KION DEVELOPMENTS

PHASE 2, 51 GREAT UNDERBANK, STOCKPORT

NOISE ASSESSMENT FOR PLANNING PURPOSES

20 November 2023

AEC REPORT: P4784/R01/PJK

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DOCUMENT STATUS

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Revision	Date	Document Details	Author	Checked By
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1.0 INTRODUCTION

1.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by Kion Developments to undertake a noise assessment in relation to the proposed residential scheme at Phase 2, 51 Great Underbank, Stockport, which will include rooftop extensions to the existing building and the construction of two new-build townhouses.

1.2 This report details the baseline noise levels measured at the development site, presents the assessment criteria and discusses the implications on the building design, to achieve acceptable internal noise levels as required by the Local Authority.

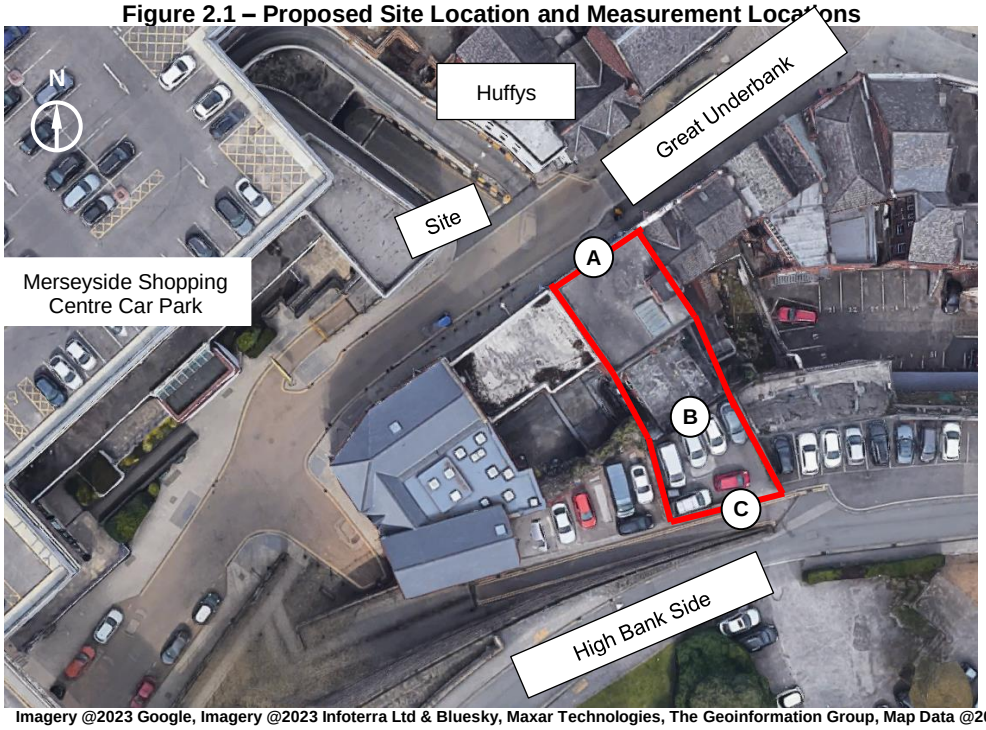
1.3 AEC prepared a noise assessment for planning purposes for Phase 1 of the scheme. The noise levels presented in the noise assessment for that scheme (AEC report P4784/R01/PJK dated 06 December 2022), have also been considered in this assessment along with updated supplementary daytime and night-time measurements.

1.4 Acoustic terminology is discussed in brief in Appendix A.

2.0 BACKGROUND AND SITE DESCRIPTION

2.1 The proposed development is located at 51 Great Underbank, Stockport. The existing building was formerly offices with a small car park to the rear. The site is bound to the north by Great Underbank and to the south by High Bank Side. A site location plan is presented in Figure 2.1, below.

Figure 2.1 – Proposed Site Location and Measurement Locations



Imagery @2023 Google, Imagery @2023 Infoterra Ltd & Bluesky, Maxar Technologies, The Geoinformation Group, Map Data @2023

2.2 The site is bound to the north by Great Underbank and to the south by High Bank. Great Underbank provides access through the centre of Stockport providing access to a number of shops and establishments in the area. Opposite the site is the exit of the Merseyway Shopping Centre car park (although none of the car park spaces are visible from the site) and Huffy's restaurant which is open between 0930 and 2300h Monday to Thursday and 0930 to 0000h on Friday and Saturday night.

2.3 The section of High Bank Side which the southern elevation of the site overlooks is a single carriageway one-way street which provides an additional exit route to leave the Merseyside Shopping Centre car park.

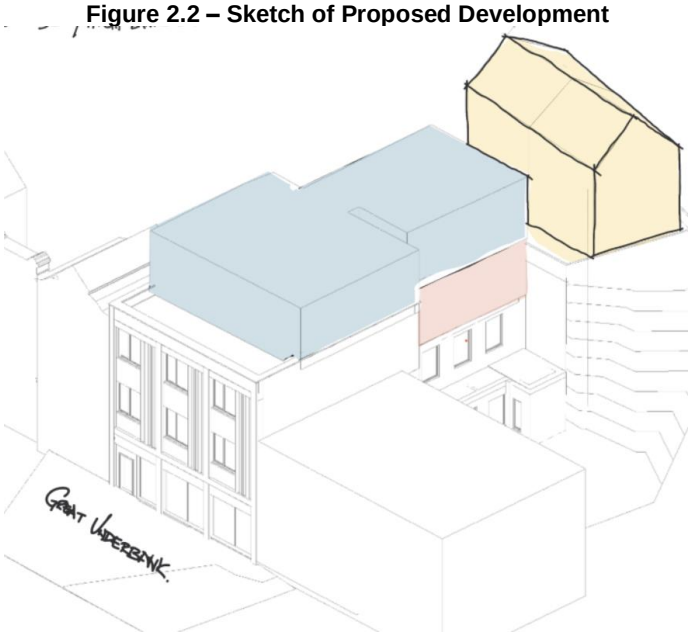
2.4 The units to the east and west are offices and shops which are understood to operate during typical offices hours.

