116a/b Amyand Park Road Twickenham TW1 3HP
Planning noise assessment

London Roc

12 August 2024

ARM0317-01

ARM Environment Limited t/a ARM Acoustics
Registered in England and Wales No.: 06090166
Registered Office: 201 Borough High St, London SE1 1JA

Table of Contents

Prepared by: Marcus Richardson

Date: 12 August 2024

1 Introduction

It is understood that 2no. air source heat pumps (ASHPs) are to be installed at the premises of 116a / 116b Amyand Park Road Twickenham TW1 3HP as part of the development of 2no. dwelling houses on the site. The plant is to comprise 2no. outdoor units, which may potentially operate at any point during a given 24hour period.

In order to ensure that the amenity of adjacent premises is not unduly affected as a result of noise emission from the mechanical plant, it is necessary to demonstrate to the local planning authority, the London Borough of Richmond upon Thames, that noise will be adequately controlled. The Richmond Local Plan 2018, sets out the Council's approach to planning policies, including Policy LP10 Local Environmental Impacts, Pollution and Land Contamination. Further information is contained within the Supplementary Planning Document (SPD) Development Control for Noise Generating and Noise Sensitive Development. The guidance advises that the assessment methodology set out in *BS 4142: Method for rating industrial noise affecting mixed industrial and residential areas*, should be adopted. Furthermore, planning consent for the scheme includes a condition relating specifically to noise from the proposed air source heat pumps.

ARM Acoustics have therefore been appointed by the client to evaluate potential noise impacts and effects arising from the foregoing mechanical plant, as necessary to comply with the requirements of the planning regime. This report therefore sets out the relevant assumptions, methodology, results and conclusions of the assessment, as necessary to satisfy the requirements of planning condition U0154490, Parts a), b) and c).

2 Site location and development proposal

2.1 Site location

The development comprises semi-detached dwellings, which replace a single dwelling which was previously on the site. The site itself is located on a parcel of land to the rear of other residential properties on Amyand Park Road. Access to the site is via a road between 114 and 116 Amyand Park Road, which runs south-west to north east. The dwellings along the road are generally of 3 and 4 storeys, some of which have 1 or 2 storey extensions to the rear, the closest of these has its rear façade at a distance of approximately 25m from the proposed location of ASHP.

To the north east of the site are residential properties of Greville Close, comprising 2 storeys with loft conversions. The closest of these premises is at a distance of approximately 17m from the proposed ASHP.

To the southeast of the site are a row of garages, beyond which runs Haggard Road. The closest dwellings in this direction are the 4 storey Burrell House, which is at a distance of approximately 50m from the site.

To the south west are the residential properties of Victoria Road, which are typically of 3 storeys, with 1 and 2 storey extensions to the rear, and at a distance of 30m or more from the site.

The ambient noise climate at the site comprises low level distant road traffic noise from the local road network, which is screened by the various terraced buildings. Regular aircraft overflights are also in evidence.

Please refer to the suite layout plan at Figure 1, Appendix 1.

2.2 Development proposal

It is proposed that the air source heat pumps be located at ground level, one at each side of the building adjacent to the flank (east and west) walls. The plant is to comprise 2no. air source heat pumps (Warmflow AS02-R32), which may potentially operate at any point during a given 24hour period. Each of the units will be mounted on vibration isolating rubber mountings (Joule HZK0K000000 anti vibration feet) in order to ensure that vibration is not transmitted into the building structure, therefore avoiding perceptible vibration or structure radiated noise.

3 Policy, legislation and standards

3.1 National Planning Policy Framework 2023

The *National Planning Policy Framework 2023* (NPPF) sets out the Government's planning policies for England and how these are expected to be applied and is a material consideration in planning decisions. To ensure that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development. With regard to noise, the NPPF paragraph 180 states that:

> "Planning policies and decisions should contribute to and enhance the natural and local environment by… 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… taking into account relevant information".

In support of the above, paragraph 191 states the following:

> "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
>
> a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
>
> 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".

