Azymuth Acoustics UK

Professional Acoustic Services

Planning Condition 24a

Condenser Noise Impact Assessment
Ref: Z57053.5 RevC

8no. Apartments & 5no. Houses,
Cross Lane and Varey Street,
Manchester

On behalf of

R&M Property Group
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1.0 Introduction

Azymuth Acoustics UK (henceforth Azymuth) has been appointed by R&M Property Group to produce a Condenser Noise Impact Assessment regarding the installation of 13No. Air Source Heat Pumps (ASHPs) at a new build development site consisting of 8no. apartments and 5no. houses located at the Cross Lane / Varey Street, Manchester.

The Condenser NIA has been produced to assist with the discharge of Planning Condition 24a in relation to condenser noise as per Planning Application 136203/FO/2023 (Cross Lane) and 136204/FO/2023 as varied by 139774/JO/2024 (Varey Street).



Figure 1 – Site plan of proposed development, Cross Lane



Figure 2 – Site plan of proposed development, Varey Street

This noise impact assessment is intended to provide information relating to potential noise levels from 13no. condensers affecting the site in order to support planning condition 24a for the residential development. In particular, the report sets out the following details:

- The results of a baseline noise survey undertaken in the vicinity of Cross Lane / Varey Street
- The appropriate assessment criteria and guidance relating to noise in the environment as associated with this kind of development
- Recommendations to meet the targets as set out by the assessment criteria
- Condition 24a below:

> 24) a) Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive
> location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The scheme shall
> be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.

It should be noted that planning condition 24a should be addressed prior to installation of the heat pumps, to check that the proposed locations and operation will meet the policy. However, in this instance the heat pumps are installed. It is assumed that all drawings and information provided by the client are up to date and correct.

2.0 Baseline Noise Survey

2.1 Measurement Procedures

The instrumentation used for the NIA consisted of a SvanTek 971/SvanTek 977 type 1 precision sound level meter. The equipment was calibrated before and after measurements. The sound level meter measured A-weighted (fast response) noise levels as well as octave bands noise levels for all measurement record.

Daytime noise level measurements were undertaken between 15:37hrs and 17:53hrs on Wednesday 6th March 2024 and between 10:32hrs and 11:53hrs on Wednesday 13th March 2024. The night-time measurements were undertaken between 23:00hrs and 00:11hrs on Tuesday 19th / Wednesday 20th March 2024.

The noise measurements were undertaken using the sound level meter at the position(s) shown in Figure 3 below:

- Position 1: Cross Lane (~6.5m from Cross Lane roadside)
- Position 2: Cross Lane / Varey Street (~5m from Cross Lane roadside)
- Position 3: Cross Lane / Chapman Street (~4.5m from Cross Lane roadside)



Figure 3 – Noise measurement position(s)

2.2 Summary of Azymuth Noise Measurements

2.2.1 General Environmental Noise Survey Data

The following table summarises the results of the noise measurements undertaken at the proposed site in terms of the average daytime and night-time noise levels.

Location	Period	L_{AFmax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
1) Cross Lane	Day	74.7	62.3	65.0	59.4	53.8
	Night	71.8	59.8	64.4	52.0	44.8
2) Cross Lane / Varey Street	Day	73.7	60.4	64.7	54.3	48.0
	Night	73.3	56.9	58.7	46.5	41.9
3) Cross Lane / Chapman Street	Day	78.3	66.2	69.1	64.5	58.9
	Night	72.9	58.6	61.9	51.1	40.9

Table 1 – Summary of Azymuth noise measurements (general day/night ambient noise)

Azymuth assumes that all noise levels measured on-site during the baseline noise survey are typical of the site. Full results can be found in Appendix B.

2.2.2 Assessment of Night-time L_{Amax} Data

Azymuth has carried out an assessment of the available night-time L_{Amax} noise level data for measurement position 1 (referenced to ~6.5m from the roadside). The highest measured L_{Amax} value was 72.4dB and the duration of the night-time survey was exactly 20 minutes in this position hence it is estimated that the 10th highest L_{Amax} value over the entire 8hr night-time period is likely to be around 74-77dB.

2.2.3 Description of Noise Climate

The main source of noise affecting the site originates from traffic along Cross Lane and Chapman Street which see a moderate flow throughout the day.

The weather during the measurement procedure on Wednesday 6th March 2024 was dry with wind speeds less then 5mph whereas the weather on Wednesday 13th March was rainy with similar wind speeds. The weather during the night-time survey consisted of light rain showers with wind speeds also less than 5mph.

3.0 Assessment Criteria

In order to assess the extent of any measures required in order to comply with suitable conditions relating to potential noise sources, Azymuth Acoustics UK has reviewed various guidance documents and standards, these include:

- National Planning Policy Framework (NPPF 2026)
- British Standard 8233:2014
- World Health Organisation Guidelines on Community Noise
- British Standard 4142:2014+A1:2019 & BS 4142:1977
- Microgeneration Certification Scheme (MCS 020a)
- Air Source Heat Pumps: Professional Advice Note (2026)
- Manchester City Council: Planning and Noise Technical Guidance
- Manchester City Council Planning Application 136203/FO/2023 (Cross Lane) and 136204/FO/2023 as varied by 139774/JO/2024 (Varey Street).

3.1 National Planning Policy Framework (NPPF) 2026

The National Planning Policy Framework (NPPF), updated in August 2026, sets out national planning policy requirements relating to noise under Chapter 17, Policy P3 – Living conditions and pollution, and Policy P4 – Impact of development on existing activities.

Policy P3(1) requires development proposals to be appropriate for their location, taking into account the likely effects, including cumulative effects, of pollution on health, living conditions and the natural environment, whether these effects are on or off-site and whether they arise from the development itself or from pre-existing conditions in its vicinity. The policy also requires consideration of the sensitivity of the site, its intended occupiers and users, and the surrounding environment and population.