2.5 The site falls within the noise contours produced by Manchester Airport and, therefore, noise from aircraft has also been considered in this assessment.

Proposed Scheme

2.6 Based on the scheme designed by Kelsall architects, three new apartments will be developed in a new two storey extension on the rear of the existing building, and a one-story extension on the roof of the existing building. Two new townhouses will also be constructed on the car park adjacent to High Bank Side. A sketch of the proposed development is presented in Figure 2.2, below.

Figure 2.2 – Sketch of Proposed Development



2.7 As previously stated, the coloured items shown above only relate to Phase 2 of the development. Phase 1 is comprised of apartments formed in the building below the coloured extensions highlighted in Figure 2.2, above.

2.8 There is no mechanical plant associated with the development, therefore, noise from this source has not been considered further.

3.0 NOISE CLIMATE

General

3.1 AEC undertook long term unattended noise measurements on the elevations facing Great Underbank and High Bank Side in November 2022. Supplementary attended daytime and night-time measurements were undertaken by AEC on the High Bank Side elevation in October and November 2023. A summary of the measured noise levels are presented separately below.

3.2 As the development is located under the flight path into Manchester Airport, a review has also been undertaken on the Manchester Airport Contour Lines. A summary of the findings of the review are also discussed.

2022 Measurements

3.3 AEC undertook unattended daytime and night-time noise level measurements on at the northern elevation (facing Great Underbank) of the building between 1230h on Friday 18 and 0700h on Monday 21 November 2022. Unattended daytime and night-time noise level measurements were undertaken on the southern elevation (facing High Bank Side) of the building between 1230h on Friday 18 and 2300h on Saturday 19 November 2022.

3.4 Both measurements, identified as Locations A and B on Figure 2.1, were undertaken at 1m from the façade at second floor level. Location A overlooked Great Underbank and the surrounding commercial units and Location B overlooked High Bank Side.

3.5 All measurements were undertaken at second floor level under façade conditions and in general accordance with British Standard (BS7445) 7445-1: 2003 '*Description and measurement of environmental noise. Guide to quantities and procedures*.

3.6 A full measurement procedure is presented in Table B.1 and the unattended measurements are presented on Graphs B.1 and B.2 of Appendix B.

3.7 A summary of the daytime ambient and night-time ambient and maximum noise levels measured at both locations is presented in Table 3.1, below.

3.8 In addition to the overall 8-hour night-time ambient noise levels, the ambient noise levels measured between 2100 and 2300h and 2300 and 0100h have also been provided as this is the period during which restaurants and other venues in the wider area are typically deemed to be at their busiest during the daytime and night-time periods.

3.9 In addition, the highest and 10th highest maximum noise level measured over 3-minute sampling periods are also presented in Table 3.1.

Table 3.1 – Summary of Daytime and Night-time Façade Noise Levels

Day	Noise Level, dB				
	Daytime		Night-time		
	0700-2300h, $L_{Aeq,16h}$	2100-2300h, $L_{Aeq,2h}$	2300-0100h, $L_{Aeq,2h}$	2300-0700h, $L_{Aeq,8h}$	$L_{Amax,F}$ Highest / 10th Highest
	Location A – Overlooking Great Underbank				
Friday	59	54	53	51	76 / 70
Saturday	56	53	52	52	84 / 70
Sunday	56	53	52	52	78 / 72
	Location B – Overlooking High Bank Side				
Friday	57	59	58	54	80 / 75
Saturday	56	54	-	-	-

3.10 Following a review of the audio recordings, the main source of noise during both the daytime and night-time periods at Locations A and B was road traffic and aircraft movements. As identified in Table 3.1, ambient noise levels at Location A did not increase between the periods of 2100 – 2300h and 2300 – 0100h when compared, respectively, to the daytime and night-time periods. Whilst there were increases at Location B between these times, these were not significant (≤4dB) and, therefore, noise from restaurants and bars is not deemed significant.

3.11 Maximum noise levels were typically due to aircraft movements at both locations. At other times, they were due to road traffic on nearby roads.

2023 Measurements

3.12 AEC undertook attended daytime noise measurements between 1615 and 1700h on Thursday 15 November 2023. Attended night-time measurements were undertaken between 2310h on Monday 09 October 2023 and 0020h on Tuesday 10 October 2023. All measurements were undertaken at Location C, identified on Figure 2.1, under free-field conditions.

3.13 A full measurement procedure is presented in Table B.2 in Appendix B and the measurements are presented in Tables B.3 and B.4 for the daytime and night-time periods, respectively.

3.14 A summary of the daytime ambient and night-time ambient and maximum noise levels is shown in Table 3.2, below.

Table 3.2 – Summary of Measured Free-field Noise Levels

Measurement Location	Period	Noise Levels, dB	
		Ambient, $L_{Aeq,T}$	Maximum, $L_{Amax,F}$
C	Daytime	60	-
	Night-time	57	76

3.15 The main source of noise during daytime period was vehicle movements on High Bank Side and aircraft movements. At night, the main source of ambient and maximum noise levels was due to aircraft movements. During the periods with no aircraft movements, the ambient noise level was due to distant road traffic.

