient noise includes contributions from external noise sources outside of the school premises and noise from building services and mechanical systems used to serve the school.

4.3 Noise from school activities, such as children playing and noise from adjacent spaces is not considered in the assessment of ambient noise, although the sound insulation criteria is intended to minimise the impact of noisy activities within the building.

4.4 Equipment used for learning, such as computers, projectors, mechanical tools and fume cupboards, are considered operational noise sources. They should, however, be considered in the design process to minimise potential impact to learning and to avoid the risk of hearing damage.

4.5 Rain noise is also not considered in the assessment of ambient noise but is addressed separately within BB93.

4.6 BB93 states that a 5 dB relaxation to the criteria is permissible under the following conditions:

Condition	Ventilation system
Normal	Natural or the total noise produced by a hybrid system. Note: the mechanical element of the system is not allowed to exceed the values in Table 1.
Summertime – ventilation under local control of teacher to prevent overheating – allowable during the hottest 200 hrs of the year	Mechanical
Intermittent boost – ventilation under local control of teacher for dilution of fumes during practical activities as in practical spaces for science, art, food technology and design and technology.	Mechanical

Table 4.1: Ventilation noise requirements of BB93

4.7 This does not apply to spaces which have an internal ambient noise limit greater than or equal to 45 dB.

4.8 When a natural ventilation system is used, a level of ≤55 dB must be achieved during the hottest 200 hours and during intermittent boost.

Noise survey and results

4.9 Our attended measurements show that the free field noise levels at the proposed school location were 51 dB $L_{Aeq,30\text{-minutes}}$.

4.10 The measured external noise levels and estimated internal noise levels based on partially open windows is shown in Figure 4.1 below:

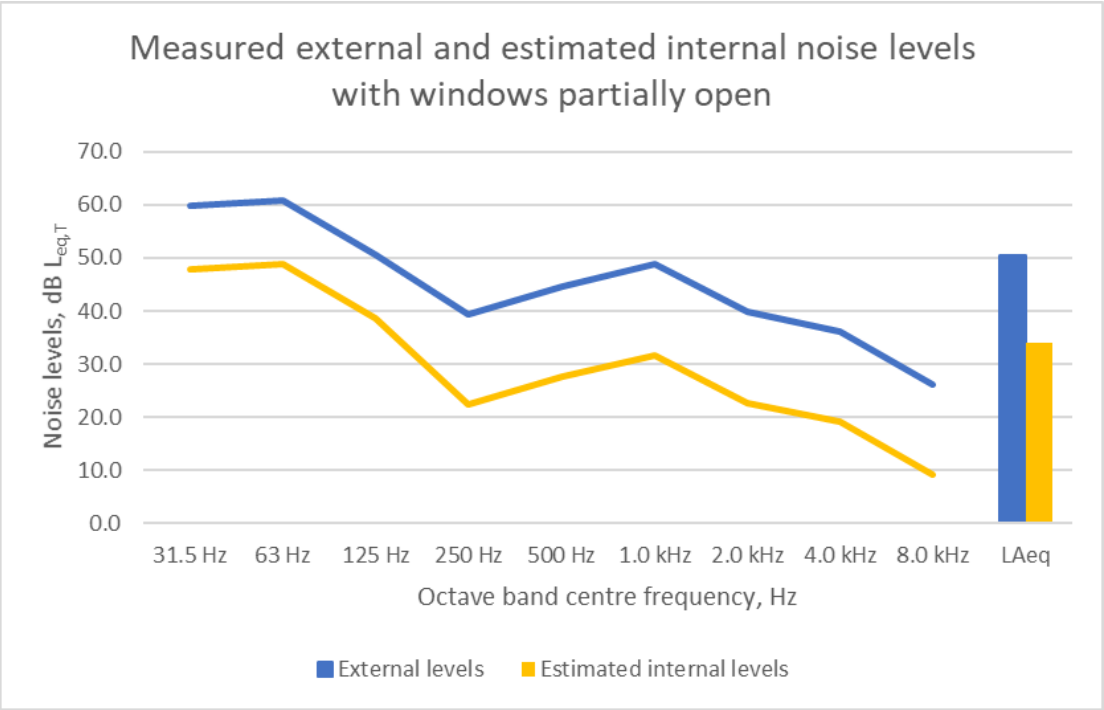

Figure 4.1: Measured external noise levels and estimated internal noise levels with windows open for ventilation