Of particular relevance to noise, Policy P3(2)(a) states that development proposals should:

“Provide healthy living conditions for occupiers and users in terms of adequate access to light and avoiding exposure to levels of air, noise, artificial light or other sources of pollution which could have an unacceptable adverse effect on health and quality of life. Where necessary suitable mitigation measures should be incorporated to secure acceptable living conditions.”

In addition, Policy P3(2)(b) states that development proposals should not give rise to, or contribute to, unacceptable levels of noise on or beyond the site, with adverse impacts to be avoided where possible or otherwise mitigated to an acceptable degree.

Policy P3(2)(d) specifically requires development proposals to:

“Mitigate and reduce to a minimum potential adverse impacts resulting from noise, not result in levels of noise exposure which would have a significant observed adverse effect, and maintain the character of tranquil areas…”

The NPPF also contains specific requirements concerning the relationship between new development and existing activities. Policy P4 – Impact of development on existing activities states that existing businesses, community facilities, public services and defence and security activities should not have unreasonable restrictions placed on their current or permitted operation as a result of development being approved after they were established. Development proposals should therefore be capable of being effectively integrated with existing activities and infrastructure in their vicinity.

Where an existing activity could have a significant adverse effect on a proposed new development, Policy P4(2) requires the proposal to identify the nature of the potential impacts and, where necessary, be informed by early discussions between the applicant, as the 'agent of change', and the existing uses that could be affected. The proposal must also demonstrate that suitable mitigation can be provided before first occupation where this is necessary for the development to be acceptable. Both lawful current and permitted levels of operation of existing activities should be taken into account.

The proposed development has therefore been assessed in accordance with NPPF Policies P3 and P4, with consideration given to existing noise conditions, the potential noise effects associated with the development, the effects on existing and proposed noise-sensitive receptors, the potential cumulative effects, and the need for appropriate mitigation measures. Where relevant, consideration has also been given to the potential for the development to affect the continued operation of existing noise-generating activities.

3.2 British Standard 8233: 2014

BS 8233 provides a code of practice for the sound insulation of a variety of building types affected by general environmental noise. It provides recommendations for control of noise in and around buildings and suggests appropriate internal ambient noise level criteria / limits for a variety of different situations including residential properties.

The following table summarises the noise limits suggested by BS 8233 applying to residential properties:

Activity	Room	Good Design Range $L_{Aeq,T}$ dB	
		07:00-23:00hrs	23:00-07:00hrs
Resting	Living Room	35	-
Dining	Dining Room / Area	40	-
Sleeping (daytime resting)	Bedroom (at night)	35	30

Table 2 – Noise Limits for Residential Properties Suggested in BS 8233

BS 8233 also states that traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$, which would be acceptable in noisier environments.

3.3 World Health Organisation Environmental Noise Guidelines (ENG) 2018

The main purpose of the 2018 WHO guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from the following sources: transportation (road traffic, railway and aircraft), wind turbines and leisure activities.

The guidelines set out to define recommended exposure levels for environmental noise in order to protect population health. Exposure limits are average levels defined over a period of one year, measured outdoors in free field at the most exposed façade. It should be noted that the document does not provide guideline limit values for multiple noise sources in combination.

The 2018 guidelines supersede the Community Noise Guidelines from 1999. Nevertheless, the document recommends that all CNG indoor guideline values and any values not covered by the current guidelines should remain valid. As such, the following guidance would remain appropriate:

For protection against sleep disturbance inside dwellings, night-time noise levels should not exceed 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for typical single sound events (which are exceeded 15 times or more per night – see ProPG Appendix A.12 for more details).

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise (interpreted as noise from all sources combined) should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas.

It should be noted that exposure levels defined in ENG and CNG are for guidance purposes as relates potential adverse health impacts and should not be interpreted as absolute limits or regulations.

3.4 British Standard 4142:2014+A1:2019 & BS 4142:1997

"Methods for assessing and rating industrial sound" describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard 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.

- Typically, the greater the difference between background sound and industrial/commercial noise, the greater the magnitude of the impact.
- 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.
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

BS 4142 notes that: "Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

In BS 4142: 1997, it states that 'background noise level below 30dB and rating level below about 35dB are considered to be very low'. The assessment should consider the character of the existing sound environment alongside the measured and predicted noise levels when evaluating the potential impact.

3.5 Air Source Heat Pump: Professional Advice Note (2026)

The Air Source Heat Pumps Professional Advice Note (2026), published jointly by the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH), provides guidance on proportionate acoustic assessments for air source heat pump (ASHP) installations, aiming to support planning applications for sustainable heating and cooling systems while reducing unnecessary administrative burdens for installers and local authorities. Where Permitted Development Rights (PDR) do not apply, the guidance outlines a range of assessment methods between standard installer-led MCS 020a calculations and more detailed assessments using BS 4142:2014+A1:2019, Methods for rating and assessing industrial and commercial sound.

The appropriate assessment level is determined by a Suitably Qualified Acoustician (SQA), considering the specific circumstances of the installation. The methodology primarily uses a noise threshold of 37 dB(A), defined as the incident sound pressure level calculated 1 metre in front of the centre of a window or door serving a habitable room in a neighbouring property.

3.6 Microgeneration Certification Scheme (MCS 020a)

The Microgeneration Certification Scheme allows for ASHPs to be installed on residential properties under permitted development.

Permission is granted if noise from the ASHP is equal to or lower than the noise limit of 37dB $L_{Aeq,5min}$ at 1 metre from a window or door opening to a habitable room ("a room other than a bathroom, shower room, water closet or kitchen") on the façade of a neighbouring residential property (including flats within the same block of flats). Compliance is determined via a series of steps set out in MCS 020a. The 37dBA noise limit approximately equates to an internal noise level ≤25dBA in rooms with half-opened windows. This is in line with target night-time limits for bedrooms described in BS 8233 and ENG.