Manchester Airport Contour Lines

3.16 Following a review of the Manchester Airport Contour Lines for 2019, issued in 2020, the site falls just in the 57 and 60dB$L_{Aeq,16h}$ contour lines during the daytime and between the 51 and 54dB$L_{Aeq,8h}$ contour lines at night. These levels are in line with the noise levels measured on-site, and therefore, the noise contours have not been considered further.

4.0 BASIS OF ASSESSMENT

National Planning Policy Framework

4.1 Current national planning policies are set out in the National Planning Policy Framework (NPPF) published by the Department for Communities and Local Government, dated 05 September 2023, which replaces the previous versions published in March 2012, reviewed in July 2018, updated in February 2019 and revised most recently in September 2023.

4.2 The planning policies which relate specifically to noise are reproduced below:

"174. 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

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 life65;

(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.

187. 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.

4.3 Further to the above, the Governments '*Planning Practice Guidance'* (PPG) published on 6 March 2014 and most recently updated in July 2021 states:

'Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.'

4.4 In addition, the guidance indicates that, whilst noise can override other planning concerns, it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users, and its surroundings, as these can have an important effect as to whether or not noise is likely to pose a concern.

Internal Noise Level Limits due to External Noise Ingress

4.5 Based on AEC's experience of assessments previously undertaken for Stockport Metropolitan Borough Council (SMBC), it is understood that they require the scheme to be designed such that internal noise levels are controlled to meet those presented in Section 7 of BS8233 and The Association of Noise Consultants (ANC) document Professional Practice Guidance (ProPG) on Planning and Noise '*New Residential Development*' (2017).

4.6 The proposed daytime and night-time noise limit levels to be achieved in habitable rooms due to transportation noise sources are presented in Table 4.1, below.

Table 4.1 – Internal Noise Level Limits within Habitable Rooms

Activity	Location	Noise Level Limit, dB		
		Daytime 0700 – 2300h $L_{Aeq,16h}$	Night-Time 2300 – 0700h	
			$L_{Aeq,8h}$	$L_{Amax,F}$
Resting	Living Room	35	-	-
Dining	Dining Room/Area	40	-	-
Sleeping (daytime resting)	Bedroom	35	30	45

4.7 In relation to maximum noise levels in bedrooms during the night-time period, Note 4 of ProPG states that "*Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB$L_{Amax,F}$ more than 10 times a night*."

4.8 Based on this AEC would propose to design the façade in order that maximum noise levels in bedrooms do not typically exceed 45dB$L_{Amax,F}$ during the night-time period 2300h to 0700h and any non-typical events such as a one-off emergency siren or noisy motorbike pass-by will be excluded in the assessment.

Ventilation Provision

Whole Dwelling Ventilation

4.9 The above internal noise level limits need to be achieved with whole dwelling ventilation, as defined in Approved Document F '*Ventilation*' (2021) of the Building Regulations.

4.10 Whole dwelling ventilation is typically achieved either via background ventilators (e.g., an open window or trickle ventilators) or mechanical means.

4.11 The Association of Noise Consultants (ANC) document 'Professional Practice Guidance on Planning & Noise: New Residential Development' (ProPG), states that the attenuation of external to internal noise levels provided by a window partially open for ventilation is no more than -15dB.

4.12 Therefore, for whole dwelling ventilation to be provided via a partially open window, the external noise levels presented in Table 4.2 should not be exceeded.

Table 4.2 – Allowable External Free-field Noise Levels for Whole Dwelling Ventilation via a Partially Opened Window

Activity	Location	Noise Level Limit, dB		
		Daytime 0700 – 2300h $L_{Aeq,16h}$	Night-Time 2300 – 0700h	
			$L_{Aeq,8h}$	$L_{Amax,F}$
Resting	Living Room	50	-	-
Dining	Dining Room/Area	55	-	-
Sleeping (daytime resting)	Bedroom	50	45	60

4.13 ADF states that information about overheating is given in Approved Document O (ADO) *'Requirement 01: Overheating Mitigation Regulations: 40B'* (2021).

4.14 In relation to purge ventilation, ProPG suggests that as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food), the internal desired noise levels are not generally applicable. Therefore, internal noise levels due to windows being opened for purge ventilation has not been discussed further.

Overheating Strategy

4.15 ADO states that in locations where external noise may be an issue (e.g. buildings close to busy roads) the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (2300 to 0700h).

4.16 The document then states that windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:

"a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am)."

4.17 Paragraph 1.11 and Table 1.4 of ADO states that the opening in the external façade of a bedroom should have a minimum free area of 4% of the floor area of the room for medium-risk areas such as this site.

4.18 In relation to proposing appropriate internal noise level limits and the control of overheating in residential properties during the daytime, AEC has considered the guidance presented in AVO. It is important to note that AVO is a design guide only and not a statutory document and the Local Authority may have their own requirements.

4.19 Whilst AVO does not specify specific limits in relation to allowable internal noise levels, it does suggest a Level 1 risk assessment should be undertaken considering the magnitude of external noise levels. Table 3.2 of AVO provides an indicative risk category assessment for different free-field external noise levels and states that above a free-field external noise level of approximately 63dB$L_{Aeq,16h}$, there is '*increasing risk of adverse impact'.* Therefore, this has been chosen as the external daytime noise level limit for which open windows cannot be relied upon for the control of overheating.

4.20 To consider the likely internal noise levels based on the above external noise levels, AVO indicates that a reduction in noise levels of around 13dB can be expected across a window that is partially open for ventilation purposes (approximately 2% or the floor area for a room).

Summary

4.21 Based on the above guidance from ADO and AVO, the free-field external noise level limits for which openable windows cannot be relied upon as an overheating strategy are presented in Table 4.3, below.

4.22 The fraction of the floor area stated by each guidance is also presented to aid in determining the corresponding internal or external noise level.