3.2 National Planning Practice Guidance (2019)

The *Planning Practice Guidance – Noise* (PPGN) to the NPPF advises on how the planning regime can manage potential noise impacts arising from new development. It is noted that whilst in some circumstances 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 on whether noise is likely to pose a concern. Planning and decisions made by local planning authorities should take account of the acoustic environment, and in doing so consider whether or not:

- a significant adverse effect is occurring or likely to occur;
- an adverse effect is occurring or likely to occur; and
- a good standard of amenity can be achieved.

In consideration of the presence or otherwise of adverse effects, the Noise Policy Statement for England, 2010 (NPSE) introduces these concepts, which are summarised as follows:

SOAEL - Significant observed adverse effect level (SOAEL): This is the level of noise exposure above which significant adverse effects on health and quality of life occur.

LOAEL - Lowest observed adverse effect level (LOAEL): this is the level of noise exposure above which adverse effects on health and quality of life can be detected.

NOEL - No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Although the word 'level' is used, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs.

The below table 1 (reproduced from the Guidance) summarises the noise exposure hierarchy, based on the likely average response of those affected.

Table 1: Noise exposure hierarch (as per National Planning Practice Guidance)

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

The Guidance also suggests four broad types of mitigation against noise:

- engineering: reducing the noise generated at source and/or containing the noise generated;
- layout: where possible, optimising the distance between the source and noise sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose-built barriers, or other buildings;
- using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and;
- mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building.

3.3 Local Planning Policy

In order to ensure that the amenity of adjacent premises is not unduly affected as a result of noise emission from the mechanical plant, it is necessary to demonstrate to the local planning authority, the London Borough of Camden, that noise will be adequately controlled. Relevant local planning polices include Policy D14 of the London Plan and Policy A4 of the Camden Local Plan 2017.

London Plan, 2021

In relation to noise, Policy D14 of the London Plan advises that:

"In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1) avoiding significant adverse noise impacts on health and quality of life
2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change
3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses
4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)
5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation
6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles
7) promoting new technologies and improved practices to reduce noise at the source, and on the transmission path from source to receiver."

The London Plan also provides high level consideration of the approach to management of noise, in the wider context of achieving sustainable development, such that the foregoing policies can be met.

London Borough of Richmond upon Thames

The Richmond Local Plan 2018, sets out the Council's approach to planning policies, including Policy LP10 Local Environmental Impacts, Pollution and Land Contamination, which advises that:

> *Noise and Vibration*
>
> *C. The Council encourages good acoustic design to ensure occupiers of new and existing noise sensitive buildings are protected. The following will be required, where necessary:*

1. a noise assessment of any new plant and equipment and its impact upon both receptors and the general background noise levels;

2. mitigation measures where noise needs to be controlled and managed;

3. time limits and restrictions for activities where noise cannot be sufficiently mitigated;

4. promotion of good acoustic design and use of new technologies;

5. measures to protect the occupiers of new developments from existing sources.

Further information is contained within the Supplementary Planning Document (SPD) Development Control for Noise Generating and Noise Sensitive Development. The guidance advises that the assessment methodology set out in *BS 4142: Method for rating industrial noise affecting mixed industrial and residential areas*, should be adopted.

Furthermore, planning consent for the scheme includes a condition relating specifically to noise from the proposed air source heat pumps, as below:

U0154490 Air Source Heat Pump

a) Before the ASHP to which the application refers is used at the premises, a scheme shall be submitted to and approved in writing by the local planning authority which demonstrates that the following noise design requirements can be complied with.

b) The cumulative measured or calculated rating level of noise emitted from the plant to which the application refers, shall be 5dB(A) below the existing background noise level, at all times that the mechanical system etc. operates. The measured or calculated noise levels shall be determined 1 metre form the facade of the nearest noise sensitive premises, and in accordance to the latest British Standard 4142; An alternative position for assessment /measurement may be used to allow ease of access, this must be shown on a map and noise propagation calculations detailed to show how the design criteria is achieved.

c) The plant shall be isolated so as to ensure that vibration amplitudes which causes reradiated noise not to exceed the limits detailed in table 4 detailed in section 7.7.2 of BS8233:2014 Guidance on sound insulation and noise reduction for buildings "

d) The ASHP shall not be installed or operated other than in accordance with the approved details.

e) A commissioning acoustic test and report shall be undertaken within 2 weeks of mechanical services commissioning, in order to demonstrate that the approved noise design requirements have been achieved. The results of the test shall be submitted to and approved in writing by the LPA.