3.7 Manchester City Council: Planning and Noise Technical Guidance

3.7.1 Guidance Relating to Residential Developments

The Council has adopted the following noise limits for residential properties:

- Bedrooms (night time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 10 times)
- Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}
- Gardens and terraces (daytime) 55 dB L_{Aeq}

3.7.2 Guidance Relating to Industrial and Commercial Noise Sources

The Technical Guidance states that:

BS 4142 should be used to assess the likely impact of noise from industrial and commercial sources at noise sensitive premises (section 3.5). One of the indications of the impact of a BS 4142 assessment is 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.

3.8 Manchester City Council Planning Application 136203/FO/2023 and 139774/JO/2024 Condition 24a

"Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The scheme shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority."

3.9 Recommended Noise Assessment Criteria

Azymuth would recommend the following criteria in order to reduce the impact of any ASHP noise on the surrounding environment:

- Noise level from plant to be 5dB L_{Aeq} below background noise level (L_{90}) at any of the nearest worst-case residential receptors (off-site and on-site) as set out in BS4142 and referenced in the planning policy 24a.
- Noise level not to exceed 37dB $L_{Aeq\ 5min}$ at the nearest noise-sensitive receptor's habitable area window (on-site) as set out in The Air Source Heat Pumps Professional Advice Note (2026) and MCS 020a.

4.0 Proposed Site Plans

4.1 Proposed Plant Specifications and Locations

It is understood that the Vaillant aroTHERM Plus 3.5kW ASHP will be installed at the rear façade of each flat and house on the ground level with the exception of 69 Cross Lane which will have a Vaillant aroTHERM Plus 5kW ASHP installed on the East façade of the building on the ground floor. The plant specification is the same for both the 3.5kW and 5kW units as follows:

Plant	Sound Power Level
Vailant aroTHERM Plus 3.5kW / 5kW	54 dB(A)

Table 3 – Sound Power Level of the ASHPs from aroTHERM plus spec sheet (VALTSB2BHTP0424)

The plant selected is quiet overall and is expected to not make any significant contribution to the surrounding environment.

4.2 Site Boundary Treatment

It is understood that 2.1 metre tall close boarded fences will be installed along the site boundary with 1.5 metre tall close boarded fences installed between the plot's gardens.



Figure 4 – Boundary Treatment Plan for Cross Lane (Key in Figure 5)



Figure 5 – Boundary Treatment Plan for Varey Street

Azymuth has included the fences within the calculations.

5.0 Assessment of Results

5.1 ASHP Sound Emissions Spectrum

As the ASHP specification sheet does not provide octave-band sound power data, Azymuth has derived the octave-band levels using data from similar models, scaled to match the specified overall sound power level listed in the spec sheet. The ground-floor units have been modelled as point sources. The resulting sound power levels are presented in the table below:

Noise source	Sound Power Level, L_{WA} (dB) in Octave Band Centre Frequency, Hz								Total L_{WA} (dB)
	63	125	250	500	1k	2k	4k	8k	
Vailant aroTHERM Plus 3.5kW / 5kW	54	63	57	52	47	38	30	25	54

Table 4 – ASHP noise octave band levels at proposed development

5.2 ASHP Noise Assessment (BS 4142 & Condition 24a)

The predicted noise levels from the proposed ASHPs will be assessed at the relevant on-site and off-site receptors in accordance with planning policy 24a and the criteria set out in section 3.11 which aligns.

Condition 24a states that '*Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. Prior to commencement of the use hereby approved, the scheme shall be submitted to and approved in writing by the City Council as local planning authority in order to secure a reduction in the level of noise emanating from the site. The scheme shall. '*

For the purposes of this assessment, the following receptor definitions have been adopted:

- Off-site receptor: The nearest noise-sensitive residential property located outside the boundary of the existing development site. Receptor locations are shown in Figure 5.



Figure 6 – Off-site receptor location

5.2.1 Off-Site Sound Assessment (Cross Lane)

The following tables presents the worst-case predicted noise levels at off-site receptors, based on the SoundPLAN model with all ASHPs operating simultaneously at 100% capacity. These are compared against the worst case measured L_{90} In the respective area (Rounded to whole numbers) to determine whether the predicted noise levels achieve a minimum 5 dB margin below background. Worst-case measurements can be found in Appendix B.

Based on previous experience with ASHPs of a similar type and capacity, the proposed Vaillant aroTHERM units are expected to generate relatively low noise levels and are not anticipated to exhibit prominent tonal or other distinctive acoustic characteristics. Given the domestic nature of the installations, Azymuth considers that the application of an acoustic character correction would not be representative of the expected noise emissions. Accordingly, no additional correction has been applied to the predicted noise levels.

Closest Off-Site Receptor	Period	A Predicted Specific Noise Level at receptor (dBA)	B Background Sound Level at Noise Sensitive Receptor -5 (dBA)	Difference (A-B)	MCC Policy 24a
No.13 Sheerness Street	Day (7:00-23:00)	34	45	-11	Compliant
No.25 Sheerness Street		33		-12	Compliant

Table 5 – BS 4142 daytime assessment of Cross Lane

As shown in Table 6 above, the predicted noise levels from the ASHPs will meet the specified criteria for all the off-site receptors during the daytime.

Closest Off Site Receptor	Period	A Predicted Noise Level at receptor (dBA)	B Background Sound Level at Noise Sensitive Receptor -5 (dBA)	Difference (A-B)	MCC 24a Policy
No.13 Sheerness Street	Night-time (23:00-7:00)	34	39	-5	Compliant
No.25 Sheerness Street		33		-6	Compliant

Table 6 – BS 4142 night-time assessment of Cross Lane

As shown in Table 7 above, the predicted noise levels from the ASHPs will meet the specified criteria for all the off-site receptors during the daytime.

5.2.2 Off-Site Sound Assessment (Varey Street)

The following tables presents the worst-case predicted noise levels at off-site receptors, based on the SoundPLAN model with all ASHPs operating simultaneously at 100% capacity. These are compared against the worst case measured L_{90} In the respective area (Rounded to whole numbers) to determine whether the predicted noise levels achieve a minimum 5 dB margin below background. Worst-case measurements can be found in Appendix B.