Table 4.3 – Noise Level Limits Above Which Openable Windows Should Not be Used for the Control of Overheating

Period	Minimum Fraction of Floor Area Required	Resulting External – Internal Level Difference, dB	Noise Level Limit, dB	
			External Free-field	Internal
Daytime Ambient, $L_{Aeq,16h}$	2%	-13	63	50
Night-time Ambient, $L_{Aeq,8h}$	4%	-9	49	40
Night-time Maximum, $L_{Amax,F}$			64	55

5.0 ASSESSMENT OF PROPOSED DEVELOPMENT

Determining of External Noise Levels

5.1 As the unattended long-term external noise level measurements were undertaken under façade conditions, a correction of -3dB has been applied to the measured noise levels in accordance with guidance presented in BS7445-2: 1991 '*Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*. .

5.2 Based on the noise levels presented in Tables 3.1 and 3.2, the daytime and night-time ambient and maximum noise levels external to the different elevations are presented in Table 5.1, below and on Figure 5.1 for the second floor and Figure 5.2, for the third floor and townhouse, respectively.

5.3 The levels are based on the periods when activities in the local area were at their noisiest to provide a robust assessment.

Figure 5.1 – Determined Free-Field External Noise Levels Second Floor

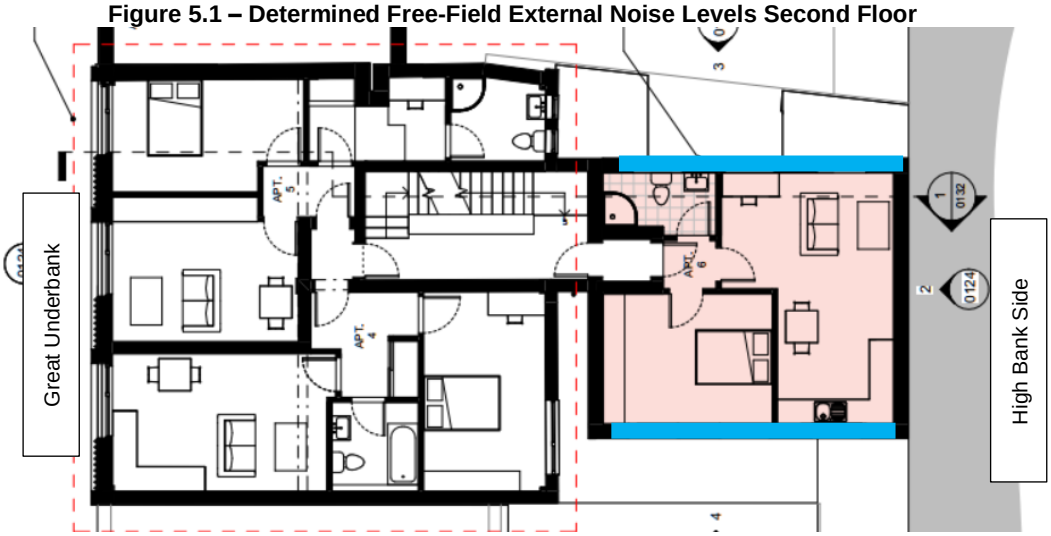


Figure 5.2 – Determined Free-Field External Noise Levels Third Floor and Townhouses

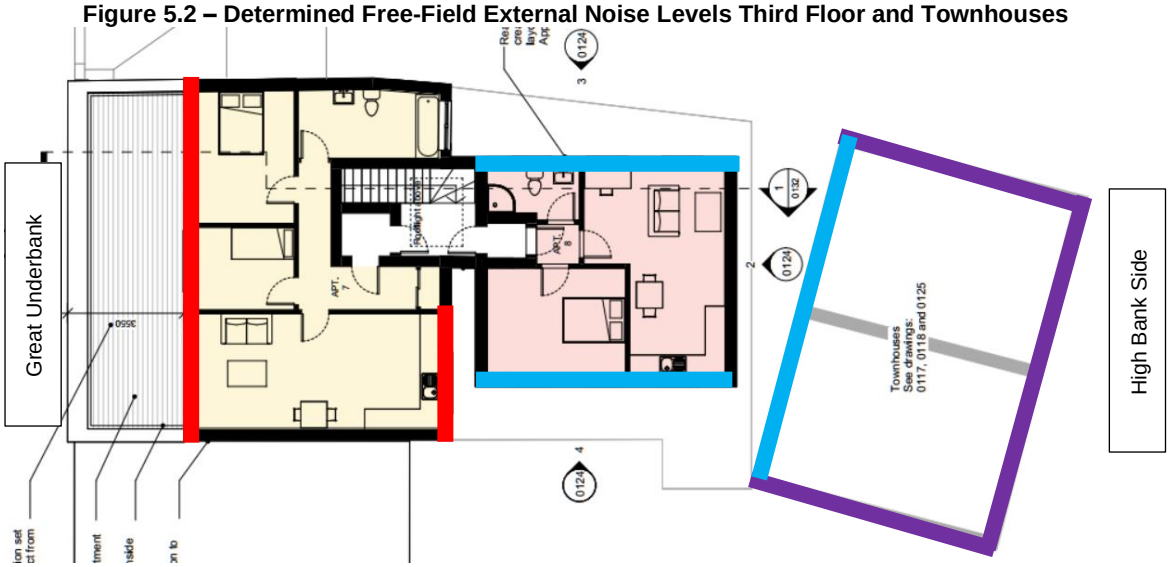


Table 5.1 – Daytime and Night-time External Free-Field Noise Levels

Colour on Figures 5.1 & 5.2	Noise Level, dB		
	Daytime 0700 – 2300h $L_{Aeq,16h}$	Night-Time 2300 – 0700h	
		$L_{Aeq,8h}$	$L_{Amax,F}$
Red	56	49	69
Blue	57	55	72
Purple	60	57	75

Glazing and Ventilation Requirements

5.4 As stated in Section 3.0, for habitable rooms to have whole dwelling ventilation provided via a window partially open, external noise levels should not exceed 50dB$L_{Aeq,T}$ during the daytime and 45dB$L_{Aeq,T}$ and 60dB$L_{Amax,F}$ at night.