4.11 Our initial calculations show that with windows open for ventilation a typical internal noise level of approximately 34 dB $L_{Aeq,30\text{-minutes}}$ would be expected in classrooms.

Ventilation requirements

4.12 If a natural ventilation strategy is used, then noise levels should meet the requirements of BB93 for standard teaching spaces. With a natural ventilation solution a 5 dB relaxation is permitted, and we would therefore expect, rooms used for SEN teaching would also meet this internal noise requirement.

4.13 We would, however, recommend that any spaces allocated for SEN teaching are orientated to face away from the A11.

4.14 Mechanical and hybrid ventilation systems should provide a greater deal of attenuation and would also be suitable for this project, providing that their self-generated noise is appropriately controlled.

Sound insulation for façade elements

4.15 The external ambient noise levels on the site are relatively low. As ventilation could be achieved with open windows, there is no requirement for glazing, walls, doors, or the roof constructions to be acoustically rated.

Internal noise from plant and services

4.16 As discussed previously, internal noise from mechanical plant and services must be designed to achieve the internal ambient noise levels given in Table 1 of BB93.

4.17 This includes noise from mechanical units, as well as self-generated noise in the ductwork, structure-borne and airborne noise, crosstalk, and noise breaking out and back in from ventilation terminals or louvers.

4.18 Acoustic criteria plans will be provided with the main design report giving the internal ambient noise levels required for each space.

4.19 It is the responsibility of the mechanical engineer to ensure their design is robust and does not result in ambient noise levels above the criteria provided. It is also the mechanical engineer's responsibility to ensure the sound insulation of partitions is not compromised. This element of the design is discussed later in this report.

4.20 Plant should be broadband and be free of any tonal, intermittent, impulsive, or other characteristics. This is particularly important for rooms which are to accommodate SEN students.

4.21 We can provide a detailed mechanical review if required.

External noise levels

4.22 BB93 states that:

> "Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,\ 30\ min}$."

4.23 Noise levels across the site were shown to be consistently below 55 dB. This is below the upper limit recommended for external teaching and recreation areas in BB93.

4.24 Measurements over the course of our survey are shown to be approximately 51 to 52 dB $L_{Aeq,30\text{-minutes}}$. Without the contribution of construction noise, we would expect external noise levels in some areas to be below 50 dB, particularly where the school provides acoustic shielding from the road to external areas. Areas that will not be obstructed from the A11 by the school building would benefit from close boarded fences to help further reduce noise across the site.

4.25 A suitable fence would be close boarded and meet a minimum mass per unit area of 10 kg/m^2. We can advise on detailed constructions if required.

