



Noise Impact Assessment of an Electric Generating Facility

Client Name: Conrad Energy (Developments) Ltd

Client Address: Suites D & E, Windrush Court, Blacklands Way, Abingdon, OX14 1SY

Site Address: Havant Lorry Park, Southmoor Lane, Havant, PO9 1JW

Date: 12/11/2020



Authorisation and Version Control

Report Prepared By	Mr P Soler, BEng, AMIOA
Report Checked By	Mr J Barratt Gibson, MSc, AMIOA
Report Approved By	Mr A T Martin, MSc, MIOA, MCIEH, MIET, MInstSCE
Date	12/11/2020
Project Number	4750CE
Version Reference	Version 1

Disclaimer

The opinions and interpretations presented in this report represent our best technical interpretation of the data made available to us. However, due to uncertainty inherent in the estimation of all parameters, we cannot, and do not guarantee the accuracy or correctness of any interpretation and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. If additional information becomes available which may affect our comments, conclusions or recommendations, the author reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly. Except for the provision of professional services on a fee basis, NOVA Acoustics Ltd does not have a commercial arrangement with any person or company involved in the interests that are the subject of this report. NOVA Acoustics Ltd cannot accept any liability for the correctness, applicability or validity for the information they have provided, or indeed for any consequential costs or losses in this regard. Our efforts have been made on a "best endeavours" basis and no responsibility or liability is warranted or accepted by NOVA Acoustics Ltd.

Copyright © The material presented within this report is confidential. This report has been prepared for the exclusive use of the client and shall not be distributed or made available to any other company or person without the knowledge and written consent of NOVA Acoustics Ltd and the client. All works undertaken by NOVA Acoustics Ltd are carried out in accordance with NOVA Acoustics Ltd's terms and conditions found at www.novaacoustics.co.uk.



CONTENTS

EXECUTIVE SUMMARY	5
1. INTRODUCTION.....	6
1.1 Overview.....	6
1.2 Scope & Objectives.....	6
2. ENVIRONMENTAL NOISE SURVEY.....	7
2.1 Measurement Methodology	7
2.2 Context & Subjective Impression.....	7
2.3 Background	8
2.4 Assumptions	8
2.5 Environmental Noise Survey Results	9
3. BS4142:2014 NOISE ASSESSMENT	10
3.1 BS4142:2014 Noise Assessment	10
3.2 Increase in Ambient Noise Level Assessment	13
3.3 Internal Noise Level Assessment - L_{Aeq}	14
3.4 Commercial Office Noise Assessment	14
3.5 Recommendations & Mitigation	15
APPENDIX A – ACOUSTIC TERMINOLOGY.....	16
APPENDIX B – LEGISLATION, POLICY AND GUIDANCE	19
B.1 - National Planning Policy Framework (2019).....	19
B.2 - Noise Policy Statement for England (2010)	19
B.3 - British Standard BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound.....	20
APPENDIX C – SITE PLANS.....	24
APPENDIX D – ENVIRONMENTAL SURVEY	25
D.1 Tabulated Summary Noise Data.....	25
D.2 Surveying Equipment	26
D.3 Meteorological Conditions	26

Tables

<i>Table 1.0 – Background Sound Level Summary Results</i>	<i>9</i>
<i>Table 2.0 – Engine and Radiator Noise Levels</i>	<i>10</i>
<i>Table 3.0 – Specific Sound Level at NSR Summary</i>	<i>11</i>
<i>Table 4.0 – Rating Penalty Assessment</i>	<i>12</i>
<i>Table 5.0 – Summary of Rating Sound Levels</i>	<i>12</i>
<i>Table 6.0 – Summary of Background Sound Levels</i>	<i>12</i>
<i>Table 7.0 – BS4142 Assessment</i>	<i>13</i>
<i>Table 8.0 – Increase in Ambient Noise Level Assessment</i>	<i>13</i>
<i>Table 9.0 – BS8233 Internal L_{Aeq} Noise Level Analysis</i>	<i>14</i>
<i>Table 10.0 – BS8233 Internal L_{Aeq} Office Noise Level Analysis</i>	<i>14</i>
<i>Table 11.0 – Sound Survey Summary Results</i>	<i>26</i>
<i>Table 12.0 – Measurement Equipment</i>	<i>26</i>
<i>Table 13.0 – Weather Summary</i>	<i>26</i>