Based on previous experience with ASHPs of a similar type and capacity, the proposed Vaillant aroTHERM units are expected to generate relatively low noise levels and are not anticipated to exhibit prominent tonal or other distinctive acoustic characteristics. Given the domestic nature of the installations, Azymuth considers that the application of an acoustic character correction would not be representative of the expected noise emissions. Accordingly, no additional correction has been applied to the predicted noise levels.

Closest Off Site Receptor	Period	A Predicted Specific Noise Level at receptor (dBA)	B Background Sound Level at Noise Sensitive Receptor -5 (dBA)	Difference (A-B)	MCC 24a Policy
No. 34 Highmead Street	Day (7:00-23:00)	24	42	-18	Compliant
No.38 Highmead Street		23		-19	Compliant

Table 7 – Daytime assessment of Varey Street

As shown in Table 8 above, the predicted noise levels from the ASHPs will meet the specified criteria for all the off-site receptors during the daytime.

Closest Off Site Receptor	Period	A Predicted Noise Level at receptor (dBA)	B Background Sound Level at Noise Sensitive Receptor -5 (dBA)	Difference (A-B)	MCC 24a Policy
No. 34 Highmead Street	Night-time (23:00-7:00)	24	35	-11	Compliant
No.38 Highmead Street		23		-12	Compliant

Table 8 – Night-time assessment of Varey Street

As shown in Table 9 above, the predicted noise levels from the ASHPs will meet the specified criteria for all the off-site receptors during the Night-time.

6.0 On Site Noise Assessment

Azymuth has undertaken an assessment against the MCC Condition 24a criteria and MCS 020a guidance for all on-site receptors. This considers the impact of cumulative noise contribution from all neighbouring ASHPs operating simultaneously at 100% capacity in accordance with BS-4142 and MCC Condition 24a, as well as individual adjacent ASHPs on neighbouring dwellings, assessed at the nearest window serving a habitable room in accordance with MCS 020a.

The cumulative predicted noise levels have been compared against the worst-case measured background sound level for that specific site (refer to Appendix B), with the aim of achieving a minimum 5 dB margin below background.

6.1 MCC 24a / BS4142 Results

Noise Receptor Flat No.	A Cumulative Noise at Receiver Location dBA with all ASHPs Operational Excluding its own (MCC Planning 24a)	MCC 24a Target dBA (Worst case Background L_{90} -5dB)	MCC 24a Policy (A-(L_{90}-5))	Compliance
14 (Semi-D)	37	39	-2	Compliant
16 (Semi-D)	38		-1	Compliant
18 (GF Flat)	51		+12	Not Compliant
20 (1F Flat)	31		-8	Compliant
22 (1F Flat)	30		-9	Compliant
24 (GF Flat)	50		+11	Not Compliant
26 (Semi-D)	37		-2	Compliant
28 (Semi-D)	38		-1	Compliant

Table 9 – MCC 24a / BS 4142 noise assessment for The Cross Lane Site

Noise Receptor Flat No.	A Cumulative Noise at Receiver Location dBA with all ASHPs Operational Excluding its own (MCC Planning 24a)	MCC 24a Target dBA (Worst case Background L_{90} -5dB)	MCC 24a Policy (A-(L_{90}-5))	Compliance
69 (House)	28	35	-7	Compliant
71 (GF Flat)	43		+8	Not Compliant
73 (1F Flat)	33		-2	Compliant
75 (1F Flat)	32		-3	Compliant
77 (GF Flat)	43		+8	Not Compliant

Table 10 – MCC 24a / BS4142 noise assessment for The Varey Street Site

6.1.3 MCC 24a / BS4142 Results Comments

The majority of units achieve the specified criteria for their respective locations, with the exception of Flats 18, 24, 71 and 77 (noise receptors), which exceed their respective targets by approximately 8–12 dB. These exceedances are attributable to the neighbouring first-floor ASHPs being located in close proximity to the rear-facing windows of the ground-floor flats. The first floor flat's ASHP are correspondingly No. 20, 22, 73 and 75. It would be noted that these are windows to the kitchen areas of the open plan kitchen / living room and that the windows to the living room zones of these rooms are away from the ASHP units.

6.2 MCS 020a Results

Noise Receptor Flat No.	A Noise Level dBA at Noise Receptor's Window (MCS)	MCS Assessment Results (A-37)	Compliance
14 (Semi-D)	10 (No. 16)	-27	Compliant
16 (Semi-D)	11 (No. 14)	-26	Compliant
18 (GF Flat)	33 (No. 24)	-4	Compliant
20 (1F Flat)	10(No.18)	-27	Compliant
22 (1F Flat)	11 (No. 24)	-26	Compliant
24 (GF Flat)	33 (No. 22)	-4	Compliant
26 (Semi-D)	9 (No 18)	-28	Compliant
28 (Semi-D)	10 (No 26)	-27	Compliant
69 (House)	4 (No. 71)	-33	Compliant
71 (GF Flat)	32 (No. 77)	-5	Compliant
73 (1F Flat)	14 (No. 69)	-23	Compliant
75 (1F Flat)	9 (No. 77)	-28	Compliant
77 (GF Flat)	33 (No. 71)	-4	Compliant

Table 11 – MCS 020a noise assessment for The Both Site

6.2.1 MCC 24a / BS4142 Results Comments

All units achieve the specified 37 dB(A) target, including Flats 18, 24, 71 and 77, where the rear-facing bedroom windows are in closer proximity to neighbouring ASHPs. The intervening fence and separation distance provide sufficient acoustic attenuation to ensure all predicted external noise levels remain below the target.

7.0 Noise Impact

Azymuth have created a noise prediction model in SoundPLAN 9.1 to predict and visualise the effect of the 13no. ASHPs on the surrounding environment, including the noise levels at nearest worst-case residential receptors.

7.1 Grid Noise Map (GNM)

Azymuth have produced the following GNM of the proposed ASHPs installation location.