REASON: To safeguard the amenities of nearby neighbouring occupants.

3.4 British standards and guidance

BS 4142: 2014+A1:2019 - Method for rating industrial noise affecting mixed industrial and residential areas

British Standard BS 4142:2019 provides a method for rating and assessment of sound of an industrial nature, together with the procedures for assessing whether the noise in question is likely to give rise to adverse or significant adverse effects upon the amenity residential dwellings, or premises used for residential purposes. The scope of the standard is not applicable to the assessment of the effects of sound on users of commercial, industrial or similar “non-residential” purposes. Industrial and commercial noise sources falling within the scope of the standard include:

a) sound from industrial and manufacturing processes;
b) sound from fixed installations which comprise mechanical and electrical plant and equipment;

c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from fork-lift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

In carrying out the assessment, the standard advises that an initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level. The standard advises that:

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
d) 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."

Note 2 to Clause 11 advises that:

> *"Adverse impacts may include but not be limited to annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

When the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be considered which may include:

1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.
   Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.
2) The character and level of the residual sound compared to the character and level of the specific sound.
3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
   i) facade insulation treatment;
   ii) ventilation and/or cooling; and
   iii) acoustic screening.

As noted, the initial estimate of impact may be modified depending on the absolute level of the sound. Guidance on absolute sound levels both within buildings is given in BS 8233:2014, which is referred to in the examples of Annex A of the standard. The relevant content of BS 8233:2014 is reviewed below.

BS8233:2014: Guidance on sound insulation and noise reduction for buildings

For residential developments which might be subjected to noise above the Lowest Observed Adverse Effect Levels, the principles of the NPPF require that any adverse effects should be mitigated and reduced to a minimum. In doing so, it is necessary to consider the design noise levels that should be adopted to demonstrate that this has been achieved.

Guidance on suitable internal noise levels for dwelling houses and flats can be found in 'BS8233:2014: Guidance on sound insulation and noise reduction for buildings. In general, it is desirable that for steady external noise sources the internal ambient noise levels set out within Table 4 therein, are not exceeded (reproduced below). These criteria are based upon the guideline values presented within the WHO Guidelines for Community Noise, 1999.

The footnotes to BS8233 Table 4, advise that "where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.

Table 2: Internal ambient noise levels for dwellings (as per BS8233:2014)

Activity	Location	07:00 – 23:00hrs	23:00 – 07:00hrs
Resting	Living room	35 dB $L_{Aeq,16\,hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\,hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\,hour}$	30 dB $L_{Aeq,8\,hour}$

For additional context, it is noted that the WHO Guidelines for Community Noise also provide guideline values for application external to bedrooms (assuming partially open windows) during the night time period in order to prevent sleep disturbance; these values are 45 dB $L_{Aeq,8\,hour}$ and 60 dB $L_{Amax,f.;}$ these values are 15dB higher than those applicable within bedrooms, accounting for the open window loss. Outside of bedrooms and living rooms during the daytime, the stated internal guideline values of 35 dB $L_{Aeq,16\,hour}$ would therefore correspond to external noise levels of 50 dB $L_{Aeq,16\,hour}$.

4 Noise survey

4.1 Baseline noise survey

In order to determine the underlying baseline ambient sound climate in the vicinity of the site an unattended noise survey was carried out over the period 11:20hrs on Tuesday 9th July to 10:15hrs on Friday 12th July 2024. The survey was carried out in accordance with the general principles set out in *BS 7445 – Description and measurement of environmental noise*.

The baseline measurement location was at the south west corner of the site, as indicated at Figure 1, Appendix 1. The measurement location was at a height of approximately 2.5m above ground level in the free-field and considered representative of the ambient noise climate at the nearest noise sensitive premises.