Figures

<i>Figure 1.0 - Indicative Site Layout</i>	<i>7</i>
<i>Figure 2.0 - Sound Level Map</i>	<i>11</i>
<i>Figure 3.0 – Specific Sound Level Map – Mitigated Scenario</i>	<i>15</i>

Executive summary

An environmental noise survey and noise impact assessment have been undertaken at Havant Lorry Park, Southmoor Lane, Havant, PO9 1JW to assess the potential increase in noise levels of a Flexible Electric Generating Facility on the surrounding Noise Sensitive Receptors. The measured background sound levels have allowed a BS4142:2014, BS8233:2014 and IEMA noise assessments to be carried out. The results are shown in the sections below.

BS4142:2014 Assessment

The BS4142 assessment shows that 'Low Impact' is expected at the closest NSR during both day and night time provided the recommendations in this report are implemented. This equates to 'No Observed Effect Level (NOEL)' when assessing in accordance with NPSE. Furthermore, it is important to mention the subsequent assessment is based on a worst-case scenario. Therefore, this is a positive indication that during 'normal' operating hours the noise emissions from the Proposed Development will not adversely affect nearby residents.

IEAM 'Increase in Ambient Noise Level Assessment'

The Increase in Ambient Noise Level assessment shows that the noise emissions from the Proposed Development are not predicted to increase the ambient noise level during the night. This level of increase is classed as a 'None/Not Significant', which adds further context to the BS4142 assessment.

BS8233:2014 Open Window Assessment

This assessment was undertaken considering the recommended night time internal noise levels presented in BS8233, and the attenuation provided by an open window. The noise levels are predicted to be within the criteria at all NSRs, showing that appropriate internal noise levels can be readily achieved.

Commercial Office Assessment

This assessment was undertaken considering the recommended day time internal noise levels presented in BS8233, and the attenuation provided by an open window. The expected internal noise level within the nearest office falls within the executive office criteria outlined in BS8233. This indicates a low impact on the surrounding offices.

1. Introduction

1.1 Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for the erection of a flexible power generation facility with associated ancillary infrastructure, access and boundary treatment (the Proposed Development') at Havant Lorry Park, Southmoor Lane, Havant, PO9 1JW ('the Site').

The applicant is preparing a full planning application ('the Application') to be submitted to Havant Borough Council.

The following technical noise assessment has been prepared to support the planning application to the Local Authority. This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.2 Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Baseline sound monitoring survey to evaluate the prevailing background sound levels at the nearest sensitive receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with; ISO9613 – 1 ISO 9613-2 - Attenuation of sound during propagation outdoors prediction methodology, to predict sound levels at the NSR;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Policy Framework (2019), Noise Policy Statement for England (2010), British Standard BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound and IEMA Guidelines on Noise Impact Assessments. Further information on the legislation can be found in Appendix B.

2. Environmental Noise Survey

2.1 Measurement Methodology

To characterise the sound profile of the area at the closest sensitive receptor (NSR), an environmental sound survey has been carried out from the 24/07/2020 to 27/07/2020. The monitoring position was chosen in order to collect representative sound levels at the NSR during the typical operational periods of the proposed development. The monitoring location is shown in Figure 1.0.