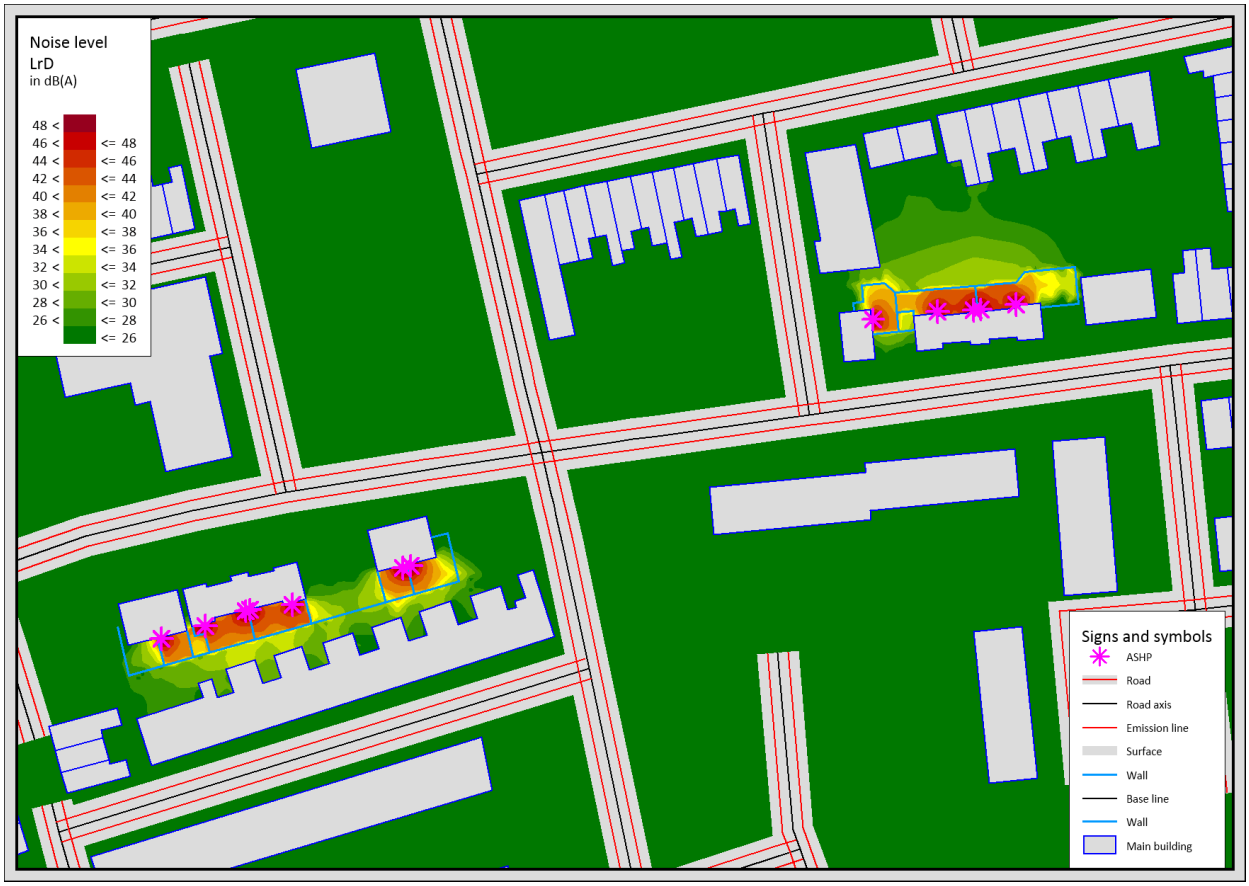


Figure 7 –GNM of ASHP on Cross Lane & Varey Street

8.0 Mitigation Methods

Based on the results presented in Section 6, appropriate mitigation measures have been identified to achieve the noise criteria specified in Section 3.11.

8.1 Quiet Mode

The Vaillant aroTHERM technical specification states that the units feature a 'Whisper Mode' operating setting, which limits their output to approximately 60% and reduces the sound pressure level by up to 9 dB (refer to Appendix C). Azymuth therefore recommends that the ASHPs serving Flats 20, 22, 73 and 75 operate in Whisper Mode at all times to reduce noise emissions and assist in achieving the specified acoustic criteria.

Whisper Mode will need to be implemented in conjunction with the additional mitigation measures outlined below to achieve the specified acoustic criteria.

8.2 Adjusting the positioning

The ASHPs serving Flats 20 and 22 will need to be repositioned to increase their separation from the neighbouring flat's windows. Azymuth recommends relocating the units to positions similar to those adopted for Flats 73 and 75. Where practicable, the units should be moved further along the wall to maximise the separation distance and provide additional acoustic attenuation.

8.3 1.8 Metre Acoustic Close Boarded Fence

A 1.8 m high acoustic close-boarded fence is to be installed between the ASHP and the neighbouring windows. The fence should extend beyond the depth of the ASHP to provide adequate screening and minimise direct noise transmission towards the affected windows.