> Measurement Position B1: 161a Amyand Park Road at a height of 2.5m, free-field level [51.451537, -0.323848]

Equipment used has been verified to traceable to reference sources calibrated to National Standards, including IEC 6172 and IEC 61269, as follows:

> Norsonic 140 sound level meter s/n 1403008 – laboratory calibration 25/10/23
>
> Norsonic 1209 preamp s/n 12421 – laboratory calibration 25/10/23
>
> Norsonic 1225 microphone s/n 225495 – laboratory calibration 26/10/23
>
> Norsonic 1251 sound calibrator s/n 31877 – laboratory calibration 26/10/23

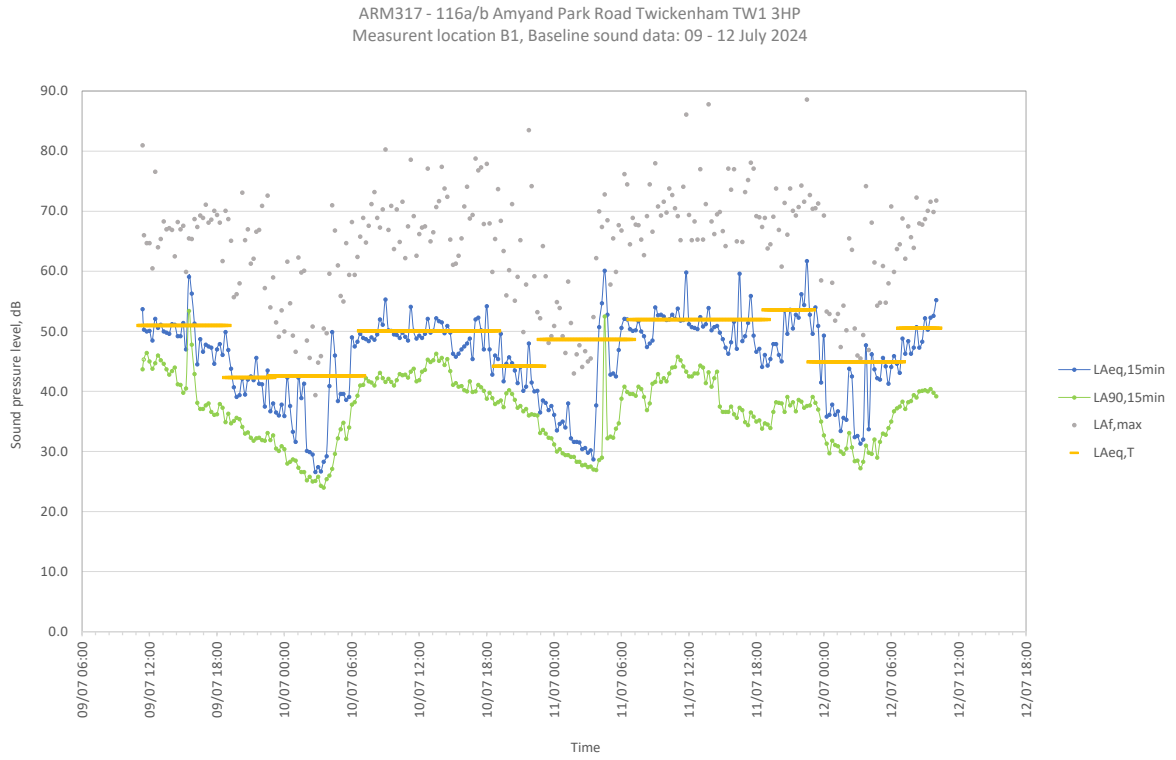
The sound level meter underwent a field calibration check on site prior to and following the survey, with no significant variation in the calibration level, 114.1dB ± 0.2 dB @ 1kHz. Broadband and 1/1 octave band (50Hz to 8kHz) sound pressure levels were measured using the fast (0.125s) time constant and logged throughout the duration of the survey.

Weather during the survey period was mild (temperatures in the range 13-23°C), with intermittent rainfall until 22:00hrs on 9th July.

4.2 Baseline sound data

Logged data have been post-processed to derive 15-minute data pertaining to the relevant assessment periods across the survey period. The derived broadband survey data in terms of $L_{Aeq,T}$, $L_{A90,T}$ and $L_{AF,max}$ are presented in Table 3, Appendix 2 and graphically in Figure 2, below.