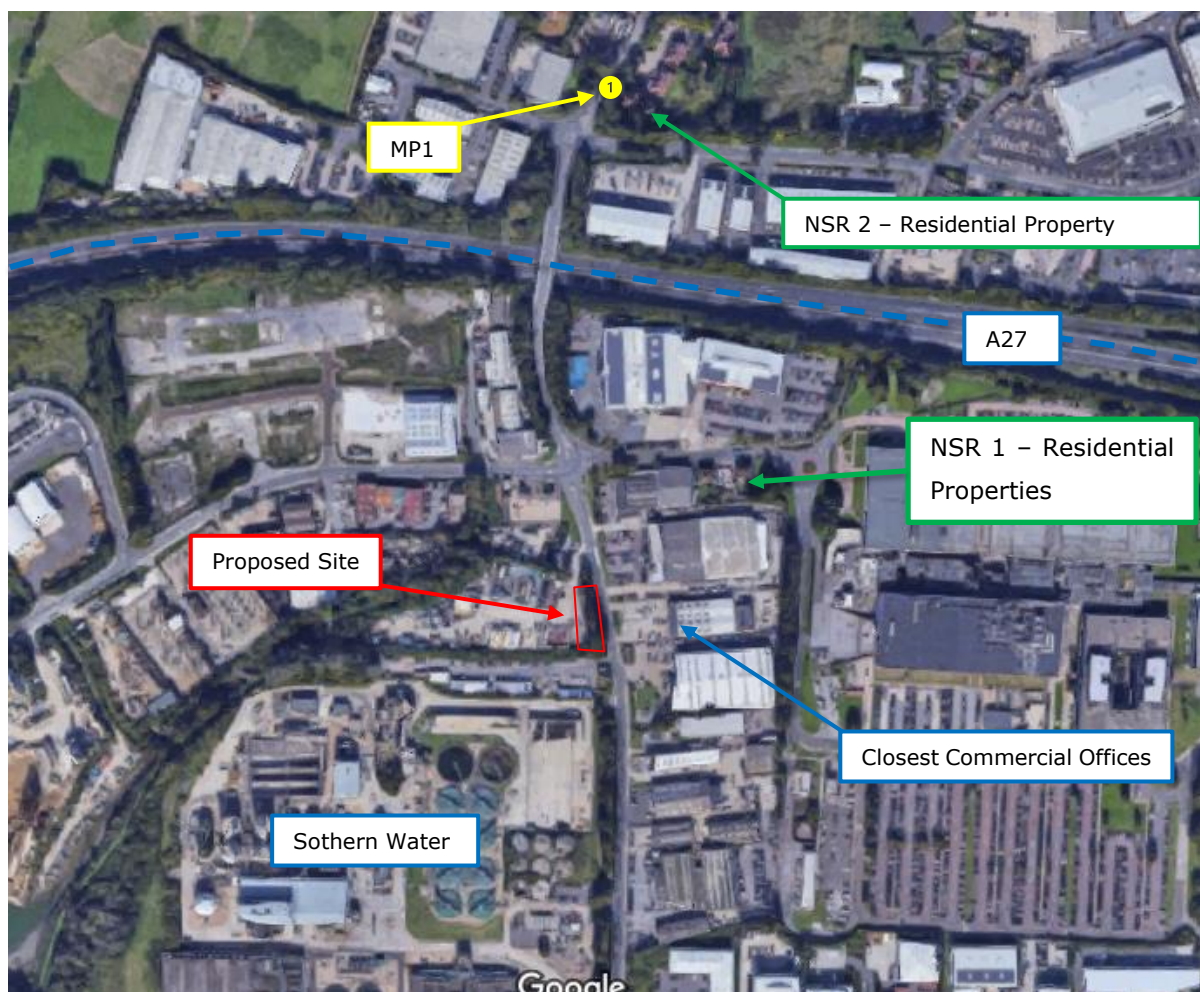


Figure 1.0 - Indicative Site Layout

2.2 Context & Subjective Impression

The proposed development is the construction of a small scale electricity generating facility, including up to two gas reciprocating engines and ancillary plant.

The site falls to the east of Southmoor Lane within the existing Broadmarsh Business and Employment area and north of the Budds Farm Sewage Works. It lies within the built-up area and forms part of the Havant Lorry Park. The site will be accessed from the existing access off Southmoor Lane, through the site. Internal access tracks will be used to enable both construction and maintenance vehicles to manoeuvre throughout the site.

The site falls entirely within Flood Zone 1 and Budds Farm Sewage Works to the south of the site benefits from flood defences. There are no heritage assets within close proximity of the site.

The surrounding area is comprised mainly of commercial and light industrial premises. Located approximately 360m to the north and 132m to the north east are the closest residential dwellings, which are considered to be the closest Noise Sensitive Receptor (NSR). The closest commercial offices have been found to the east and are considered the second nearest Noise Sensitive Receptor (NSR3). During the site visits, the engineer found that the noise profile of the area was dominated by traffic travelling along A27 and its surrounding road network and noise emissions from the current industrial and commercial premises.

2.3 Background

The proposed development is the construction of up to 5 MW small scale electricity generating facility, including up to two gas reciprocating engines and ancillary plant.

The main function of the proposed facility is to supply the national grid at times of peak demand and/or times of stress demand. This is either by power generation or by demand reduction. These sites typically have gas power generating units that can operate at any time of the day or night dependent on the demand of the national grid. It is expected that the site will operate at peak times, which is primarily during the morning and evenings during the winter period. Standby power plants such as the proposed facility also act as an insurance against sudden losses in generation, imbalances in system frequency or other unforeseen increases in demand.