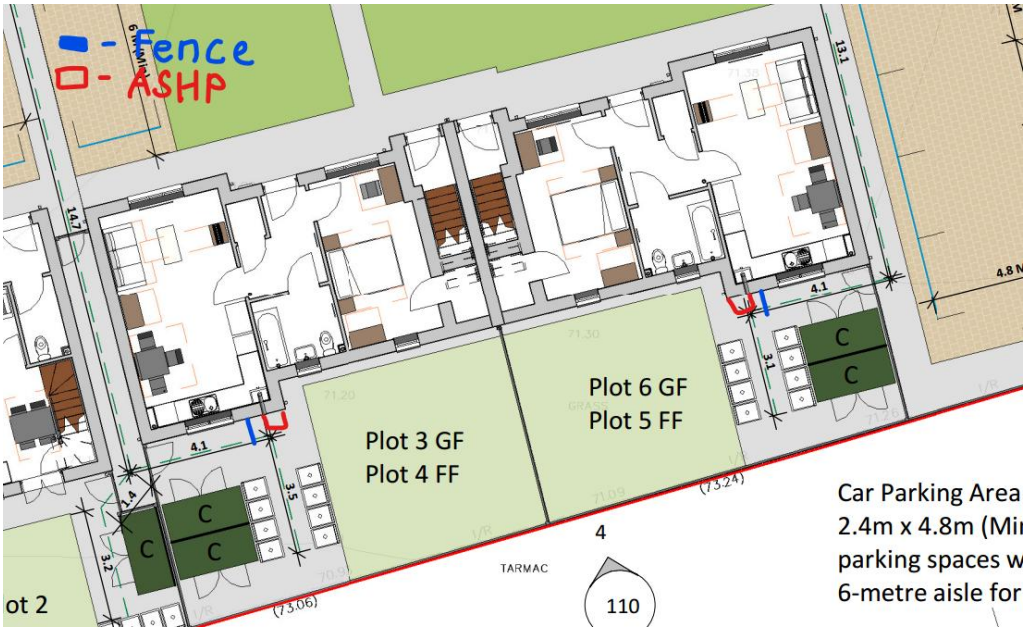


Figure 8 – Fence Location for Cross Lane

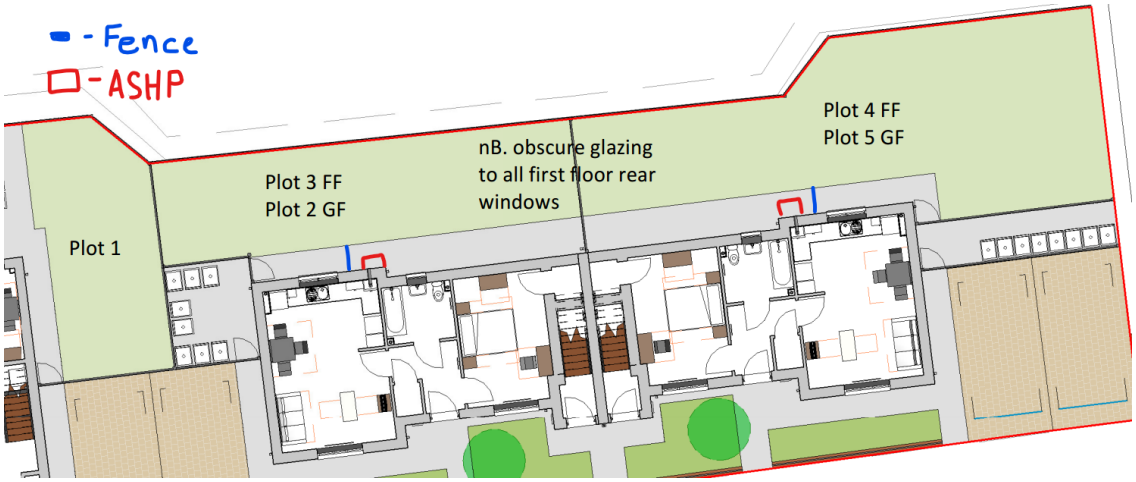


Figure 9 – Fence Location for Varey Street

8.4 GNM Including all Mitigation

Azymuth has produced a Grid Noise Map (GNM) including all mitigation methods implemented.