5.5 A comparison between these levels and the determined noise levels presented in Table 5.1, indicates that alternate means of whole dwelling (background) ventilation would need to be provided to all habitable rooms in the development during the daytime and night-time periods.

5.6 The minimum sound insulation performances of the glazing and ventilators to meet the required internal noise levels limits for each noise source have been calculated based on the source noise levels and the glazing and room sizes stated on the provided drawings for the apartments. In relation to the townhouses, AEC has not been provided drawings for these, therefore, the room and glazing sizes have been assumed.

5.7 The minimum sound insulation performances are presented in Table 5.2, below.

Table 5.2 – Outline Requirements of Glazing and Ventilation to Achieve Internal Noise Levels in Habitable Rooms

Elevation / Colour on Figure 5.1	Sound Insulation Performance			
	Daytime (Living rooms etc.)		Night-time (Bedrooms only)	
	Glazing	Ventilator	Glazing	Ventilator
Red	29dBR_w / 25dBR_w + C_{tr}	33dB$D_{n,e,w}$	35dBR_w / 30dBR_w + C_{tr}	38dB$D_{n,e,w}$
Blue	29dBR_w / 25dBR_w + C_{tr}	33dB$D_{n,e,w}$	35dBR_w / 30dBR_w + C_{tr}	38dB$D_{n,e,w}$
Purple	32dBR_w / 28dBR_w + C_{tr}	38dB$D_{n,e,w}$	40dBR_w / 34dBR_w + C_{tr}	38dB$D_{n,e,w}$

5.8 Example glazing build-ups, to achieve the required sound insulation performances presented in Table 5.2, are provided in Table 5.3 below. Consideration of frames and seals is more critical where the glazing acoustic performance requirement is 40dBR_w or higher, in these instances consideration should be given to secondary glazed systems or alternative means of controlling noise break-in.

Table 5.3 – Example Glazing Constructions

Sound Insulation Performance	Example Construction
$40dBR_w$ / $34dBR_w + C_{tr}$	6mm Glass / 16mm TC / 6.8 Optiphon Glass
$35dBR_w$ / $30dBR_w + C_{tr}$	10mm Glass / 6-16mm TC / 4mm Glass
$32dBR_w$ / $28dBR_w + C_{tr}$	6mm Glass / 6-16mm TC / 4mm Glass
$29dBR_w$ / $25dBR_w + C_{tr}$	4mm Glass / 6-16mm TC / 4mm Glass

5.9 Prior to any glazing being installed, octave band sound insulation performance data of the glazing build-ups and ventilators selected must be verified by AEC or others.

5.10 All background ventilation sound insulation requirements have been based on the use of a single ventilator per room. If more than one unit is required, such as may be required to satisfy Building Control requirements, the performance of each unit might need to be increased.

5.11 Prior to any glazing being installed, octave band sound insulation performance data of the glazing build-ups and ventilators selected must be verified by AEC or others.

5.12 All background ventilation sound insulation requirements have been based on the use of a single ventilator per room. If more than one unit is required, such as may be required to satisfy Building Control requirements, the performance of each unit might need to be increased.

Purge Ventilation

5.13 Windows can be openable for purge ventilation provided that they are effectively acoustically sealed when closed, and it is important that any frames and seals do not downgrade the sound insulation performance of the glazing.

Control of Overheating

5.14 If it is determined by others that there is a need to control overheating within the development, a comparison between the noise levels presented in Table 5.1 and those presented in Table 4.2, indicates that windows can be opened to aid with the control of overheating in all habitable rooms during the daytime on all elevations.

5.15 However, windows would need to be kept closed to all bedrooms during the night-time period and alternative means of providing comfort cooling installed. If this is required, this would need to be developed.

External Envelope

5.16 To maintain the sound insulation performance of the external envelope the remainder of the façade construction should have a sound insulation performance of at least 10dB higher than the glazing. Therefore, the external walls and roof would need to achieve a sound insulation performance of at least around $50dBR'_w$. This would be readily achievable with standard construction methods such as cavity masonry.

6.0 SUMMARY & CONCLUSIONS

6.1 Acoustic & Engineering Consultants Limited (AEC) has been instructed by Kion Developments to undertake a noise assessment in relation to the proposed residential scheme at Phase 2, 51 Great Underbank, Stockport, which will include rooftop extensions to the existing building and the construction of two new build townhouses.

6.2 The proposed development is located at 51 Great Underbank, Stockport. The building was formerly offices. The site is bound to the north by Great Underbank and to the south by High Bank Side. The site falls within the noise contour produced by Manchester Airport and, therefore, noise from aircraft has also been considered.

6.3 Based on the scheme designed by Kelsall architects, three new apartments will be developed in a new two storey extension on the rear of the existing building, and a one story extension on the roof of the existing building. Two new townhouses will be constructed on the car park adjacent to High Bank Side.

6.4 AEC undertook long term unattended noise measurements on the elevations facing Great Underbank and High Bank Side in November 2022. Supplementary attended daytime and night-time measurements were undertaken by AEC on the High Bank Side elevation in October and November 2023.

6.5 Full details of the noise level survey are presented in Appendix B. A summary of the noise levels measured and the sources of noise affecting the proposed development are discussed in Section 3.0.