5.0 BACKGROUND NOISE LEVELS

5.1 Histograms of the daytime and night-time measurement results are shown in the following figures.

5.2 Periods of high wind have been excluded from our data analysis.

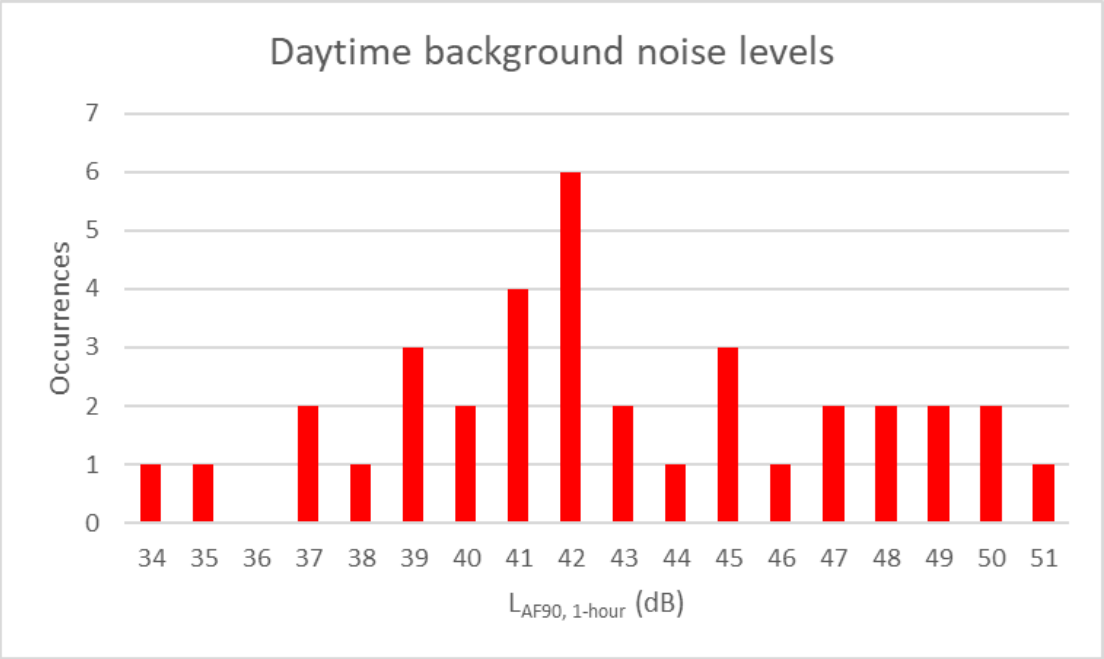

Figure 5.1: Daytime background noise levels

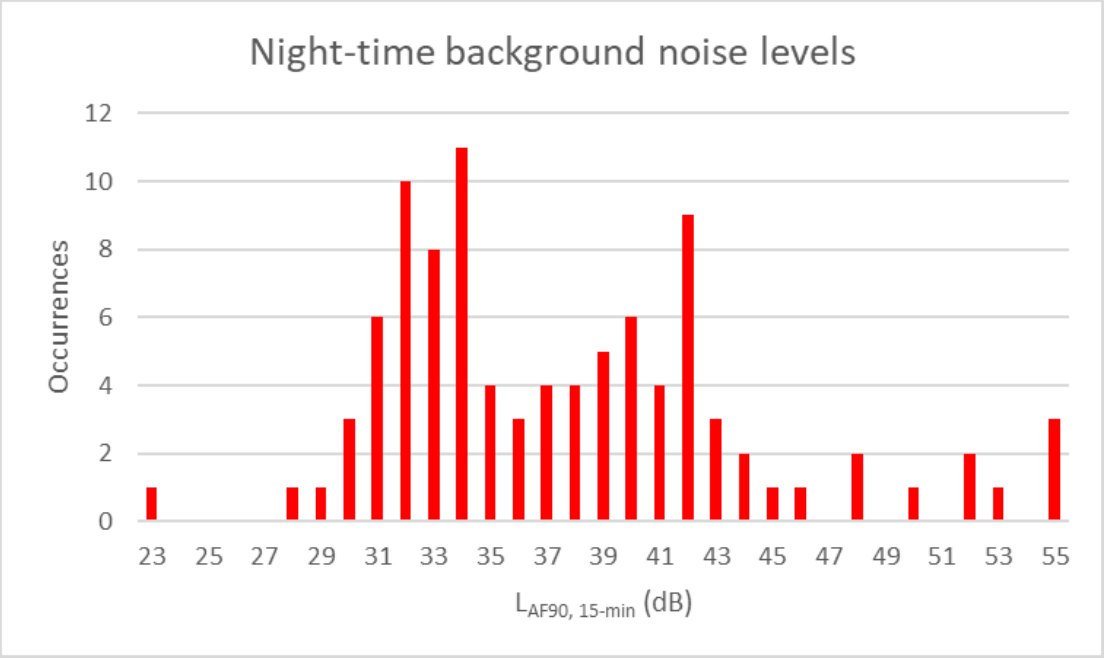

Figure 5.2: Night-time background noise levels

5.3 For this assessment, we have considered 42 dB $L_{A90,1hour}$ to be representative during the daytime and 32 dB $L_{A90,15mins}$ to be representative during the night-time.