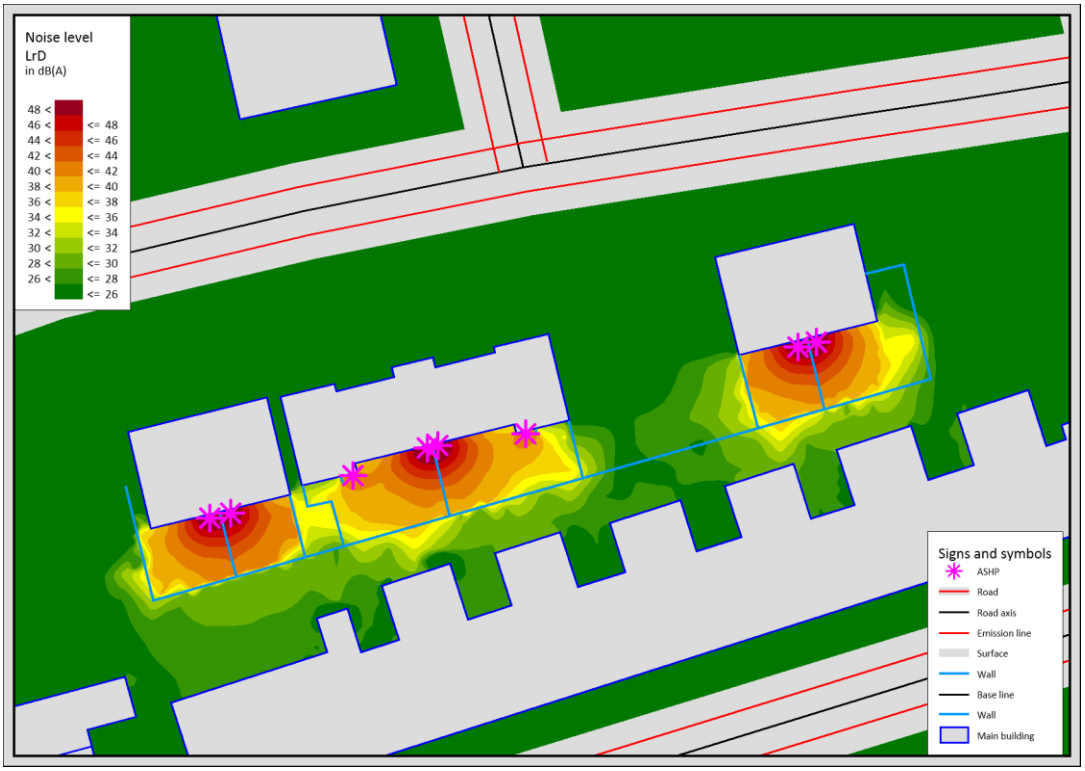


Figure 10 –GNM of ASHP on Cross Lane with All Mitigation Methods

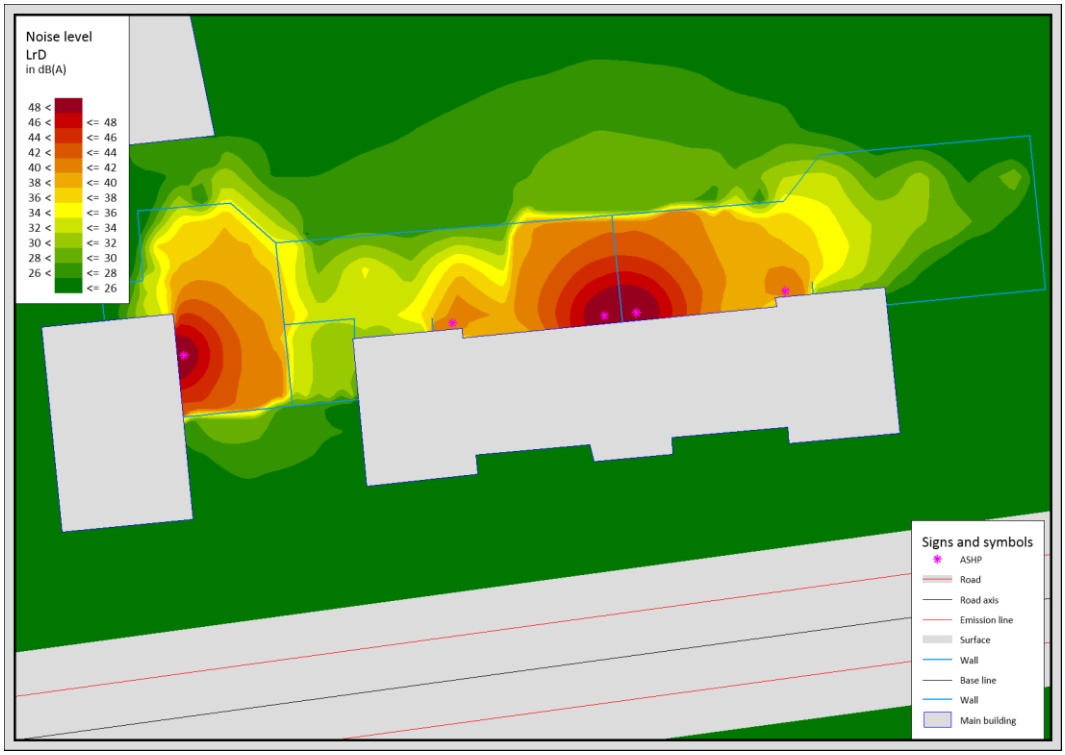


Figure 11 –GNM of ASHP on Varey Street with All Mitigation Methods

8.5 Results After Mitigation

Azymuth has summarised the predicted noise levels at the affected receptors following implementation of the recommended mitigation measures.

Noise Receptor Flat no.	A Cumulative Noise at Receiver Location dBA with all ASHPs Operational Excluding its own (MCC Planning 24a)	MCC 24a Target dBA (Worst case Background L_{90} -5dB)	MCC 24a Policy (A-(L_{90}-5))	Compliance
18 (GF Flat)	32	39	-7	Compliant
24 (GF Flat)	30		-9	Compliant
71 (GF Flat)	34	35	-1	Compliant
77 (GF Flat)	27		-8	Compliant

Table 12 – Results of the Affected Sites with the Mitigation Methods Implemented

9.0 Summary

Azymuth Acoustics UK (henceforth Azymuth) has been appointed by R&M Property Group to produce a Noise Impact Assessment regarding the installation of 13 Air Source Heat Pumps (ASHPs) at a new build development site consisting of 8no. apartments and 5no. houses located at the Cross Lane / Varey Street, Manchester.

The NIA has been produced to assist with the discharge of Planning Condition 24a in relation to condenser noise and mitigation methods, per Planning Application 136203/FO/2023 (Cross Lane) and 136204/FO/2023 as varied by 139774/JO/2024 (Varey Street).

Off Site Receptors

Azymuth has assessed noise from the proposed ASHPs at all assessed off-site noise-sensitive receptors in accordance with BS 4142 and MCC's 24a policy. The results presented in Tables 5–8 indicate that the predicted rating levels will meet the adopted BS 4142 assessment criterion and Manchester City Council's Condition 24a target during both the daytime and night-time periods, remaining at least 5 dB below the background sound levels.

Based on previous experience, the Vaillant aroTHERM units are expected to generate low noise levels without prominent tonal or distinctive acoustic characteristics. Therefore, Azymuth has not applied an acoustic character correction to the predicted noise levels.

All ASHPs operating simultaneously at 100% capacity. The predicted noise levels are compared against the worst-case background sound levels (BS4142 & MCC Planning condition 24a).

On Site Receptors – Prior to Mitigation

Azymuth has undertaken an BS 4142 in relation with MCC's 24a Policy and MCS 020a assessment of noise from the single unit of ASHP at on-site receptors.

BS 4142 / MCC 24a

The majority of units achieve their respective noise criteria. However, Flats 18, 24, 71 and 77 exceed their targets by approximately 8–12 dB due to the proximity of neighbouring first-floor ASHPs to their rear-facing windows. Additional mitigation is therefore required for these flats to achieve compliance. The proposed mitigation is set out in Section 8.0.

MCS 020a

All units achieve the specified 37 dB(A) target, including Flats 18, 24, 71 and 77, where the rear-facing bedroom windows are in closer proximity to neighbouring ASHPs.

Mitigation

- **Quiet Mode**: Operate the specified ASHPs continuously in Whisper Mode to reduce noise emissions by up to 9 dB.
- **Adjusting the Positioning**: Relocate the ASHPs serving Flats 20 and 22 further away from neighbouring windows.
- **1.8 m Acoustic Close-Boarded Fence**: Install a 1.8 m high acoustic fence between the ASHPs and affected windows to provide additional noise screening.

Conclusion

Overall, based on the assessment results, the proposed development is considered to have an acceptable noise impact at the nearest off-site noise-sensitive receptors, demonstrating compliance with BS 4142 and Manchester City Council guidance, thereby satisfying Condition 24a.