6.6 The basis of assessment is presented in Section 4.0. The design aim for the scheme is based on achieving the desirable internal noise level limits presented in BS8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’ (BS8233) and the Association of Noise Consultants (ANC) document 'ProPG: Planning and Noise - New Residential Development', 2017 (ProPG). These limits are based on achieving the whole dwelling ventilation requirements as set out in Approved Document F ‘Ventilation’ (2021) of the Building Regulations only.

6.7 The implications of the external noise levels on the control of overheating have been assessed using the design advice presented in the Approved Document O *‘Requirement 01: Overheating Mitigation Regulations: 40B’* and the ANC design guide ‘*Acoustic ventilation and Overheating – Residential Design Guide’* (AVO).

6.8 The determined external daytime and night-time noise levels are presented on Figures 5.1 and 5.2. An assessment of the required glazing sound insulation performances to meet the internal noise level limits provided in Section 4.0 are presented in Table 5.2.

6.9 In relation to the control of overheating, windows can be open to all habitable rooms during both the daytime. However, windows would need to be kept closed to all bedrooms at night with alternative means of comfort cooling provided.

6.10 The above demonstrates that appropriate acoustic measures can be implemented into the design of the proposed development to achieve appropriate acoustic standards.

6.11 Based on this assessment, noise should not be considered a determining factor in relation to any planning permission being sought.

APPENDIX A – Acoustic Terminology in Brief

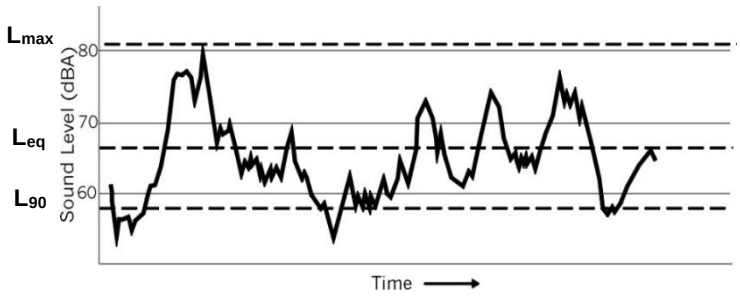
General

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air. The rate at which the pressure fluctuations occur determines the pitch or *frequency* of the sound. The frequency is expressed in Hertz *(Hz)*, that is, cycles per second. The human ear is sensitive to sounds from about 20 Hertz to 20,000 Hertz. Although sound can be of one discreet frequency - a 'pure tone' - most noise is made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same subjective way. This is the basis of the A-weighted sound pressure level *dBA,* normally used to assess the effect of noise on people. The dBA weighting emphasizes or reduces the importance of certain frequencies within the audible range

Sound / Noise Units

The figure below shows an example of sound level varying with time. Because of this variation over time the same period of noise can be described by several different levels. The most common of these are described below.