6.0 PLANT NOISE ASSESSMENT

6.1 We understand that the site will have the following equipment installed:

- 4 no. CAHV-R450YA-HPB air source heat pumps in louvered enclosure (assumed 50% open area). We understand that these units will run in COP Priority Mode which had a sound pressure of 64 dB Lp(A) at 1 metre per unit. The units do have a Capacity Priority Mode which is 8 dB louder, but we understand that this units will not run in this mode.
- 1 x Schneider 1000 kVA electric substation in enclosure (for the purposes of our assessment we have not considered the additional sound insulation provided by this enclosure, but as will be seen later in this report, this will not have an impact on the assessment).
- 2 x Heat recovery units (the exact model number of which are currently unknown, but data for AHS HRU2 units has been provided by the mechanical team at NPS showing induct sound power levels of 64 dB Lw on the inlet and 75 dB Lw on the outlet).
- 1 x Heat recovery units (the exact model number of which are currently unknown, but data for AHS HRU5 units has been provided by the mechanical team at NPS showing induct sound power levels of 64 dB Lw on the inlet and 77 dB Lw on the outlet).
- 1 x kitchen supply AHU (the exact model number of which are currently unknown, but data has been provided by the mechanical team at NPS showing the unit will be attenuated to meet 50 dB (A) 5 meters from the inlet).
- 1 x kitchen extract fan (the exact model number of which are currently unknown, but data has been provided by the mechanical team at NPS showing the unit will be attenuated to meet 55 dB(A) 5 meters from the inlet).
- 1 x roof mounted PUZ-ZM outdoor sever room condenser unit.

6.2 The mechanical consultant responsible for the project has informed us that the ground floor 'CAHV-R450YA-HPB' ASHP units will have the potential to operate during the night. However, they have informed us that it is highly unlikely that more than two of the 'CAHV-R450YA-HPB' ASHP units will run simultaneously during the night. We have considered this when modelling night-time noise levels.

6.3 It may be prudent to minimise the risk of all ASHP's operating simultaneously by way of controlling the operation of the units, if practicable.

6.4 The units also have a night-time mode which we understand limits the units to operate at 75% capacity. Test data is not currently available for this mode; however a 2 dB reduction is expected (in line with previous models). Due to the lack of test data, we have not considered this mode of operation in our assessment.

6.5 In addition to this, we understand that the server room condenser and substation have the potential to operate all of the time.

6.6 All other plant will operate during daytime hours only.

6.7 To assess noise around the site we have constructed a CadnaA noise propagation model of the development and the proposed plant.

6.8 Figures 6.1 and 6.2 show the geometry of our model and the combined noise levels across the site, during the daytime and night-time respectively.