The usage is only a prediction, however, and the units could be in operation at any point during the day or night. As such the following analysis is based on the background sound levels measured during day time and the night periods. This is considered to be a robust assessment as it is likely the units will only operate during the night in an extreme scenario, such as a power outage (the client has indicated that the annual night usage is expected to be between 20 or 30 hours).

It is proposed 2 power reciprocating engines are installed at the site along with radiators and transformers. The gas engines are proposed to be enclosed within a canopy/enclosure to reduce its noise emissions. To provide a robust analysis, this assessment analyses the cumulative impact of all engines and radiators. No specific make or model of the proposed plants has been presented to NOVA Acoustics Ltd thus far, however, the client has stated that the noise emissions from each engine unit and radiator will not exceed 65 dB L_{Aeq} at 10m. It is assumed that the units propagate sound evenly across the containers of the engines. The site will also have associated transformers however noise from the transformers is minimal and as such need not be assessed as these will have a negligible impact on the acoustic environment surrounding the area.

Location and site plans are included in Appendices C and D respectively

2.4 Assumptions

- The total noise emissions from each engine, including exhaust systems will not exceed a noise level of 65dBA at 10m when operating at maximum capacity.

- The total noise from each radiator will not exceed a noise level of 65dBA at 10m when operating at maximum capacity.

2.5 Environmental Noise Survey Results

The proposed plant can operate at any time during both the day and night. The table below outlines the background sound levels measured during the quietest day and night time, that will be used as the baseline for the noise assessment. Further summary results for the entire measurement period can be found in Appendix E.

Measurement Position MP1				
Measurement Period ('t')	LA90,15min	*SMR LA90,15min	Min. LA90,15min	Max. LA90,15min
Day 1 - 24/07/2020 - 07:00-23:00	58.0	56.0	49.0	59.0
Night 3 - 26/07/2020 - 23:00-07:00	45.0	39.0	36.0	59.0

Table 1.0 – Background Sound Level Summary Results

**Statistically Most Repeated*

3. BS4142:2014 Noise Assessment

3.1 BS4142:2014 Noise Assessment

The noise sources under assessment are 2 No. 2.5MWe reciprocating engines and associated radiators.

3.1.1 Specific Sound Level

The specific make and model of the proposed units are not known yet due to the stage of the project. However, the client has stated that they are aiming to install units which noise emissions are no more than 65 dBA at 10m (a worst-case scenario). The specific sound levels for the engines and radiators have been calibrated in SoundPlan software. The cumulative noise emissions of the generators are comprised by the noise breaking out the engine casing and the noise from the exhaust. It is assumed all sides of the engine and radiator casings emit sound evenly as area noise sources. The calculated façade noise level of the engine and radiator cases can be seen in the table below.

Description	Manufacturer Noise Level at 10m (dBA)	Calibrated Façade Noise Level (dBA)
Engine Casing Noise Emissions	65.0	73.0
Radiator Casing Noise Emissions	65.0	78.0

Table 2.0 – Engine and Radiator Noise Levels

The specific sound level at the NSRs has been calculated using SoundPlan 8.1, which undertakes its calculations in accordance with the guidance given in ISO9613 – 1:1993 and ISO9613 – 2:1996.

The following assumptions have been made within the calculation software:

- To accurately model the land surrounding the development the topographical data has been taken from Google Maps, it is assumed this has an accuracy within the last 3 years.
- The ground between the source and receiver is mixed, 'soft' and 'hard', for the purpose of the assessment the ground has been considered as 'hard'.
- The noise model has been calibrated using the predicted noise levels stated above.
- The grid height of the noise map has been set to 1.5m.
- All engines are assumed to have a height of approximately 3.2m.
- All radiators are assumed to have a height of approximately 2.2m.
- Point source emitters have been modelled to represent the exhaust outlets. A sound power of 80.0 dB has been used to calibrate the cumulative noise emissions of the engine to a level of 65 dB at 10m. They have each been modelled at heights of 7m from the ground.
- The engine and radiator casings are assumed to act as area noise sources. This is calculated within the SoundPlan model.

The sound map showing the specific sound level emissions from the Proposed Development can be seen below in the figure below.

