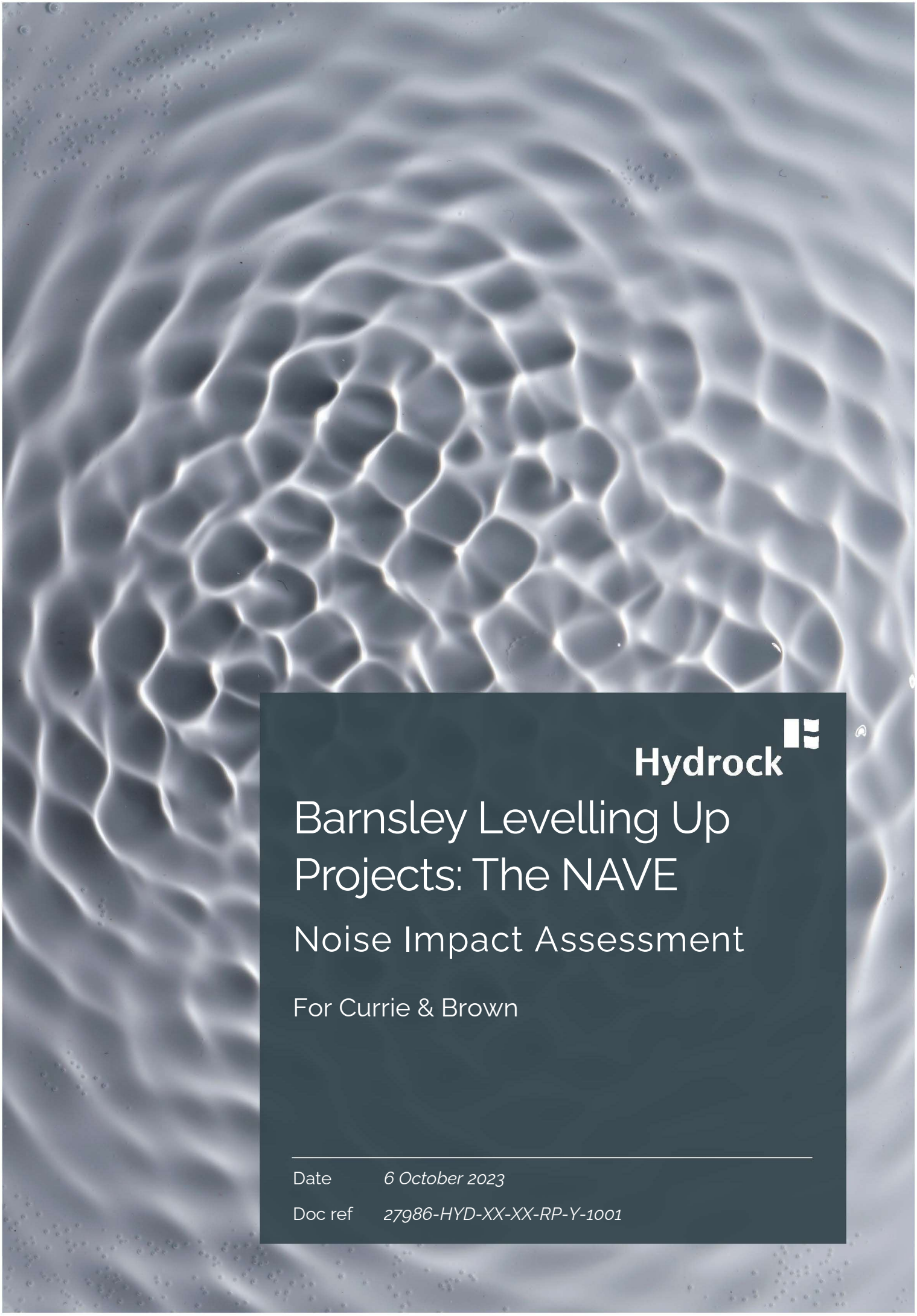

Hydrock

Barnsley Levelling Up Projects: The NAVE

Noise Impact Assessment

For Currie & Brown

Date	*6 October 2023*
Doc ref	*27986-HYD-XX-XX-RP-Y-1001*

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Issued by	Hydrock Consultants Limited Northern Assurance Buildings 9-21 Princess Street Albert Square Manchester M2 4DN United Kingdom	T +44 (0)161 804 5550 E manchestercentral@hydrock.com hydrock.com
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Prepared by		Becca Gabriel BEng(hons), AMIOA
Checked by		Eddy Goldsmith, BEng (Hons), MIOA
Approved by		Eddy Goldsmith, BEng (Hons), MIOA

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1. Introduction

Hydrock have been commissioned by Currie & Brown to undertake a noise impact assessment in support of a full planning application for the repurposing of a former Barnsley Metropolitan Borough Council (BMBC) office building to a choral venue workshop and rehearsal space, and social/meeting space ('Proposed Development'), for Barnsley Youth Choir. The existing building is situated building on land (the 'Site') located to the west of St Mary's Place, Barnsley, S70 2SR.

1.1 Site Context

The site is bordered by St Mary's Places shopper car park to the north, with Barnsley Wholesale and Retail Floor Coverings commercial property, and Churchfield Road beyond. To the east, the site is bordered by St Mary's Place, with Barnsley College Church Street Campus and Barnsley Town Hall beyond, to the north east and south east respectively. To the south, the site is bordered by Westgate, with Barnsley Sixth Form College beyond. To the west, the site is bordered by Barnsley Law courts, with BMBC offices and South Yorkshire Police Station beyond.

The Proposed Development comprises a change of use and associated refurbishment to the existing building, summarised as following:

- 4 or more rehearsal spaces with flexibility to be turned into 2 larger spaces via a moveable wall systems/curtains and provision for mirrors. One of the spaces may have a sprung floor for dance;
- A number of smaller 'breakout' spaces for smaller rehearsals;
- A large multipurpose reception area;
- A central office that overlooks the entrance/reception;
- A meeting room (for up to 12 people);
- A number of toilets on each floor – individual toilets / mixed sex / disabled;
- Full disabled access including a lift that can also transport large equipment;
- Secure storage for large and expensive technical equipment with access to outside for a tail lift van;
- A large library and reprographics room;
- A number of smaller storerooms for Barnsley Youth Choir (BYC) equipment and also partner organisations equipment (subletting);
- Smaller rooms suitable for 1:1 vocal training;
- A large uniform store with changing facilities;
- Kitchenettes on each floor with a larger kitchen on the ground floor that can be used to cook for guests and functions. There may also be a potential for a small community café;
- Further secure storage for staging. This ideally would not be directly inside the building but would be adjacent and accessible; and,
- Potentially a recording studio linked to a larger space that could be used by choirs and also external bookings for recording work.

This noise impact assessment has been carried out, together with a baseline noise survey, in order to determine the noise mitigation requirements for the Proposed Development, during the construction phase and operational phase.