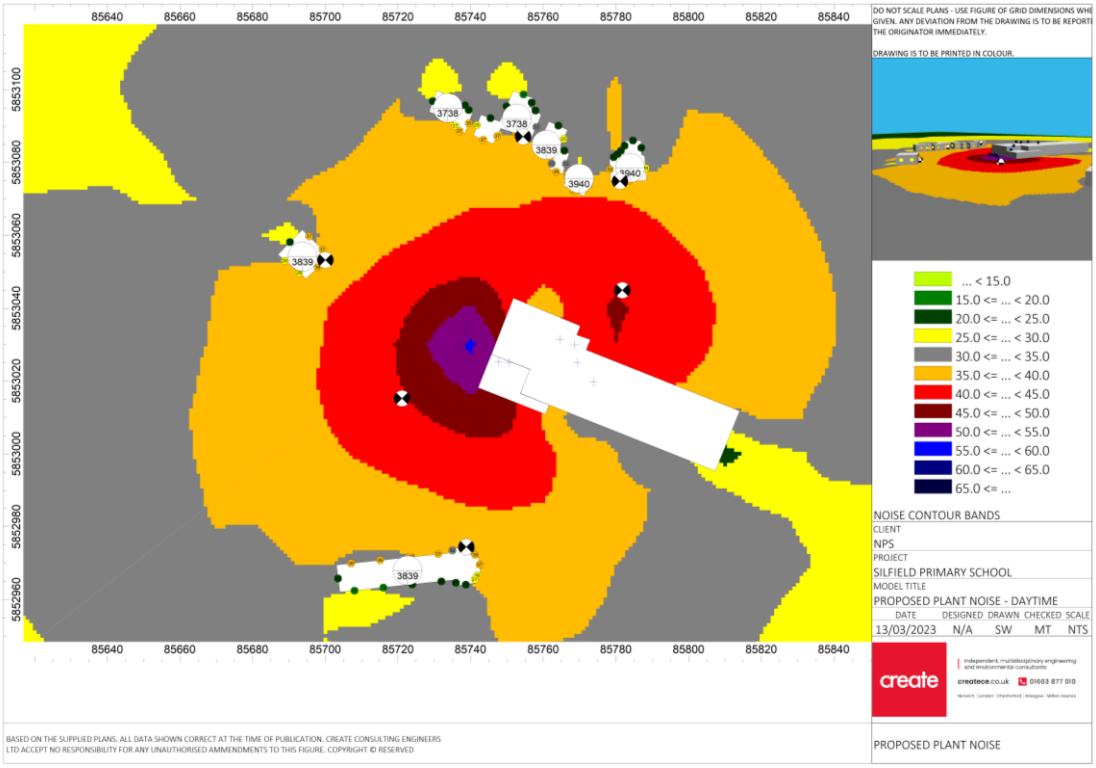

Figure 6.1: Calculated daytime noise levels

Figure 6.2: Calculated night-time noise levels

6.9 Combined noise levels from all plant are shown to be approximately 37 dB $L_{Aeq,1\text{-hour}}$ – 39 dB $L_{Aeq,1\text{-hour}}$ during the daytime and 27 dB $L_{Aeq,15\text{-min}}$ – 31 dB $L_{Aeq,15\text{-min}}$ during the night-time.

6.10 A summary of impact in accordance with BS 4142 is provided in Table 6.1.

6.11 A 4 dB penalty has been included for the substation to account for low frequency hum, which is typical for this type of equipment.

6.12 In general, our experience shows that plant that is well maintained and correctly installed should not exhibit prominent tones, rattles or bangs which would attract penalties in accordance with BS 4142. We would also not expect the plant associated with this project to turn on and off regularly during the assessment periods.

Plant item	Specific noise level, $L_{Aeq,T}$	Character penalty	Residual noise level $L_{Ar,Tr}$	Background $L_{A90,T}$ (where T is 1 hour during the daytime and 15 minutes during the night-time)	Level over background
Houses to the north					
Daytime 07:00 – 23:00					
Air source heat pumps in enclosure	32 dB	-	32 dB	42 dB	-10 dB