Figure 2: Baseline ambient noise data

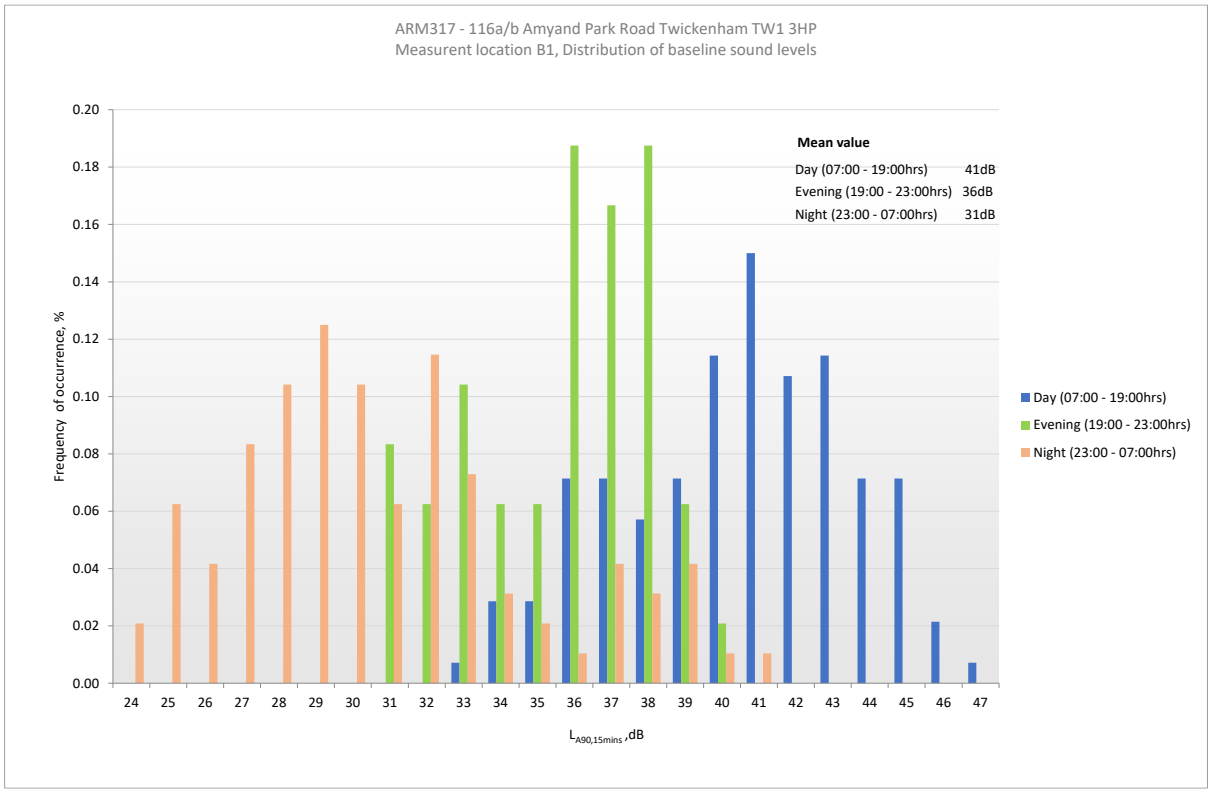


As noted, the Local Authority advise that the plant noise emissions and background noise levels should be evaluated as per the method set out in BS 4142. The commentary to Clause 8.1 of the Standard advises that:

> *"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."*

The standard doesn't explicitly advise how a typical background sound level(s) may be determined. Note 1 to Subclause 8.1.4 makes it clear that it is not a simple matter of identifying a minimum or modal value over a particular period, but recognizing that several periods of measurement may be necessary and that a thorough analysis of the data may be required. The distribution of the 15-minute background sound level data has been plotted as histograms for the day, evening and night periods as per Figure 4, below. Periods of rainfall have been omitted from the data set in determining the background noise level.