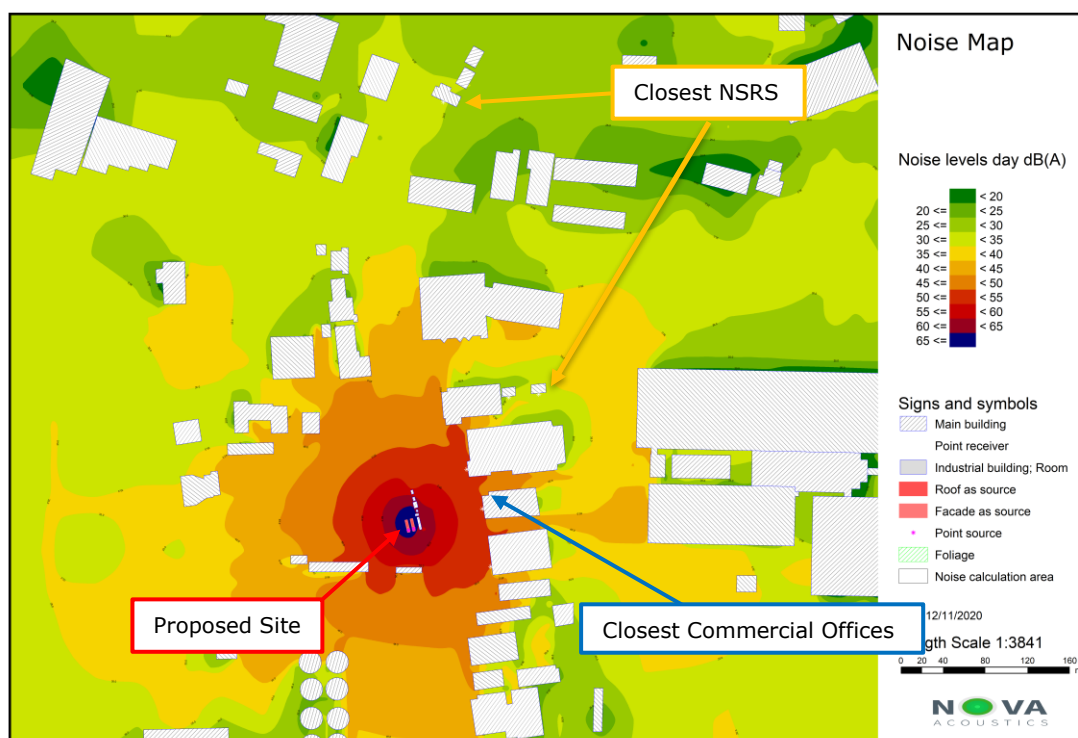


Figure 2.0 - Sound Level Map

A summary of the specific sound levels at the NSR based on the sound map shown in Figure 2.0 can be seen in the following table.

NSR	Specific Sound Level (dBA)
1	40.0
2	32.0
Commercial Office	50.0

Table 3.0 - Specific Sound Level at NSR Summary

3.1.2 Rating Level

Rating Penalty

Rating Penalty Assessment

Considering the requirements of the rating penalty, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in the following table.

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Engines and Radiators	+2	--	--	--	A +2 dB rating penalty is applied due to a 'just perceptible' possible tonal component at the NSRs.

Table 4.0 – Rating Penalty Assessment

Rating Level

Incorporating the rating penalties with the specific sound levels, the rating sound levels have been derived and have been detailed in the following table.

NSR	Rating Sound Level (dBA)
1	42.0
2	34.0

Table 5.0 – Summary of Rating Sound Levels

3.1.3 Background Sound Level

The table below outlines a summary of the background sound levels for the lowest day time and night time periods at the NSR.

Measurement Position MP1				
Measurement Period ('t')	L _{A90,15min}	*SMR L _{A90,15min}	Min. L _{A90,15min}	Max. L _{A90,15min}
Day 1 - 24/07/2020 - 07:00-23:00	58.0	56.0	49.0	59.0
Night 3 - 26/07/2020 - 23:00-07:00	45.0	39.0	36.0	59.0

Table 6.0 – Summary of Background Sound Levels

Discussion:

According to the statistical analysis, the most repeated L_{A90,t} value during the day time measurement period is 56.0 dBA, however, the range of values is reasonably large and the most repeated value sits at the top of this range. Therefore, the lowest measured L_{A90,15min} value of 49.0 dB will be used in the subsequent assessment to provide a robust analysis.