This report is technical in nature; therefore, a glossary is provided in **Appendix A.**

2. Methodology

This assessment considers the following:

- Potential impacts associated with road traffic noise at the Proposed Development, in accordance with BS8233 and WHO guidance;
- Potential noise impacts from proposed industrial type noise sources associated with the development, at the nearest Existing Sensitive Receptors (ESRs), in accordance with BS4142; and,
- Potential noise impacts from choral and music performances at the Proposed Development upon the nearest ESRs.

The assessment detailed in this report has been prepared with reference to the site's draft designs, provided by Currie & Brown and shown in **Figure 1** (dated 14th June 2022).

2.1 Consultation with Barnsley Metropolitan Borough Council

The proposed noise survey and assessment methodology was agreed in principle with Adam Cattell (Environmental Health Officer – Pollution Control) of Barnsley Metropolitan Borough Council, via email dated 20th July 2023.

2.2 Policy and Guidance

The following current policy and guidance documents are considered to be relevant for this assessment:

- National Planning Policy Framework, 2021 (NPPF);
- Noise Policy Statement for England 2010 (NPSE);
- Planning Practice Guidance – Noise, 2019 (PPG);
- World Health Organisation (WHO) Guidelines for Community Noise, 1999;
- British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings (BS8233);
- British Standard 4142:2014 Methods for rating and assessing industrial and commercial sound (BS4142);
- Building Bulletin 93: 2015 Acoustic Design of Schools (BB93); and,
- Department of Transport – Calculation of Road Traffic Noise, 1988 (CRTN).

A summary of key policy and guidance documents is provided in **Appendix B.**

3. Noise Survey

3.1 Survey Overview

A noise survey was undertaken at the site, between the Wednesday 9th and Thursday 10th August 2023.

Noise measurements were carried out using Class 1, integrating sound level meters. Each of the microphones were positioned approximately 1m from the existing building façade, out of windows of the existing building, at first floor and second floor level, approximately 5m and 9m above ground, respectively.

The sound level meters were calibrated to a reference level of 94 dB at 1kHz both prior to, and on completion of, the noise survey. No significant drift in calibration was noted during the survey (≤ 0.5 dB).

3.2 Weather Conditions

All noise monitoring took place during dry and calm conditions, with wind speeds less than $5ms^{-1}$ and no precipitation. Weather forecasts were reviewed prior to the survey and observations made during setup and decommissioning of the noise monitoring equipment; which are summarised as follows:

- Temperatures ranging between 14˚C and 25˚C;
- Sunny spells and occasional cloud;
- No precipitation;
- Wind speed varying between 1 and $5ms^{-1}$; and,
- Dry ground.

3.3 Monitoring Locations

Monitoring Locations (MLs) are presented in **Figure 2** and are described in further detail below:

- **ML1 –** Unattended 24-hour noise monitoring out of a 2nd floor window at approximately 1m from the eastern facade of the existing building, approximately 9m above ground, and at a perpendicular distance of approximately 3m from the curb side of St Mary's Place. This location was selected to capture representative noise levels incident on the eastern façade of the Proposed Development, from road traffic on St Mary's Place,
- **ML2 –** Unattended 24-hour noise monitoring out of a 2nd floor window at approximately 1m from the southern facade of the existing building, approximately 9m above ground, and at a perpendicular distance of approximately 9m from the roadside of Westgate to the south. This location was selected to capture representative noise levels incident on the southern faced of the Proposed Development, from road traffic on Westgate.
- **ML3 –** Unattended 24-hour noise monitoring out of a 1st floor window at approximately 1m from the western facade of the existing building, approximately 5m above ground, and at a perpendicular distance of approximately 23m from the roadside of Westgate to the south. This location was selected to capture representative background noise levels in the vicinity of the western façade of the building and at ESRs.

Observations were carried out at each ML during the survey and existing noise sources affecting the Site noted. Measurements were also supplemented with audio recordings to allow retrospective analysis of the baseline acoustic environment.

3.4 Summary of Existing Acoustic Environment

Observations made during the survey and a review of audio recordings identified the following noise sources contributing to the noise climate at the Site:

Road Traffic: Road traffic noise from St. Marys Place, Westgate and the remainder of the local road network was dominant during the daytime and night-time periods across the site. St Mary's Place was observed to be the prevailing noise sources given the proximity to the site and higher volume of traffic movements.

3.5 Summary of Measured Noise Levels

Measured noise levels at all locations have been separated in to daytime (0700 to 2300 hours) and night-time (2300 to 0700 hours) categories, in accordance with current guidance, where appropriate. A summary of measured noise levels over the full monitoring period is provided in **Appendix C.**

Average baseline noise levels are summarised in **Table 1.**

Table 1: Average Measured Daytime and Night-time Noise Levels

Monitoring Location	Time Period	Measured Noise Level, $L_{Aeq,T}$ dB
ML1	0700 – 2300	67
	2300 – 0700	60
ML2	0700 – 2300	63
	2300 – 0700	55
ML3	0700 – 2300	56
	2300 – 0700	48

4. Noise and Vibration Impact Assessment

4.1 Noise Impacts at the Proposed Development

4.1.1 Noise Levels in Sensitive Areas

As noted in **Section 3**, the existing acoustic environment at the Site is dominated by road traffic noise from St Marys Place to the east, and to a lesser extent, Westgate to the south.

To determine the potential noise impacts at proposed sensitive spaces within the development, Internal Ambient Noise Level (IANL) targets have been set with based on BB93 guidance for refurbishment projects which are outlined in **Table 2** below.

The noise level criteria selected are relevant during the daytime period only (0700-2300hrs), as the Proposed Development will not be operational during the night-time (2300-0700hrs).

Table 2: Noise Levels at Facades of Proposed Development and Required Sound Insulation of Building Fabric

Receptor / Façade	Daytime Façade Level, $L_{Aeq,T}$ dB	Target Internal Ambient Noise Level, $L_{Aeq,T}$ dB	Minimum Composite Level Difference of the facade, D_w, dB
Proposed Choral Practise Rooms on Eastern Façade	67	40*	27
Proposed Choral Practise Rooms on Western Façade	56	40*	16
Proposed Offices on Southern Façade	63	45	18
Proposed Studios on Southern Façade	63	35	28

*** This is the minimum recommended IANL target for this type of space based on BB93 guidance, however, more onerous criteria may be adopted depending on developed design strategy and end-user requirements.**

Table 2 indicates that mitigation will be required to control external noise ingress into the development to meet the specified IANL targets. Open windows as a form of background ventilation would result in an exceedance of IANL criteria in all cases, therefore alternate means of ventilation will be required throughout, in combination with a suitable glazing strategy.

Mitigation requirements are discussed in further detail in **Section 5.**

4.2 Noise Impacts at Existing Sensitive Receptors

4.2.1 Noise Break-out during Choral Performance

Choral rehearsals and performances are proposed to take place regularly at the Proposed Development which have the potential to generate high levels of noise.