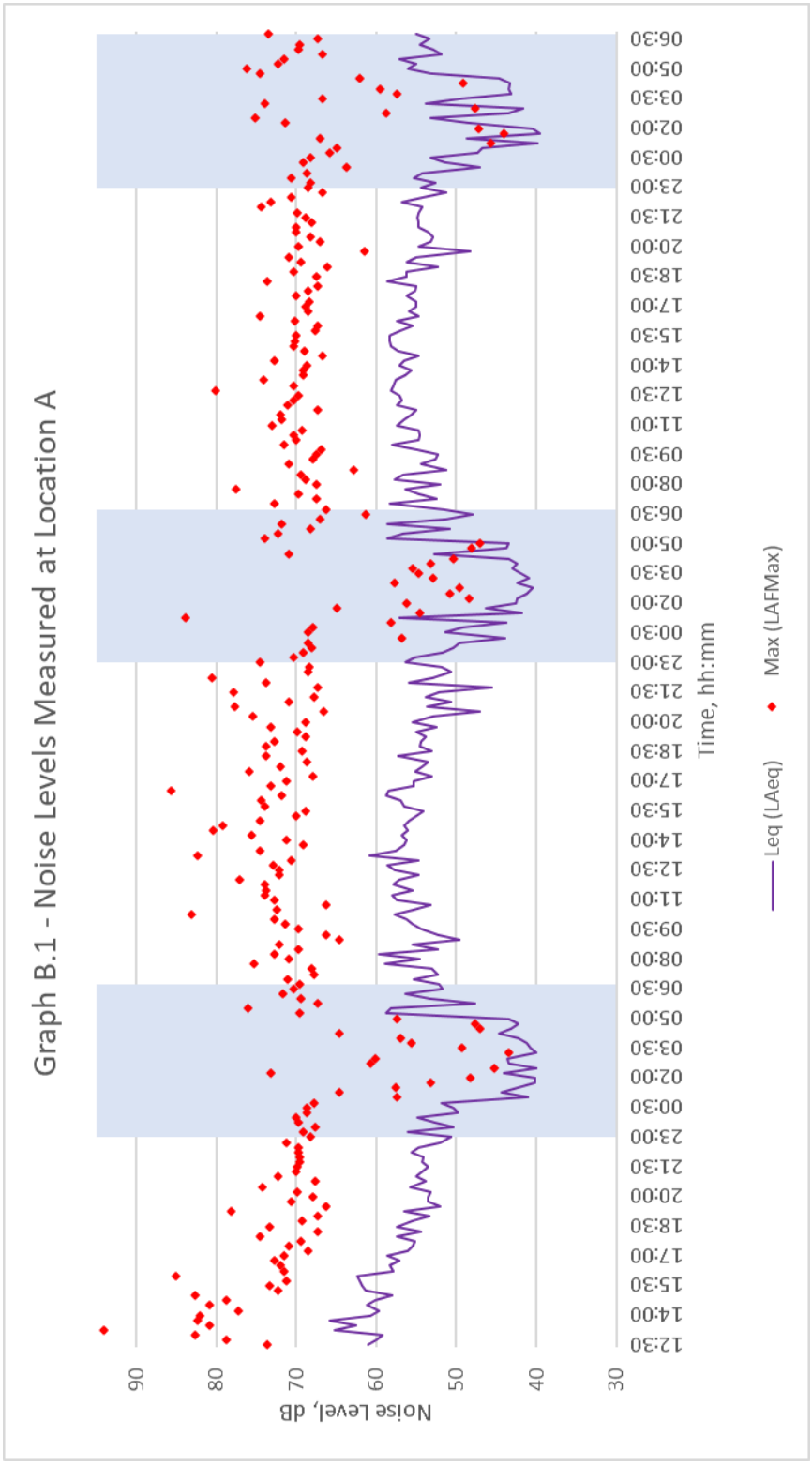


Commonly Used Descriptors for Sound / Noise	
$L_{Amax,F/S}$	The maximum (A-weighted) sound level measured during a given time. 'Fast' or 'Slow' meter response should be cited.
$L_{Aeq,T}$	The equivalent continuous (A-weighted) sound level. It may be thought of as the "average" sound level over a given time, T. It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises. **It can be considered as the "ambient" noise level.**
$L_{A90,T}$	The (A-weighted) sound level exceeded for 90% of a measurement period. **It is the value often used to describe the "background" noise.**
Free-field Level	This refers to the sound level measured outside, away from reflecting surfaces.
Façade Level	This refers to the sound level measured outside, at 1m from a hard reflecting surface, typically 3dB greater than the free-field level.
R_w	Single number rating used to describe the laboratory airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
R'_w	Apparent sound reduction index - Single number rating used to describe the sound reduction index of an on-site construction over a range of frequencies, typically 100-3150Hz.
$D_{n,e,w}$	Element normalised level difference. Single number rating used to describe the sound insulation performance of small elements
C_{tr}	A road traffic spectrum adaptation term which is used to describe the low frequency sound insulation performance of building elements.

APPENDIX B – Noise Survey Details

Table B.1 – Measurement Procedure

Date & Time of Survey:	Location A - 1430h on Friday 18 to 0700h on Monday 21 November 2022. Location B - 1430h on Friday 18 to 2300h on Saturday 20 November 2022.					
Personnel:	Paul Knowles (AEC).					
Equipment Used:	Location A - Cirrus CR:171B Real Time Analyser (AEC Kit 3). Location B - Cirrus CR:171B Real Time Analyser (AEC Kit 5).					
Calibration:	The sound level analysers, which conform to BS EN 61672-1: 2013 *'Electroacoustics – Sound level meters - Part 1 Specifications'* for Class 1 Type Z meters, were in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	**Date**	**Period**	**Wet/Dry**	**Temp**°C	**Wind Speed & Direction**	**Cloud Cover**
	18.11.22	Day	Dry	09°C	Easterly and 4m/s	50%
	18-19.11.22	Night	Dry	07°C	Southerly and 2m/s	20%
	19.11.22	Day	Dry	09°C	Southerly and 2m/s	50%
	19-20.11.22	Night	Dry	06°C	Northerly and 4m/s	80%
	20.11.22	Day	Dry	09°C	Northerly and 3m/s	50%
	20-21.11.22	Night	Dry	04°C	Southerly and 2m/s	100%
Measurement Locations:	The microphones were connected via an extension cable and fixed externally at a location 1m from the northern and southern elevations at 2nd floor level, identified as A and B on Figure 2.1.					


Graph B.1 - Noise Levels Measured at Location A
Noise Level, dB
90
80
70
60
50
40
30
Time, hh:mm
12:30
14:00
15:30
17:00
18:30
20:00
21:30
23:00
00:30
02:00
03:30
05:00
06:30
08:00
09:30
11:00
12:30
14:00
15:30
17:00
18:30
20:00
21:30
23:00
00:30
02:00
03:30
05:00
06:30
Leq (LAeq)
Max (LAFMax)