The most repeated L_{A90,t} value during the night time measurement period is 39.0 dBA. As this value sits next to the bottom of the range, the L_{A90,15min} value of 39.0 dBA will be used in the subsequent assessment to provide a robust analysis.

3.1.4 BS4142 Assessment

The rating sound levels have been assessed in accordance with BS4142:2014 at the most exposed NSR. The BS4142:2014 assessment at the NSR, during day and night time periods, can be seen in the table below.

Description	NSR1 (dB) - Day	NSR1 (dB) - Night	Notes
Rating Sound Level	42.0	42.0	As shown in Table 5.0
Background Sound Level	49.0	39.0	As shown in Table 6.0
Excess of Rating over Background Sound Level	-7.0	+3.0	Assessment Indicates 'Low Impact, depending on context' at the NSR during the day time and 'Adverse Impact Depending on Context' During the night time

Table 7.0 – BS4142 Assessment

Discussion

The daytime and night-time assessments indicate that 'Low Impact' is expected at both NSRs. However, during the night time period the background sound level is exceeded by 3dB at NSR 1. This indicates the potential for a low level of 'Adverse Impact' at a low level.

3.2 Increase in Ambient Noise Level Assessment

The following section analyses the expected increase in ambient noise levels in the surrounding area due to the Proposed Development. The specific sound levels associated with the Proposed Development are logarithmically added to the lowest measured residual sound level. The higher the increase in noise levels the higher the impact. The predicted noise levels during the night time have been assessed as this is the period when the existing ambient noise level is lowest.

Increase in Ambient Noise Level Assessment	
Description	NSR1 (dBA)
Lowest Measured Ambient Noise Level	51.0
Specific Noise Level	42.0
Resulting Noise Level	51.5
Increase in Noise Level	+0.5
Expected impact	None/Not Significant

Table 8.0 – Increase in Ambient Noise Level Assessment

Discussion

As can be seen in the assessment above, the specific sound level emissions from the proposed site are not predicted to significantly increase the ambient noise levels at the NSRs.

3.3 Internal Noise Level Assessment - L_{Aeq}

In the following section, the predicted noise emissions from the Proposed Development are compared with the internal noise level criteria presented within BS8233:2014. It is stated in BS8233:2014 that internal noise levels should not exceed 30 dB during the night time period. Subsequently, the façade sound level should not exceed 45 dB L_{Aeq} when considering the attenuation provided by an open window.

NSR	Façade Noise Level (L_{Aeq} dB)	Attenuation of an Open Window (dB)	Expected Internal Level (dB)	BS8233 Night Time Criteria ($L_{Aeq,8hour}$)	Exceedance of BS8233 (dB)
1	40.0	-15.0	25.0	30.0 dB	-5.0

Table 9.0 – BS8233 Internal L_{Aeq} Noise Level Analysis

Discussion

The BS8233:2014 open window assessment shows that the noise emissions from the Proposed Development are predicted to be within the BS8233 criteria. This indicates the Proposed Development will have a low impact on the surrounding residents.

3.4 Commercial Office Noise Assessment

Some consideration should also be given to nearby commercial offices. Therefore, in the following section, the predicted noise emissions from the Proposed Development are compared with the internal noise level criteria presented within BS8233:2014. It is stated in BS8233:2014 that internal noise levels for an executive office should not exceed 35 dB. Subsequently, the façade sound level should not exceed 50 dB L_{Aeq} when considering the attenuation provided by an open window.

NSR	Façade Noise Level (L_{Aeq} dB)	Attenuation of an Open Window (dB)	Expected Internal Level (dB)	BS8233 Criteria	Exceedance of BS8233 (dB)
Commercial Office	50.0	-15.0	35.0	35.0 dB	0.0

Table 10.0 – BS8233 Internal L_{Aeq} Office Noise Level Analysis

Discussion

As can be seen in the assessment above the expected internal noise level within the nearest office falls within the executive office criteria outlined in BS8233. This indicates a low impact on the surrounding offices.

3.5 Recommendations & Mitigation

In order to ensure the noise emissions at NSR 1 fall below the background sound level during the night time period the units should be limited to a noise levels of 60 dB at 10m.

The sound map indicating the noise levels at the NSRs considering the above mitigation is implemented can be seen below.