The rehearsal spaces of the development are to be located on the eastern and western façades, therefore, the nearest ESR is Barnsley Law Courts located 21m to the west.

Additionally, Barnsley College and BMBC offices are located 20m to the south and 22m to the east, respectively. However, these receptors are considered less sensitive than Barnsley Law Courts and are located further from the Proposed Development, any noise impact from choral activities will be lower than at Barnsley Law Courts to the west. Therefore, this assessment focusses on potential impacts at Barnsley Law Courts.

The main rehearsal space, which will operate as a performance space on occasion, at first floor level (See **Figure 1**) is likely to generate the most noise when in use, due to the size of the space and the intention to use the space for larger recitals. It is highlighted that smaller practise rooms of the development will generate noise, but to a lesser extent that that expected of the main rehearsal space.

The following assessment considers the potential impacts of noise break-out from choral performances of the main rehearsal space, at the nearest sensitive receptor, which is Barnsley Law Courts located approximately 21m from the western façade of the Proposed Development.

Noise impacts associated with choral rehearsals/performances have been assessed using the Noise Rating (NR) methodology provided by BS8233, which is considered to provide an appropriate method when evaluating impacts from amplified music. An internal noise level of NR20 typically corresponds to 'virtually inaudible' and meeting this criterion is an indicator of a negligible impact.

The assessment is based on octave band noise level spectrum data representative of choir performances, taken from Hydrock's database, with further reference to a research study on the sound exposure of choristers[1], informing the likely noise level generated from a large choir group in practise.

The overall noise level will vary over the course of a performance and will depending on the type of performance, and number of choristers involved. It's considered unlikely that internal noise levels would rise to 100 dB $L_{Aeq,\,T,}$ even for short periods. However, an overall internal noise level of 100 dB $L_{Aeq,\,T}$ has been adopted for the purposes of this assessment, in order to provide a robust assessment of potential noise impacts at ESRs.

The noise break-out from the main rehearsal space has been calculated, taking into consideration the overall sound insulation from the external blockwork, glazing and roof which faces Barnsley Law Courts. The corresponding noise level at 1m from the nearest façade of Barnsley Law Courts has been calculated, and the resulting noise rating (NR) level inside the Law Courts is presented in **Appendix D.**

[1] *Dance SM, Zepidou G. Sound Exposure of Choristers. Noise Health. 2019 Jan-Feb;21(98):41-46. doi: 10.4103/nah.NAH_40_19. PMID: 32098930; PMCID: PMC7050229.*

The calculations include the following assumptions, to provide a robust assessment:

- The key performance space is located at first and second floor levels (double floor height space) on the western façade of the building;
- The external façade of the proposed refurbishment will remain the same as existing, consisting of the following (or similar):
    - External Wall Build-up- 100mm single leaf plastered blockwork, with a sound insulation performance of 45 dB R_w
- The proposed roof construction is to comprise a vaulted ceiling design which will consist of the following build-up (or similar):
    - 7mm Slate tiles on felt
    - 75mm timber purlins at 600mm centres (no insulation in cavity)
    - Pitched timber with exposed rafters
    - Standard 12.5mm Gypsum plasterboard between each rafter
    - Overall sound insulation performance of 41 dB Rw.
- Based on existing elevations as observed on site and through review of elevations via aerial imaging, glazed areas on the façade of the main rehearsal space will total approximately 7.5m^2 and are 4mm single glazed units as a minimum (31 dB R_w)
- The Proposed Development will be mechanically ventilated, so windows will be closed during choral performance;
- Barnsley Law Courts is naturally ventilated via open windows; and,
- An open window at ESRs provides approximately 15 dB sound attenuation.

The NR assessment in **Appendix D** indicates that the noise impact from choir rehearsals at the Proposed Development is predicted to achieve NR19 in within Barnsley Law Courts with windows open. This is below NR20 and indication that noise from choir performances is likely to be inaudible within Barnsley Law Courts. Therefore, noise impacts are predicted to be negligible.

It is acknowledged that end-user requirements of the rehearsal spaces are likely to result in further enhancements to the building fabric, which would reduce the noise impact at ESRs to the east and west further.

Furthermore, the assessment indicates that any potential impacts upon ESRs further away from the Proposed Development, including Barnsley Sixth Form College to the south and east, would be negligible.

Therefore, it is considered that the retained building elements and the proposed mechanical ventilation strategy to be implemented as part of the Proposed Development will be sufficient in avoiding potential significant noise impacts at nearby ESRs.

The example building envelope construction specified above are based on available information and is subject to change as the design develops and robust assumptions have been made in order to determine feasibility. Any alternate construction details will be reviewed by Hydrock during technical design and remaining RIBA Stages in order to ensure sound insulation provided by the final design will achieve the criteria specified in this report as a minimum. It's likely that the final design will achieve a higher standard of sound insulation in order to satisfy end user requirements.

4.2.2 *Proposed Plant Noise Emission Limits*

At this stage, specific plant provisions are not known. However, it is understood the proposals include mechanical ventilation systems, with external plant likely to be located externally at ground floor level, in the yard in the western part of the site. Therefore, guideline noise limits have been established based on the measured background sound levels and BS4142 guidance.

Measured daytime and night-time background levels at ML3 are representative of the baseline acoustic environment at the nearest ESRs which are most likely to be affected by plant noise. Plant noise limits have been set at 5 dB below background level at nearby ESRs, which corresponds to a low impact in accordance with BS4142, depending on context.

The plant noise limits presented for the daytime and night-time periods in **Table 3** apply to the cumulative noise rating level of all plant and ancillary equipment associated with the Proposed Development, with the exception of emergency plant, and should not be exceeded at 1m from the nearest sensitive façade of Barnsley Law Courts to the west, and Barnsley College to the south.

Table 3: Recommendations for Plant Noise Limits at Receptor Locations

Period	Existing Background Levels, dB $L_{A90,T}$ dB	Plant Noise Limit, dB $L_{Aeq,T}$
Daytime (07:00 to 23:00 hrs)	45	40
Night-time (23:00 to 07:00 hrs)	34	29

The above plant noise limits would ensure that any noise from fixed plant does not exceed the background level. However, the magnitude of impact depends upon the context and not only upon the comparison of rating and background noise levels, therefore these levels are intended to provide a guideline at this stage.

A review of plant noise emissions should be carried out by a suitably qualified acoustic engineer during Technical Design.

5. Noise Mitigation Scheme

5.1 Glazing

Based on the minimum composite level difference requirements shown in **Table 2**, the existing glazing is likely sufficient to meet the BB93 refurbishment IANL targets.

However, due to client requirements for the rehearsal spaces, it is likely that secondary glazing will be required on the eastern elevation, to mitigate noise from road traffic on St Mary's Place so that the resulting IANL achieves beyond the target criteria.