Plant item	Specific noise level, $L_{Aeq,T}$	Character penalty	Residual noise level $L_{Ar,Tr}$	Background $L_{A90,T}$ (where T is 1 hour during the daytime and 15 minutes during the night-time)	Level over background
Substation	1 dB	4 dB	5 dB	42 dB	-37 dB
Roof mounted heat recovery units (combined)	38 dB	-	38 dB	42 dB	-4 dB
Roof mounted kitchen supply and extract	32 dB	-	32 dB	42 dB	-10 dB
Roof mounted server room condenser unit	11 dB	-	11 dB	42 dB	-31 dB
Combined	**39 dB**	**-**	**39 dB**	**42 dB**	**-3 dB**
Night-time 23:00 – 07:00					
Air source heat pumps in enclosure	29 dB	-	29 dB	32 dB	- 3 dB
Substation	1 dB	4 dB	5 dB	32 dB	-27 dB
Roof mounted server room condenser unit	11 dB	-	11 dB	32 dB	-21 dB
Combined	**29 dB**	**-**	**29 dB**	**32 dB**	**- 3 dB**

Table 6.1: BS 4142 Assessment of Impact to Existing Houses to North

Plant item	Specific noise level, $L_{Aeq,T}$	Character penalty	Residual noise level $L_{Ar,Tr}$	Background $L_{A90,T}$ (where T is 1 hour during the daytime and 15 minutes during the night-time)	Level over background
Houses to the west					
Daytime 07:00 – 23:00					
Air source heat pumps in enclosure	33 dB	-	33 dB	42 dB	- 9 dB
Substation	3 dB	4 dB	7 dB	42 dB	-35 dB
Roof mounted heat recovery units (combined)	29 dB	-	29 dB	42 dB	-13 dB
Roof mounted kitchen supply and extract	32 dB	-	32 dB	42 dB	-10 dB
Roof mounted server room condenser unit	4 dB	-	4 dB	42 dB	-38 dB
Combined	**34 dB**	**-**	**34 dB**	**42 dB**	**-8 dB**

Plant item	Specific noise level, $L_{Aeq,T}$	Character penalty	Residual noise level $L_{Ar,Tr}$	Background $L_{A90,T}$ (where T is 1 hour during the daytime and 15 minutes during the night-time)	Level over background
Night-time 23:00 – 07:00					
Air source heat pumps in enclosure	30 dB	-	30 dB	32 dB	- 2 dB
Substation	3 dB	4 dB	7 dB	32 dB	-25 dB
Roof mounted server room condenser unit	4 dB	-	4 dB	32 dB	-28 dB
Combined	**31 dB**	**-**	**31 dB**	**32 dB**	**- 1 dB**

Table 6.2: BS 4142 Assessment of Impact to Future Houses to West

Plant item	Specific noise level, $L_{Aeq,T}$	Character penalty	Residual noise level $L_{Ar,Tr}$	Background $L_{A90,T}$ (where T is 1 hour during the daytime and 15 minutes during the night-time)	Level over background
Houses to the south		-			
Daytime 07:00 – 23:00					
Air source heat pumps in enclosure	29 dB	-	29 dB	42 dB	-13 dB
Substation	2 dB	4 dB	6 dB	42 dB	-36 dB
Roof mounted heat recovery units (combined)	31 dB	-	31 dB	42 dB	-11 dB
Roof mounted kitchen supply and extract	34 dB	-	34 dB	42 dB	-8 dB
Roof mounted server room condenser unit	8 dB	-	8 dB	42 dB	-34 dB
Combined	**38 dB**	**-**	**38 dB**	**42 dB**	**-4 dB**
Night-time 23:00 – 07:00					
Air source heat pumps in enclosure	25 dB	-	25 dB	32 dB	- 7 dB
Substation	2 dB	4 dB	6 dB	32 dB	-26 dB
Roof mounted server room condenser unit	8 dB	-	8 dB	32 dB	-24 dB
Combined	**27 dB**	**-**	**27 dB**	**32 dB**	**-5 dB**

Table 6.3: BS 4142 Assessment of Impact to Future Houses to South

6.13 Our calculations show that all equipment the combined noise level, including penalty ratings are below the background noise level and below the point at which BS 4142 states that an adverse impact is likely.