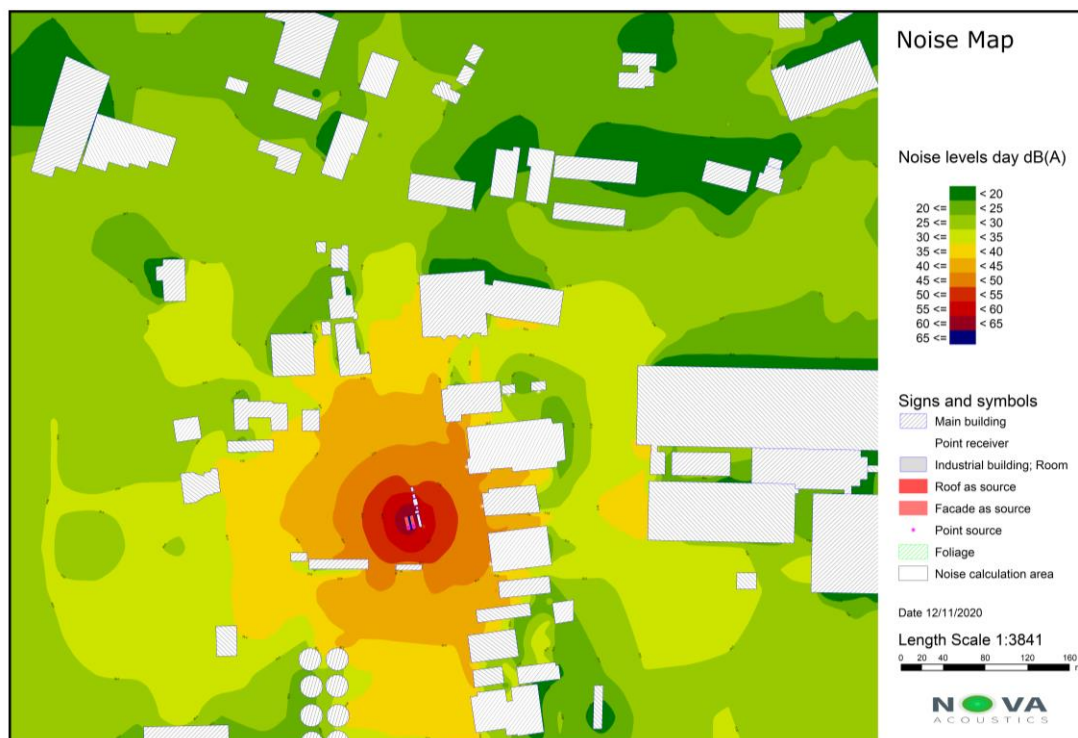


Figure 3.0 – Specific Sound Level Map – Mitigated Scenario

Provided the above recommendations are implemented the rating noise levels will fall a minimum of 2 dB below the background sound level in the night time thus indicating 'Low Impact' and 'No Observed Effect Level' when assessed in accordance with the NPPF and NPSE.

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s ₁ and s ₂ is given by 20 log ₁₀ (s ₁ / s ₂). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L _{eq,T}	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
L _{max,T}	A noise level index defined as the maximum noise level during the period T. L _{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L _{90,T}	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L _{10,T}	A noise level index. The noise level exceeded for 10% of the time over the period T. L ₁₀ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

B.1 - National Planning Policy Framework (2019)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 170e, it states:

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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 180 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:

- a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- 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.*

B.2 - Noise Policy Statement for England (2010)

Paragraph 180 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision 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.

To achieve this vision the Statement identifies the following three aims:

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;*
- Where possible, contribute to the improvement of health and quality of life.*

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

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. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 - British Standard BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound

Overview

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ ‘specific sound level’, immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method."*

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinct against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the “specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a ‘typical’ background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 states: “The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs”. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

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

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore be classified as a No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

Appendix D – Environmental Survey

D.1 Tabulated Summary Noise Data

Measurement Position MP1				
Measurement Time Period ('t')	L _{Aeq,t}	L _{Amax,t}	L _{A90,t}	L _{A10,t}
Day 1 – 24/07/2020 – 10:15 – 23:00	62.0	95.0	58.0	64.0
Night 1 – 24/07/2020 – 23:00 – 07:00	53.0	77.0	48.0	56.0
Day 2 – 25/07/2020 – 07:00 – 23:00	64.0	105.0	58.0	65.0
Night 2 – 25/07/2020 – 23:00 – 07:00	51.0	79.0	46.0	54.0
Day 3 – 26/07/2020 – 07:00 – 23:00	61.0	91.0	56.0	63.0
Night 3 – 26/07/2020 – 23:00 – 07:00	55.0	81.0	45.0	60.0
Day 4 – 27/07/2020 – 07:00 – 09:45	64.0	84.0	63.0	65.0