5.2 Ventilation

To ensure all sensitive spaces throughout the proposed development achieve the recommended BB93 criteria, and to control any noise impacts from the development itself upon nearby sensitive receptors, some form of mechanical ventilation will be required throughout, to remove the need for open windows as a means of background ventilation.

Note that windows may remain openable for any purge ventilation requirements.

Any upgrades to the existing building fabric, including ventilation inlets and outlets should be reviewed by a suitably qualified acoustician to ensure the acoustic performance remains adequate within each proposed space. Details of the ventilation system are not known at this stage; however, it is typically recommended that attenuators be fitted to the atmosphere side of any louvres to minimise noise break-out via the façade.

5.3 Roof

Noise break-out from the roof is a key consideration for the first-floor rehearsal spaces. It is understood the current roof is in a state of disrepair and the required upgrades will be made as necessary.

Hydrock are appointed to provide acoustic consultancy services during the developed design stages of this project and therefore advice will be provided at the later stages, to ensure adequate detailing and construction build-up is specified to meet a suitable level of sound insulation to minimise noise break-in and break-out to and from the rehearsal spaces.

6. Conclusion

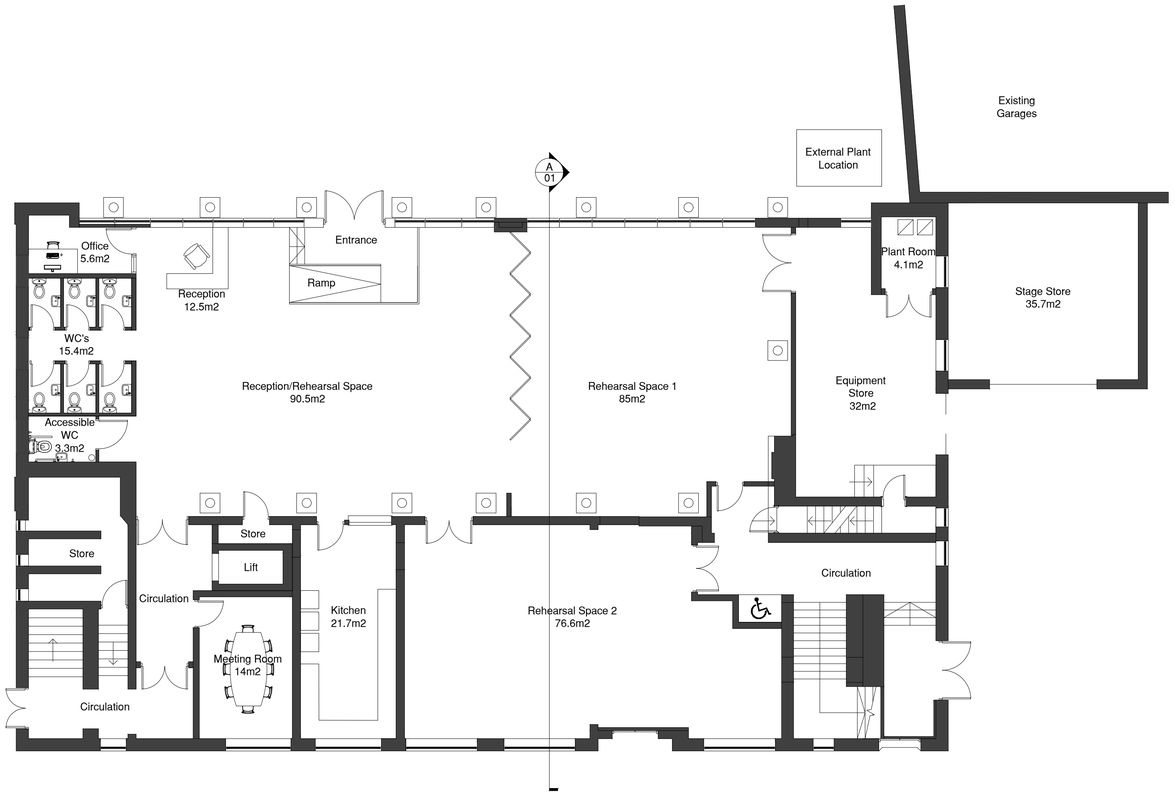
Hydrock have carried out a Noise Impact Assessment in support of a planning application for the Proposed Development of 'The NAVE' in Barnsley, which comprises the refurbishment of the existing Barnsley Metropolitan Borough Council office building in to a choral venue workshop and rehearsal space, for Barnsley Youth Choir.

A noise survey has been carried out at the Site to support the assessment, which considers the potential for impact during both the construction and operational phase.

Existing noise levels at the Proposed Development (existing building) have been assessed, and target internal ambient noise levels have been outlined in accordance with BB93. It is highlighted that critical spaces within the Proposed Development will aim for more onerous criteria during technical design, to better suit the end user requirements. Therefore, the targets outlined herein provide the minimum requirements and, in turn, a robust assessment of potential impacts.

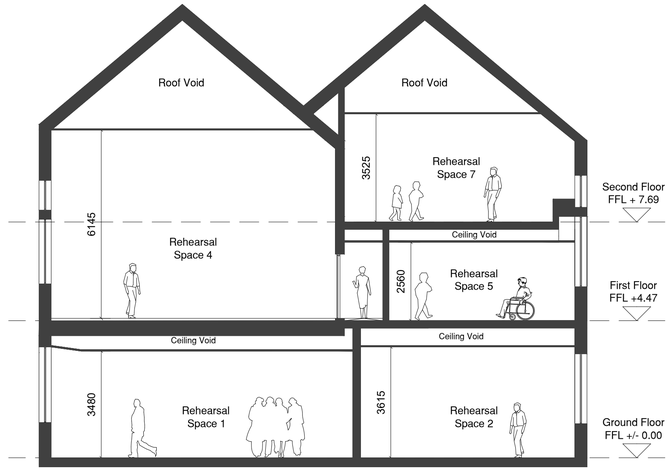
The potential noise impact from choral performances associated with the Proposed Development at nearby sensitive receptors is predicted to be below NR20 and below the existing background sound level, assuming the Proposed Development will have closed windows during recitals. This is an indication of a negligible impact. Specific noise limits for ancillary plant have been established in order to reduce the potential for an adverse noise impact at existing and proposed sensitive areas around the Site in accordance with BS4142. Plant noise should be reviewed by a suitably qualified engineer during Technical Design.