6.14 In all cases our calculations assume a 100% on time, which will be a worst-case assessment.

6.15 If conditions arise that lead to all four CAHV-R450YA-HPB air source heat pumps operating simultaneously, then resultant noise levels would be below background sound levels at the houses to the north and south. However, in a scenario such as this, there would be an exceedance of background sound levels at the houses to the west of + 2 dB(A), however this is still below the point at which BS 4142 states that an adverse impact is likely.

7.0 UNCERTAINTY

7.1 In all assessments there is a degree of uncertainty which must be considered.

7.2 In this case our calculations are based on manufacturers data, and in some cases single figure data which has been provided by our client. Where possible we have sourced octave band sound data and used this in our calculations. The degree of uncertainty associated with using manufacturers data is not easily quantified, although, we would expect the uncertainty to be low where equipment is installed correctly, balanced in line with the manufacturer's recommendations, and maintained and serviced throughout the equipment's working life.

7.3 As mentioned in section 6.0, there is some uncertainty with regard to the night-time operation of the 'CAHV-R450YA-HPB'. Due to the lack of test data to confirm the potentially lower sound levels, we have modelled the night-time levels using the daytime operating mode, resulting in a worst-case-scenario. As such, we would expect that conditions would be preferable, leading to a decrease in the likelihood of adverse impact, should there be a reduction in sound levels produced by the unit at night.

7.4 We recommend that the supplier of any products confirms that their product can meet the noise levels summarised in Section 6 of this report. Any equipment which produces higher noise levels then those given in this report should be reviewed separately.

7.5 In all cases calculations were carried out in accordance with ISO 9613-2. This standard assigns a +/- 3 dB accuracy for the calculation methodology. In this case the model geometry is relatively simplistic, and we would not expect a significant margin of error to be associated with our model.

7.6 We have not considered the mitigation provided by the transformer building, nor the effect of inline attenuators (as these have not yet been specified). Our breakout calculations are therefore based on the worst-case operating conditions, and we would therefore not expect the impact of the uncertainty to alter the outcome of our assessment. It is the responsibility of the mechanical engineers to ensure the noise levels from all plant are appropriately controlled to comply with BB93.

8.0 CONCLUSION

8.1 We have attended site and measured noise levels to assess both the impact of existing noise to the proposed school building and the impact of new plant to the surrounding area.

8.2 The outcome of our assessment shows that the school could be naturally ventilated if desired, and the external noise levels should not adversely impact the ventilation strategy.

8.3 Plant noise is shown to be below the point at which BS 4142 states that an adverse impact is likely, and is indeed, in most cases, significantly below the existing background noise levels.

8.4 As our calculations tend to the worst-case running conditions, we do not expect uncertainty to change the outcome of our assessment.

9.0 DISCLAIMER

9.1 Create Consulting Engineers Ltd disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report.

9.2 The copyright of this report is vested in Create Consulting Engineers Ltd and NPS Group. The Client, or their appointed representatives, may copy the report for purposes in connection with the development described herein. It shall not be copied by any other party or used for any other purposes without the written consent of Create Consulting Engineers Ltd or NPS Group.

9.3 Create Consulting Engineers Ltd accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

APPENDICES

APPENDIX A

Acoustic Glossary

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter can be used to duplicate the ear's variable sensitivity to sound across a spectrum of frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the average ear. This is called an "A-weighting filter". Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

$L_{eq,T}$

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period (T).

$L_{10,T}$

This is the minimum level exceeded for not more than 10% of the time period (T). This parameter is often used as a "not to exceed" criterion for noise.

$L_{90,T}$

This is the minimum level exceeded for not more than 90% of the time period (T). This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{fmax}

This is the maximum sound pressure level that has been measured over a period using a fast time constant.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.

Addition of noise from several sources

Noise from different sound sources combine, on a logarithmic scale, to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 3 identical sources produce a 5dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g., stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed, and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

IANL

IANL or 'Internal Ambient Noise Level' refers to the recorded (or predicted) $L_{Aeq,T}$ within a dwelling, office, commercial unit or treatment space. IANL typically defines a design limit or range.