LA90 Analysis				
Measurement Period ('t')	L _{A90,t}	SMR L _{A90,t}	Min. L _{A90,t}	Max. L _{A90,t}
Day 1 – 24/07/2020 – 10:15 – 23:00	58.0	56.0	49.0	59.0
Night 1 – 24/07/2020 – 23:00 – 07:00	48.0	44.0	41.0	54.0
Day 2 – 25/07/2020 – 07:00 – 23:00	58.0	60.0	50.0	61.0
Night 2 – 25/07/2020 – 23:00 – 07:00	46.0	42.0	37.0	50.0
Day 3 – 26/07/2020 – 07:00 – 23:00	56.0	58.0	47.0	60.0
Night 3 – 26/07/2020 – 23:00 – 07:00	45.0	39.0	36.0	59.0
Day 4 – 27/07/2020 – 07:00 – 09:45	60.0	60.0	59.0	61.0

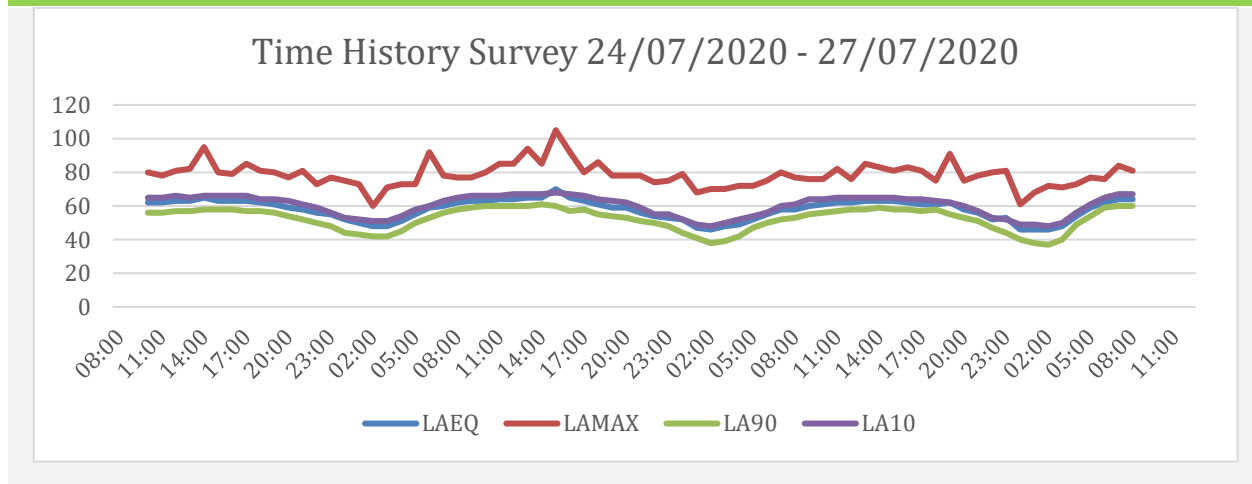


Table 11.0 – Sound Survey Summary Results

D.2 Surveying Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA TA120 Class 1 Sound level meter	T238593	≤0.5
CESVA CB006 Class 1 Calibrator	901013	

Table 12.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localized records of weather conditions were taken. However, during the setup and collection of the monitoring equipment, the weather conditions have been documented in the following table. All measurements have been compared with met office weather data of the area, specifically the closest weather station, the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather conditions – Southbourne – 6km				
Time period	Air temp (°C)	Rainfall mm/h	Prevailing Wind Direction	Wind Speed (m/s)
24/07/20 – 00:00 – 00:00	14.7 – 23.8	0.0 – 1.0	SW	0.0 – 0.6
25/07/20 – 00:00 – 23:59	12.9 – 18.8	0.0 – 3.2	S	0.0 – 2.1
26/07/20 – 00:00 – 23:59	12.0 – 21.6	0.0 – 0.2	SSW	0.0 – 1.2
27/07/20 – 00:00 – 23:59	15.4 – 19.8	0.0 – 1.2	S	0.0 – 3.0

Table 13.0 – Weather Summary