In summary, the assessment demonstrates that the existing building fabric, with the implementation of mechanical ventilation, is sufficient to provide the necessary level of sound insulation to meet the BB93 refurbishment criteria internally, and control of noise emissions with respect to potential impacts at nearby existing sensitive receptors, with respect to internal noise levels within the development



Ground Floor Plan

1:100



Section A

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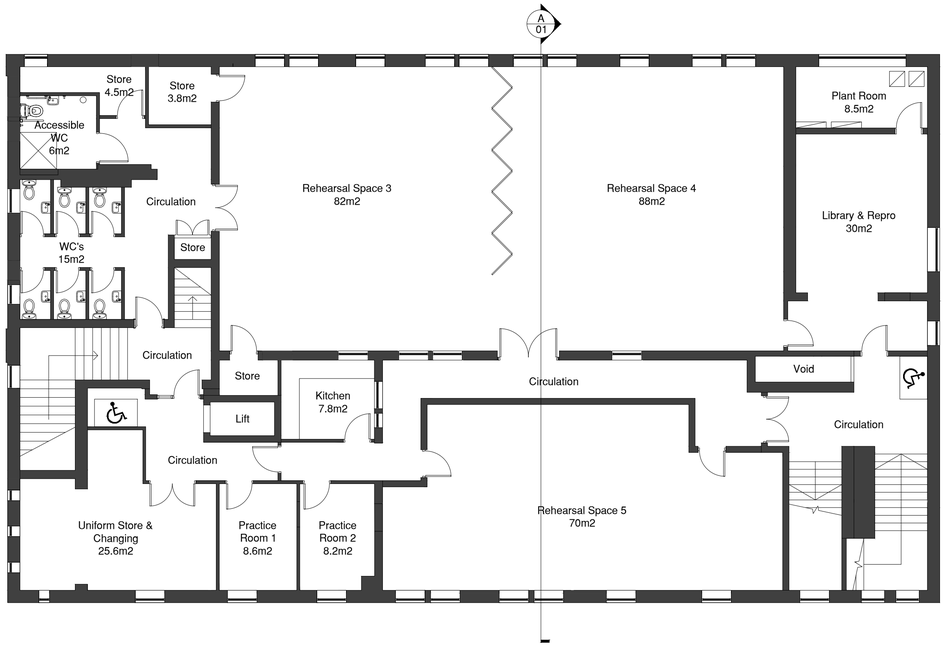

First Floor Plan

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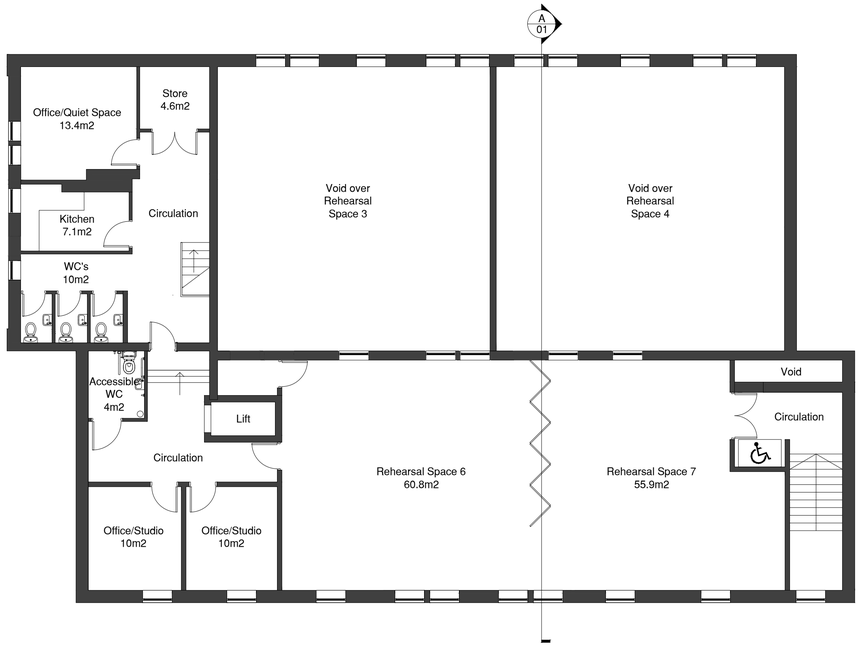


Second Floor Plan

1:100

0m 1 2 3 6m

1:100

NOTES

Rev	Notes	Date	Issued By
P1	First Issue	14/06/22	BST

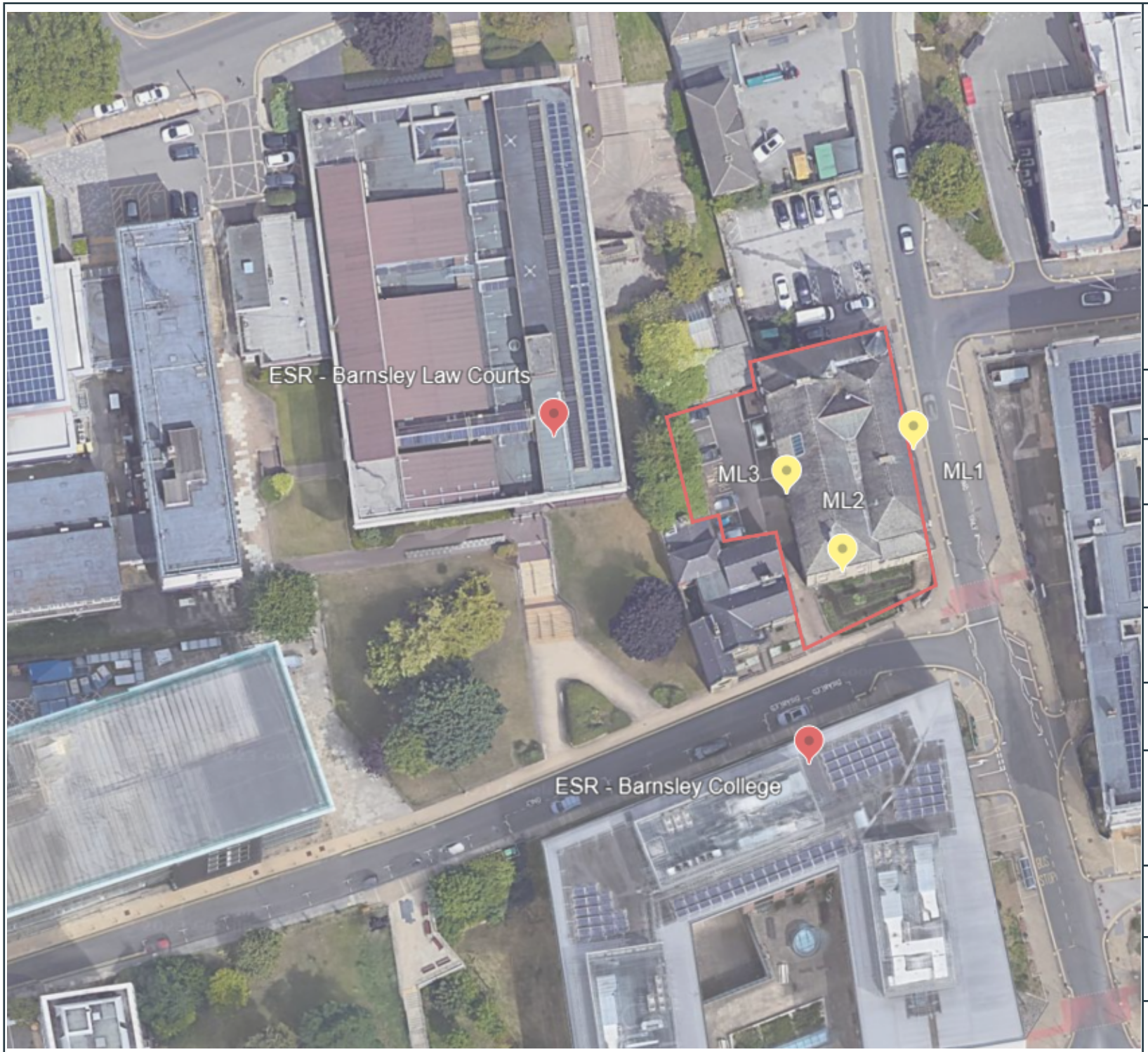
BARNSLEY Metropolitan Borough Council
PROPERTY SERVICES