Figure 3: Distribution of background sound levels



Typical background noise values have therefore been derived, as below:

Table 4 Typical representative background sound levels

Location	Typical background sound level, $L_{A90,15mins}$ (free-field)		
	Day (08:00-20:00hrs)	Evening (20:00-23:00hrs)	Night (23:00-07:00hrs)
B1 – All receptors	41 dB	36 dB	29 dB

4.3 Specific sound data

The specific sound level arising from operation of the proposed outdoor condenser units (Warmflow AS02-R32) is based on a broadband sound power level derived in accordance with EN12102-1, as advised by the manufacturer. Spectral data are based on a typical spectrum shape for a similarly rated air source heat pump. Data are stated as a sound power level in Table 5, below.

Table 5: Source sound power level data

Plant ref.	Plant item	Octave Band Centre Frequency Hz								$L_{p,A}$
		63	125	250	500	1000	2000	4000	8000	
A1	Warmflow AS02-R32	55	63	59	54	44	39	34	30	55

NB. Sound power level tested in accordance with EN 12102. Assumed spectrum shape.

Each of the units will be mounted on vibration isolating rubber mountings (Joule HZK0K000000 600mm anti-vibration feet) in order to ensure that vibration is not transmitted into the building structure, therefore avoiding perceptible vibration or structure radiated noise.

5 Noise assessment

5.1 Noise modelling

The foregoing information has been used to carry out modelling and assessment of the potential noise impacts arising from use of the proposed plant, comprising 2no. air source heat pumps (Warmflow AS02-R32). Modelling of noise was undertaken using the proprietary environmental modelling software package CadnaA, implementing the standards set out within *ISO 9613-2:1996, Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation*. Site geometry and building data is based upon opensource mapping data and information obtained during site visits.

As stated at 2.2, the heat pump may potentially operate at any point during a give 24 hour period.

5.2 Predicted noise levels

Resultant specific sound pressure levels have been calculated at positions external to the façade of noise sensitive receptors in the vicinity of the site. And are presented in Table 6, below.

Resultant specific sound pressure levels have been calculated at positions external to the façade of noise sensitive receptors in the vicinity of the site. It is anticipated that during the daytime the condenser unit is likely to operate intermittently for approximately 50% of the time during the reference period, whilst the unit may operate continuously during the night over the reference period (15 minutes). Suitable on-time correction has therefore been applied for the operation of the unit during the daytime. The resulting specific sound levels are presented in Table 6, below.

Table 6: Predicted specific sound pressure levels

AL_ID	Address	Specific sound level, $L_{Aeq,T}$	
		Day (07-23:00)	Night (23-07:00)
R1	11 Greville Cl, Twickenham TW1 3HR	15 dB	18 dB
R2	13 Greville Cl, Twickenham TW1 3HR	15 dB	18 dB
R3	15 Greville Cl, Twickenham TW1 3HR	14 dB	17 dB
R4	118 Amyand Park Rd, Twickenham TW1 3HP	11 dB	14 dB
R5	116 Amyand Park Rd, Twickenham TW1 3HP	12 dB	15 dB
R6	114 Amyand Park Rd, Twickenham TW1 3HP	12 dB	15 dB
R7	112 Amyand Park Rd, Twickenham TW1 3HP	13 dB	16 dB
R8	108 Amyand Park Rd, Twickenham TW1 3HP	8 dB	11 dB
R9	12 Victoria Rd, Twickenham TW1 3HW	11 dB	14 dB
R10	11 Victoria Rd, Twickenham TW1 3HW	10 dB	13 dB

5.3 Noise impact assessment

Based upon the predicted specific sound levels in Table 6, an evaluation of the potential impact of the plant sound rating level on the most affected noise sensitive receptor (R1, 11 Greville Close) has been carried out in accordance with the methodology set out in BS4142 as set out in Table 7, below.

Table 7: BS4142 assessment at R1, 11 Greville Close – Night time (23:00 – 07:00hrs).