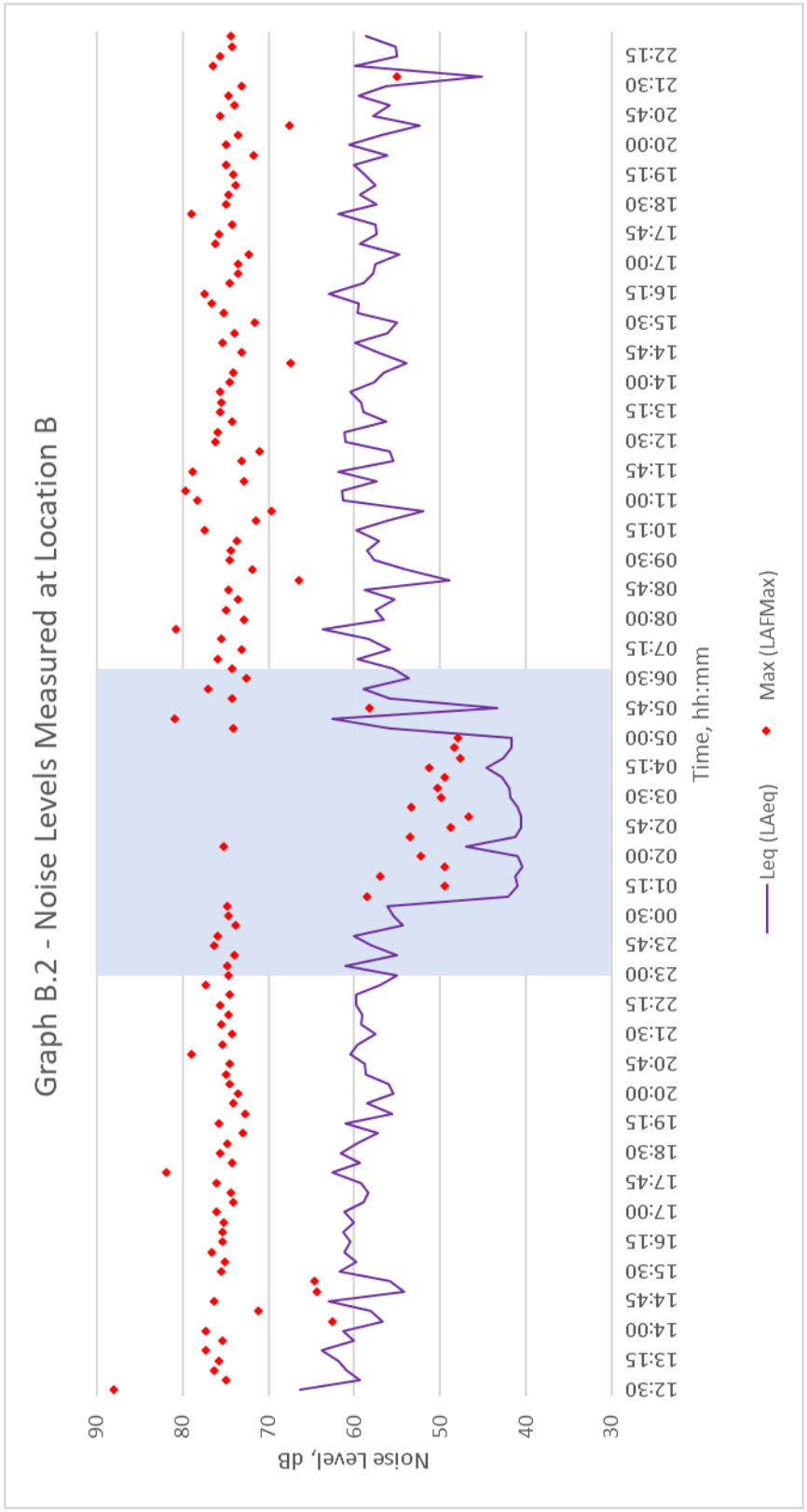

Graph B.2 - Noise Levels Measured at Location B
Noise Level, dB
90
80
70
60
50
40
30
Time, hh:mm
12:30
13:15
14:00
14:45
15:30
16:15
17:00
17:45
18:30
19:15
20:00
20:45
21:30
22:15
23:00
23:45
00:30
01:15
02:00
02:45
03:30
04:15
05:00
05:45
06:30
07:15
08:00
08:45
09:30
10:15
11:00
11:45
12:30
13:15
14:00
14:45
15:30
16:15
17:00
17:45
18:30
19:15
20:00
20:45
21:30
22:15
Leq (LAeq)
Max (LAFMax)

Table B.2 – Environmental Measurement Procedure

Date & Time of Survey:	Daytime: 1615 to 1700h on Wednesday 15 November 2023. Night-time: 2310h on Monday 09 to 0020h on Tuesday 10 October 2023.					
Personnel:	Paul Knowles (AEC).					
Equipment Used:	Cirrus CR:171B Real Time Analyser (AEC Kit 3).					
Calibration:	The sound level analysers, which conforms to BS EN 61672-1: 2013 *'Electroacoustics – Sound level meters - Part 1 Specifications'* for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	**Date**	**Period**	**Wet/Dry**	**Temp**°C	**Wind Speed & Direction**	**Cloud Cover**
	15.11.23	Daytime	Dry	09C	Easterly and 3 m/s.	100%
	09-10.10.23	Night-time	Dry	12°C	Calm.	60%
Measurement Locations:	Measurements were undertaken at a single location, identified as C on Figure 2.1 and described below. C – 1m from nearest carriageway of High Bank Side.					
Measurement Details:	All measurements were undertaken under free-field conditions. Measurements were undertaken over various periods in terms of L_{eq}, L_{10}, $L_{90,}$ and L_{max} and were logged continuously over 1s for post processing and assessment. The daytime and night-time measured noise levels are presented in Tables B.3 and B.4, respectively, below.					
Measured Data:	Full 1/3rd octave/octave band centre frequency data was obtained for all measurements.					

Table B.3 – Measured Daytime Noise Levels

Location	Period, h	Noise Level, dB				Comments
		L_{Aeq}	L_{A10}	L_{A90}	$L_{Amax, F}$	
C	1615 – 1630	64.2	68.0	55.4	78.5	Main sources of noise intermittent road traffic on High Bank Side and planes flying into Manchester Airport.
	1630 – 1645	62.1	63.6	54.3	77.9	
	1645 – 1700	62.4	64.9	54.4	79.4	

Table B.4 – Measured Night-Time Noise Levels

Location	Period, h	Noise Level, dB			Comments
		L_{Aeq}	L_{A90}	$L_{Amax, F}$	
C	2310 – 2320	60.7	40.3	75.2	Main sources of noise intermittent road traffic on High Bank Side and planes flying into Manchester Airport.
	2320 – 2330	55.3	39.5	72.7	
	2330 – 2340	56.5	39.5	74.6	
	2340 – 2350	59.6	39.6	74.2	
	2350 – 0000	58.9	39.1	74.8	
	0000 – 0010	40.3	38.5	62.3	Main sources of noise distant road traffic.
	0010 – 0020	42.0	38.9	59.9	