SERVICE
Barnsley Youth Choir

PROJECT
The Nave

TITLE
Proposed Plans

PROJECT REF	DRAWING REFERENCE	REV
	020	P1
SCALE 1:100	DISCIPLINE ARCHITECTURE	SHEET SIZE A1
PURPOSE OF ISSUE PRELIMINARY	Drawn BST / Checked	



KEY

APPROXIMATE SITE BOUNDARY

MONITORING LOCATION

EXISTING SENSITIVE RECEPTOR

NOTES

REVISIONS

FIRST ISSUE

CREATED 03/10/2023	CHECKED 03/10/2023
B. GABRIEL	E. GOLDSMITH

Hydrock

Northern Assurance Building
9-21 Princess Street
Albert Square
Manchester
M2 4DN

CLIENT

CURRIE & BROWN

PROJECT

BARNSLEY LEVELLING UP FUND - THE NAVE

TITLE

FIGURE 2 - MONITORING LOCATIONS AND EXISTING SENSITIVE RECEPTORS

HYDROCK PROJECT NUMBER	SCALE
29119	NOT TO SCALE

PURPOSE	STATUS
FOR INFORMATION	S2

DRAWING NO.	
29119-HYD-XX-XX-Y-DR-1007	P01

Appendix A Glossary

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{AFmax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{AFmax} is sometimes used in assessing environmental noise where occasional loud noises occur, 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_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L10 is the level exceeded for 10% of the time, and the L90 is the level exceeded for 90% of the time.
R_w	R_w is the single-number quantity which characterizes the sound insulating properties of a given material over a range of frequencies. This is typically measured in a laboratory in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	$D_{n,e,w}$ is the single number quantity which characterizes the airborne sound insulation performance across a given 'element' and is typically used to describe the acoustic performance of trickle ventilators etc.
C_{tr}	C_{tr} is a correction term applied to single-number sound insulation values (R_w, $D_{n,e,w}$ etc.) to afford additional weighting against low frequency performance.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and at least 3m from buildings.

Appendix B Policy and Guidance

National Planning Policy Framework (NPPF)

Published in February 2021, this document sets out the Government's planning policies for England and supersedes the previous version of the NPPF published in 2019. It makes the following reference to noise in the section entitled Conserving and enhancing the natural environment:

> *"170. 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. 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."*

It also makes the following references to noise in the Section entitled Ground conditions and pollution:

> *"180. 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 life60;*
>
> *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.*
>
> *60 See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."*

And

> *"182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*

Noise Policy Statement for England (NPSE)

Published in March 2010, the Noise Policy Statement for England (NPSE) sets out the long-term vision of Government noise policy as follows:

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

The NPSE identifies three observed effect levels, names "No Observed Effect Level" (NOEL), "Lowest Observed Adverse Effect Level" (LOAEL) and "Significant Observed Adverse Effect Level" (SOAEL).

The NPSE contains little detail on assessment methodologies and specific parameters at which the varying observed effect levels would occur in the context of a residential development.

BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings

As discussed above, there is no specific guidance contained within the Planning Condition and the NPSE. In lieu of this, the approach that is generally adopted when assessing environmental noise sources on residential developments is to undertake an assessment in accordance with BS 8233: 2014.

BS 8233 provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building. The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is desirable that the internal ambient noise level does not exceed the following criteria set out in the table below:

Activity	Location	Period	
		Daytime (07:00 to 23:00 hrs)	Night-time (23:00 to 07:00 hrs)
Resting	Living room	$L_{Aeq,16hrs}$ 35 dB	-
Dining	Dining room/area	$L_{Aeq,16hrs}$ 40 dB	-
Sleeping (Daytime resting)	Bedroom	$L_{Aeq,16hrs}$ 35 dB	$L_{Aeq,8hrs}$ 30 dB

Whilst BS 8233:2014 recognises that a guideline value may be set in terms of SEL or L_{AFmax} for the assessment of regular individual noise events that can cause sleep disturbance during the night-time, a specific criterion is not stipulated. Accordingly, reference has been made in this assessment to the World Health Organisation (WHO) 1999: Guidelines for Community Noise below.

With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

World Health Organisation (WHO) 1999: Guidelines for Community Noise

As with the 'good' and 'reasonable' criteria in BS 8233, the L_{AFmax} criterion in BS8233 is largely concordant with the World Health Organisation (WHO) guidance 1999: Guidelines for community noise. This document draws upon guidance from Vallet and Vernay, which states:

> *"For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night"*

BS 4142:2014 - Methods for rating and assessing commercial and industrial sound

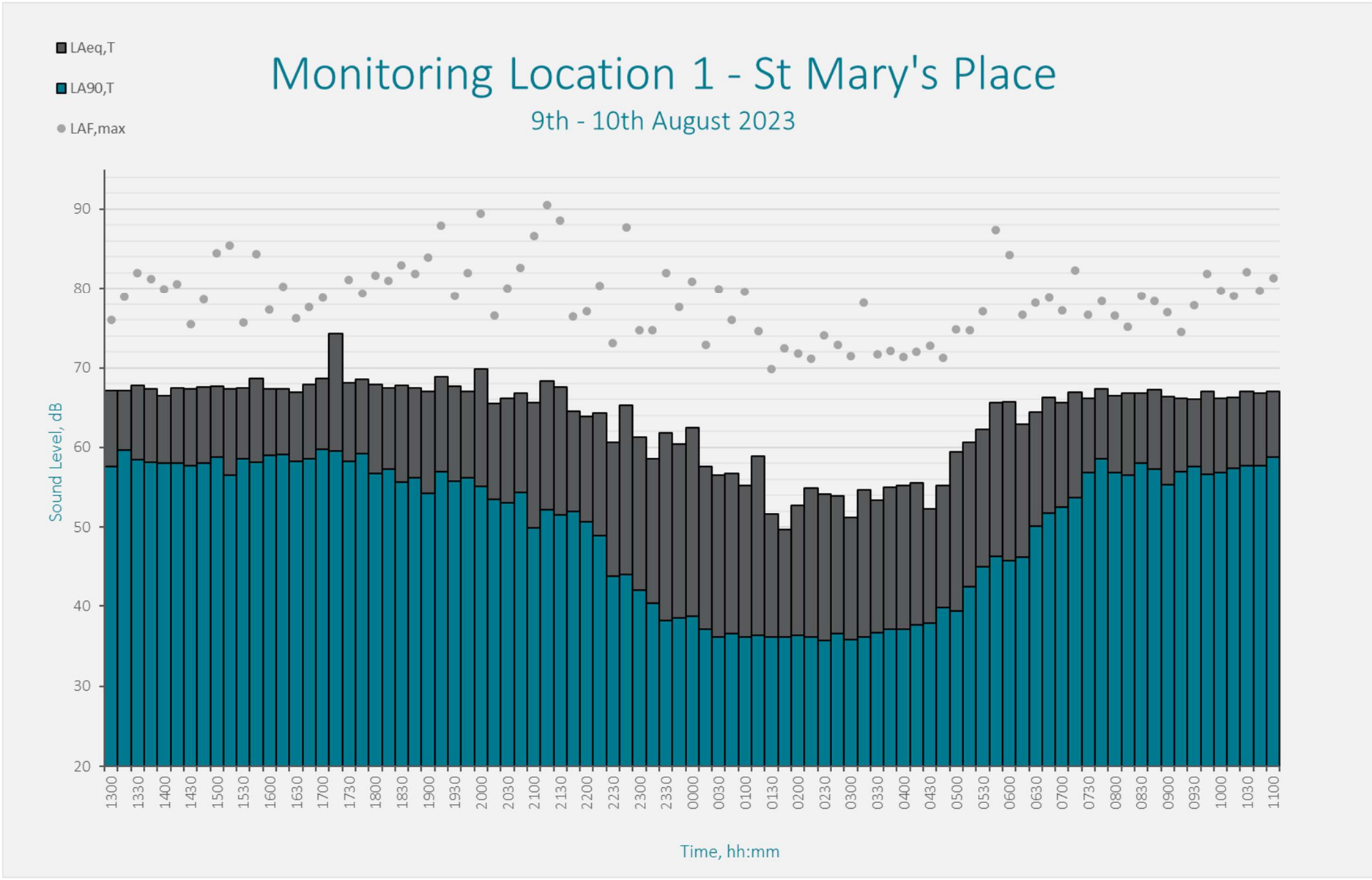
BS 4142 describes methods for rating and assessing sound from industrial and manufacturing processes, fixed installations which comprise mechanical and electrical plant and equipment, the loading and unloading of goods and materials at industrial and/or commercial premises and mobile plant and vehicles that are an intrinsic part of the overall sound emanating from premises or processes.

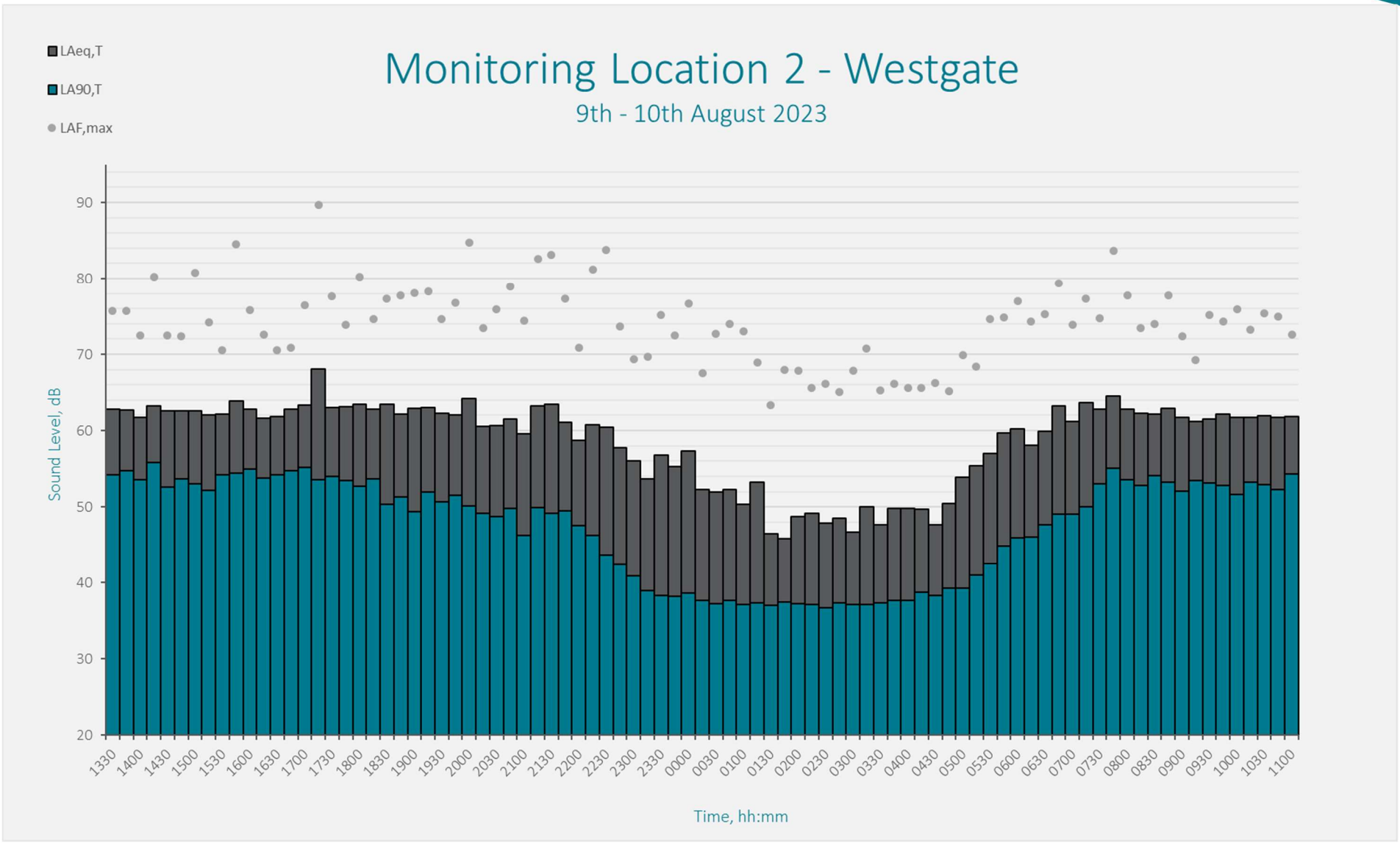
The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