Results		Relevant clause	Commentary
Background sound level	$L_{A90(15min)}$ = 29	8.3	Background sound level determined from measured values at B1
Residual sound level	$L_{Aeq,T}$ = 42	7.3.3	Estimated residual sound level. Noise climate incorporates a number of mechanical plant items serving various commercial premises
Reference time interval of 15 minutes on the basis that plant will operate during the night time period.		7.2	
On time correction	0 dB	7.3.15	Assumes 100% on time during the night time reference period.
Specific sound level (calculated)	$L_{Aeq(1\ hour)}$ = 18	7.3.6	Accounting for geometric attenuation, ground absoprtion, reflection effects and on time.
Acoustic feature correction	4 dB	9.2	Specific sound level below the residual and background noise levels. Correction of +4dB allowed ito accout for any acoustic features under defrost or reverse mode in order to represent a reaonable worst case assessment .
Rating level	18+ 4 = 22 dB	9.2	
Background sound level	$L_{A90(15min)}$ = 29	8.6	
Excess of rating over background sound level	(22 - 29) dB = -7 dB	11	
Assessment is below a level likely to indicate an adverse impact		11	
Uncertainty of the assessment		10	Specific sound levels are based upon manufacturer's test data and calculations undertaken in accordance with ISO9613-2. Assessment assumes a +4dB correction for potential acoustic features, such as may potentially occur during defrost or reverse cycles, and is therefore considered to represent a worst case.

From the foregoing assessment it can be seen that the rating level is anticipated to be 7dB below the typical $L_{A90,15minute}$ background sound level during the most sensitive night time period of operation (23:00 - 07:00hrs). As advised within BS4142, where the rating level does not exceed the background sound level, this is an indication that of the specific sound source having a low 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.

Furthermore, BS4142 advises that where background sound levels and rating levels are low (especially at night), as is the case in this instance, absolute levels might be as or more relevant than the margin by which the rating level exceeds the background; this is especially true at night. In this context, the absolute level of the specific sound, 18dB, is substantially below the BS8233 guideline values which would be applicable external to the premises (night time 45 dB $L_{Aeq,\ 8\ hour}$, allowing for open window losses) and would indicate that no adverse impact will arise from the operation.

6 Conclusion

It is understood that 2no. air source heat pumps (ASHPs) are to be installed at the premises of 116a / 116b Amyand Park Road Twickenham TW1 3HP as part of the development of 2no. dwelling houses on the site, which may potentially operate at any point during a given 24hour period.

In order to ensure that the amenity of adjacent premises is not unduly affected as a result of noise emission from the mechanical plant, it is necessary to demonstrate to the local planning authority, the London Borough of Richmond upon Thames, that noise will be adequately controlled. The Richmond Local Plan 2018, sets out the Council's approach to planning policies, including Policy LP10 Local Environmental Impacts, Pollution and Land Contamination, with further information contained in the Supplementary Planning Document (SPD) Development Control for Noise Generating and Noise Sensitive Development. The guidance advises that the assessment methodology set out in *BS 4142: Method for rating industrial noise affecting mixed industrial and residential areas*, should be adopted. Furthermore, planning condition *U0154490* relating to the air source heat pump requires that "T*he cumulative measured or calculated rating level of noise emitted from the plant to which the application refers, shall be 5dB(A) below the existing background noise level.*"

The results of the assessment indicate that the sound rating level is anticipated to be 7dB below the typical $L_{A90,15minute}$ background sound level during the night time and therefore compliant with the level required by the planning condition. The results are an indication that the sound source has a low impact. This is further supported through consideration of the contextual considerations, including the level of the residual sound and the low absolute level of the specific sound when considered against BS8233 guideline values.

Each of the units will be mounted on vibration isolating rubber mountings (Joule HZK0K000000 600mm anti-vibration feet) in order to ensure that vibration is not transmitted into the building structure, therefore avoiding perceptible vibration or structure radiated noise.

The assessment therefore serves to demonstrate the suitability of the proposal in the context of national and local planning policy and guidance within the context of sustainable development and the principles of good design, as adverse effects have been avoided or reduced to a minimum. It is therefore considered that sound arising from the operation of the plant installation will be compliant with the requirements of the Richmond Local Plan 2018 Policy LP10 and planning condition *U0154490 Air Source Heat Pump*, with this report satisfying the requirements of Parts a), b) and c) of the condition.