However, on-site results predict exceedances at the ground-floor flats 18, 24, 71 and 77 based on the current layout and ASHP positioning owing to neighbouring proximity of the ASHPs belonging to Flats 20, 22, 73 and 75. Implementation of the recommended mitigation measures will ensure all receptors achieve the specified noise criteria.

Support to discharge Condition 24b can be undertaken once the mitigation measures have been installed.

Appendix A – Glossary of Acoustic Terms

Decibel (dB)
This is the unit used to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro Pascal to 100 Pascal).

dB (A)
This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. A-weighting) to compensate for the sensitivity of the human ear to sound of different frequencies. The A-weighting curve is implemented in sound level meters using an electronic filter that approximately corresponds to the frequency response of the ear.

Octave Band Noise Level
The human ear is sensitive to sound over a range of frequencies between approximately 20Hz to 20kHz. The ear is also generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum can be divided into frequency bands. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it.

L_{Aeq}
This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over a given time period.

Reverberation Time (RT or sometimes T_{30} or T_{60})
This is the time taken for the reverberant sound energy in an enclosure to decay one millionth of its equilibrium value, i.e. by 60dB, after the source has been switched off. The reverberation time is frequency dependent and it is customary to measure its value in octave or one-third octave bands. Reverberation occurs when sound waves are repeatedly reflected from each surface of the room.

Sound Reduction Index (SRI)
Difference measured between the amount of energy flowing towards the wall in the source room and the total amount of energy entering the receiving room (usual range 100 - 3150Hz for one third octave band values). The SRI varies with frequency and is measured in a laboratory in either octave or one-third octave bands.

SRI = L1 - L2 + 10 log (S/A), where:
L1 = Noise level in the source room
L2 = Noise levels in the receiving room
S = Surface area of test specimen
A = Equivalent acoustic absorption area in the receiving room

Weighted Sound Reduction Index (R_w)
This is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions. The procedure used to quantify the R_w is to compare the sound reduction index (SRI) in each of the one-third octave bands from 100Hz to 3150Hz against a set of standard reference curves.

Appendix B – Noise Survey Data

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
Wednesday 6th March 2024							
15:42:00	1	00:05:00	75.4	61.4	64.6	59	55.9
15:47:00	1	00:05:00	73.3	61.7	64.8	59.2	55.8
15:52:00	1	00:05:00	74.9	61.1	64	59.3	55.1
17:02:00	2	00:05:00	72.8	60.2	64.7	53.8	47.8
17:07:00	2	00:05:00	73.4	59.9	64.5	53.3	48.2
17:12:00	2	00:05:00	78.2	61	64.8	54.1	48
17:17:00	2	00:05:00	72.3	60.6	65.3	54.3	48.4
17:22:00	2	00:05:00	75	60.5	64.5	56.2	48.6
17:27:00	2	00:05:00	72	59	63.1	54.7	47
17:32:00	2	00:05:00	72.4	61.3	66.3	55.7	48.8
17:37:00	2	00:05:00	70.8	58.9	63.5	52.4	47.9
17:42:00	2	00:05:00	76.5	61.3	65.7	54.8	47.4
17:47:00	2	00:05:00	73.8	60.1	64.5	53.4	48.2
17:53:00	3	00:05:00	74.6	65.6	68.7	64.2	59.8
Wednesday 13th March 2024							
10:32:00	1	00:05:00	75.8	62.6	64.8	59.4	53.7
10:37:00	1	00:05:00	70.3	59.2	62.7	55.8	50.6
10:42:00	1	00:05:00	79.9	59.2	61.7	57.1	52.4
10:47:00	1	00:05:00	70	60.4	64.6	57.6	51.8
10:52:00	1	00:05:00	74.8	61.9	63.8	59.6	53.7
10:57:00	1	00:05:00	75.8	59.9	63.8	57.3	50.4
11:05:00	3	00:05:00	74.5	64.9	68.1	63.2	57.5
11:10:00	3	00:05:00	76	65.8	68.8	64.6	58.5
11:15:00	3	00:05:00	77.3	66	69	65	59.6
11:20:00	3	00:05:00	83.8	67.4	70.2	64.1	57.8
11:25:00	3	00:05:00	77.3	66.2	68.8	64.8	59.6
11:30:00	3	00:05:00	84.5	67	70.3	65.3	59.4
11:38:00	1	00:05:00	73.5	64.2	68	62	54.4
11:43:00	1	00:05:00	72.6	64.4	68	62.7	56.6
11:48:00	1	00:05:00	79.7	65.7	69.3	63.3	55.2
Tuesday 19th March 2024							
23:05:00	1	00:05:00	71.5	60.3	64.8	52.6	44.3
23:10:00	1	00:05:00	72.4	59.8	64.4	52.9	45.8
23:15:00	1	00:05:00	71.1	58.6	63.3	50.5	44.9
23:20:00	1	00:05:00	72.2	60.4	64.9	52	44.3
23:30:00	2	00:05:00	74.8	57.7	61.1	47.8	43
23:35:00	2	00:05:00	75.3	57.8	59.7	45.8	41.5
23:40:00	2	00:05:00	72.1	54.9	55.1	46	41.7
23:45:00	2	00:05:00	71	56.5	58.7	46.3	41.3
23:56:00	3	00:05:00	72.6	56.5	59.8	49	40.4
Wednesday 20th March 2024							
00:01:00	3	00:05:00	73.3	59.8	63.3	50.5	41.6
00:06:00	3	00:05:00	76	59.3	62.6	53.8	41.8
00:11:00	3	00:05:00	69.7	58	62	50.9	39.9

Table B1 – Fully tabulated noise measurement results

Appendix C – ASHP Noise Data

Sound power pressure level

aroTHERM plus	3.5 kW	5 kW	7 kW	10 kW	12 kW
Sound power level A7/W55	54 dB	54 dB	55 dB	60 dB	60 dB