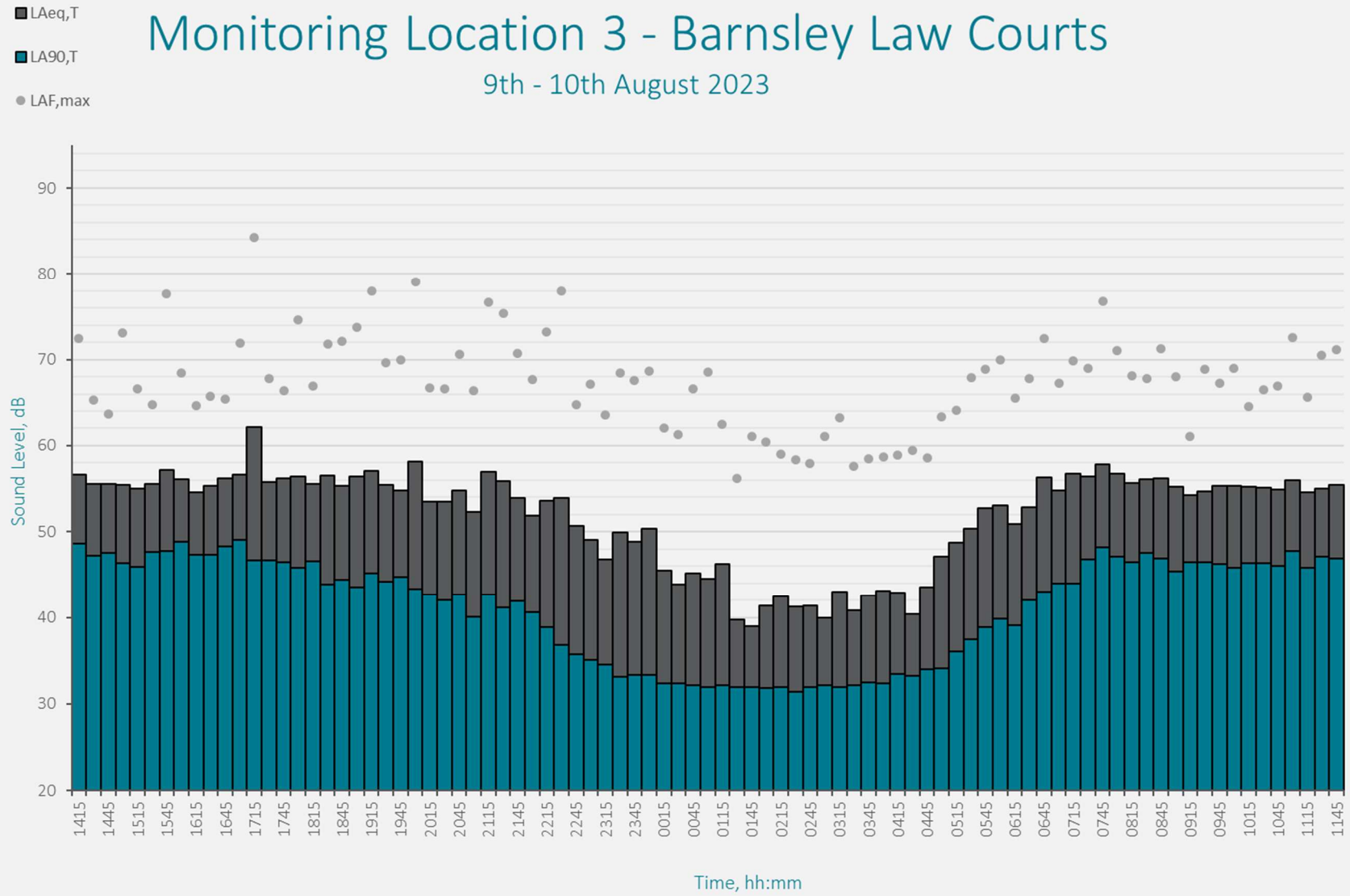
If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features to give a 'rating' level ($L_{Ar,Tr}$). The Standard effectively compares and rates the difference between the rating level of the sound and the prevailing background sound level ($L_{A90,T}$). Comparing the rating level with the background sound level, BS 4142 states:

> *"Typically, the greater this difference, the greater the magnitude of 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."*

Appendix C Noise Survey Results


LAeq,T
LA90,T
LAF,max
Monitoring Location 1 - St Mary's Place
9th - 10th August 2023
Sound Level, dB
90
80
70
60
50
40
30
20
1300
1330
1400
1430
1500
1530
1600
1630
1700
1730
1800
1830
1900
1930
2000
2030
2100
2130
2200
2230
2300
2330
0000
0030
0100
0130
0200
0230
0300
0330
0400
0430
0500
0530
0600
0630
0700
0730
0800
0830
0900
0930
1000
1030
1100
Time, hh:mm


LAeq,T
LA90,T
LAF,max
Monitoring Location 2 - Westgate
9th - 10th August 2023
Sound Level, dB
90
80
70
60
50
40
30
20
1330
1400
1430
1500
1530
1600
1630
1700
1730
1800
1830
1900
1930
2000
2030
2100
2130
2200
2230
2300
2330
0000
0030
0100
0130
0200
0230
0300
0330
0400
0430
0500
0530
0600
0630
0700
0730
0800
0830
0900
0930
1000
1030
1100
Time, hh:mm


LAeq,T
LA90,T
LAF,max
Monitoring Location 3 - Barnsley Law Courts
9th - 10th August 2023
Sound Level, dB
90
80
70
60
50
40
30
20
1415
1445
1515
1545
1615
1645
1715
1745
1815
1845
1915
1945
2015
2045
2115
2145
2215
2245
2315
2345
0015
0045
0115
0145
0215
0245
0315
0345
0415
0445
0515
0545
0615
0645
0715
0745
0815
0845
0915
0945
1015
1045
1115
1145
Time, hh:mm

Appendix D Noise Rating (NR) Assessment

Noise Rating (NR) Curve Assessment

Hydrock

Predicted Internal Noise Impact at Barnsley Law Courts during Typical Choir Recital at The NAVE

Frequency, Hz	Calculated Noise Level at Receptor Point (1m from Western Façade of Barnsley Law Courts)	Noise Attenuation from Open Window	Resultant Internal Noise Level, dB	NR20	A-Weighted Internal Noise Level, dB(A)
125 Hz	53.0	15.0	38.0	39.4	21.9
250 Hz	40.5	15.0	25.5	30.6	16.9
500 Hz	34.4	15.0	19.4	23.8	16.2
1 kHz	29.6	15.0	14.6	20.0	14.6
2 kHz	27.7	15.0	12.7	16.8	13.9
4 kHz	29.0	15.0	14.0	14.4	15.0
				Overall A-weighted Level	25.2

Comparison of Internal Noise Level and NR20