APPENDIX B

Summary of National Policy

National Planning Policy

National Planning Policy Framework (July 2021)

The National Planning Policy Framework (NPPF) replaces the previous version of the NPPF and the Planning Policy Statements (PPS) and Planning Policy Guidance (PPG), including the Department of the Environment's Planning Policy Guidance Note 24: 'Planning and Noise' (PPG 24), which was published in 1994. The main reference to noise within the latest version of the NPPF is at Paragraphs 174 (e) and 185:

> *'Para.174 (e). "Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability."*
>
> *'Para.185. 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:*
>
> *(a) 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[65];*
> *(b) 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*
> *(c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'*

The reference number 65 cross references the National Policy Statement for England (NPSE) Explanatory Note.

Although some qualitative guidance on noise has been provided in the web-based Planning Practice Guidance document, there has been no alternative quantitative guidance proposed by the Government as a direct replacement for PPG24. This was due to the recognition that every site is different and that there is no single acceptable noise level, suitable for all applications.

National Planning Policy Guidance (2019)

On 6th March 2014, the Department for Communities and Local Government (DCLG) launched the National Planning Practice Guidance (NPPG) web-based resource to supersede previous planning guidance documents including PPG24 and provide clarification over all disciplinary sectors in the delivery of the design quality aspirations of the NPPF. This has been updated in July 2019.

The NPPG-Noise provides guidance on the assessment of noise, the needs to be considered when new developments may create additional noise and when developments would be sensitive to the prevailing acoustic environment.

The acoustic environment should be taken into account in the planning of new development and decision making should take the following into consideration:

- *'whether or not 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.'*

It then cross-references the Noise Policy Statement for England (2010) for further clarification on how to assess the overall effect of noise exposure.

The Noise Policy Statement for England (2010)

The Noise Policy Statement for England (NPSE) was published in March 2010 and is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long-term vision of Government noise policy which is to:

> *'Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.'*

The vision is supported by the following aims which are reflected in paragraph 1.7 of the Noise Policy Statement for England:

> *'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.'*

The Explanatory Note to the NPSE introduces three concepts to the assessment of the potential effects of noise:

- '***NOEL*** *– No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
- ***LOAEL*** *– Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected.*
- ***SOAEL*** *– Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.'*

Unlike the now redundant PPG24, the three levels are not defined numerically in the NPSE, and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent a SOAEL for noise is acknowledged and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

APPENDIX C

Measurement Equipment

Equipment description and serial number	Equipment type	Manufacturer	Calibration valid between	Calibration certificate number
Sound Level Meter (1406932)	Nor 140	Norsonic	02/07/2021 – 01/07/2023	38327
Preamplifier (1209.21140)	Nor 1209	Norsonic	02/07/2021 – 01/07/2023	38327
Microphone (1225.285513)	Nor 1225	Norsonic	02/07/2021 – 01/07/2023	38326
Sound Level Meter (1406933)	Nor 140	Norsonic	02/07/2021 – 01/07/2023	38329
Preamplifier (1209.21141)	Nor 1209	Norsonic	02/07/2021 – 01/07/2023	38329
Microphone (1225.285519)	Nor 1225	Norsonic	02/07/2021 – 01/07/2023	38328
Acoustic Calibrator (34963)	Nor 1251	Norsonic	02/07/2021 – 01/07/2023	38325

Calibration level: 1406932: Ref: 113.9dB Before: 113.9 After: 113.9
1406933: Ref: 113.9dB Before: 113.9 After: 113.9

Person in charge of measurement: Mat Tuora MIOA and Sam Ward AMIOA

Other people present: None

Measurement parameters: L_{eq} 1/3rd octaves, L_{Aeq}, L_{AFmax}, L_{Fmax} 1/3rd octaves, L_{AF90}, L_{F90} 1/3rd octaves, L_{AF10}, L_{F10} 1/3rd octaves