Appendix 1 – Site plan

Figure 1: Site plan

Appendix 2 – Measurement data

Table 2: Baseline noise data

Equipment	NOR140_8172539		
Periods	15m		
Start	09/07/2024 11:22		
End	12/07/2024 10:00		
Weighting	A		
Unit	dB		
Period start	$L_{Aeq,15min}$	$L_{A90,15min}$	$L_{AFmax,15min}$
09/07/2024 11:22	53.7	43.7	81
09/07/2024 11:30	50.3	45.3	66
09/07/2024 11:45	50	46.4	64.7
09/07/2024 12:00	50.1	45	64.7
09/07/2024 12:15	48.5	43.8	60.5
09/07/2024 12:30	52.1	44.7	76.6
09/07/2024 12:45	50.6	46	64
09/07/2024 13:00	51.1	45.2	65.4
09/07/2024 13:15	50	44.6	68.3
09/07/2024 13:30	49.8	43.7	67
09/07/2024 13:45	49.6	42.8	67.2
09/07/2024 14:00	51.2	43.4	66.9
09/07/2024 14:15	51.1	44	62.5
09/07/2024 14:30	49.2	41.2	68.2
09/07/2024 14:45	49.2	41.1	67
09/07/2024 15:00	51.4	39.8	67.6
09/07/2024 15:15	47	40.5	59.9
09/07/2024 15:30	59.1	53.4	65.5
09/07/2024 15:45	56.3	47.8	65.4
09/07/2024 16:00	51.3	42.9	68.7
09/07/2024 16:15	44.5	38.1	67.4
09/07/2024 16:30	48.7	37.1	69.3
09/07/2024 16:45	46.6	37.1	68.9
09/07/2024 17:00	47.8	37.7	71.1
09/07/2024 17:15	47.5	38	68.1
09/07/2024 17:30	47.3	36.6	68.6
09/07/2024 17:45	44.6	36.1	70.1
09/07/2024 18:00	47	36.2	69.4
09/07/2024 18:15	47.9	37.9	68.1
09/07/2024 18:30	46.1	37.3	61.7
09/07/2024 18:45	49.9	34.9	70.1
09/07/2024 19:00	46.9	36.3	68.7
09/07/2024 19:15	43.8	34.7	65.1
09/07/2024 19:30	40.7	35.1	55.7
09/07/2024 19:45	39.1	35.6	56.2
09/07/2024 20:00	39.4	35.4	58
09/07/2024 20:15	42.1	34.1	73.1
09/07/2024 20:30	39.5	33	65.2
09/07/2024 20:45	42	33.2	67
09/07/2024 21:00	42.5	32.3	61.3
09/07/2024 21:15	41.9	31.8	62.1
09/07/2024 21:30	45.6	32.2	66.6
09/07/2024 21:45	41.3	32.3	66.9
09/07/2024 22:00	41.2	31.9	70.9
09/07/2024 22:15	37.5	31.8	57.2
09/07/2024 22:30	43.5	33.1	72.6
09/07/2024 22:45	36.7	31.9	54
09/07/2024 23:00	38	32.7	59
09/07/2024 23:15	36.5	30.5	51.5
09/07/2024 23:30	36	30.1	49.1
09/07/2024 23:45	37.8	30.9	53.5
10/07/2024 00:00	35.9	30.4	50
10/07/2024 00:15	42.3	28	61.6
10/07/2024 00:30	37.6	28.3	54.7
10/07/2024 00:45	33.3	28.7	49.3
10/07/2024 01:00	31.6	28.5	46.6
10/07/2024 01:15	42.3	27.3	62.3
10/07/2024 01:30	38.9	26.6	59.8
10/07/2024 01:45	41.3	26.6	60.1

10/07/2024 02:00	30.1	25.2	48.5
10/07/2024 02:15	29.9	25.8	45.6
10/07/2024 02:30	29.5	25	50.8
10/07/2024 02:45	26.6	25.1	39.4
10/07/2024 03:00	27.4	25.8	44.8
10/07/2024 03:15	26.7	24.3	45.9
10/07/2024 03:30	28.3	24	50.5
10/07/2024 03:45	29.2	25.4	49.7
10/07/2024 04:00	40.9	26	59.6
10/07/2024 04:15	49.9	27.1	71
10/07/2024 04:30	46	29.6	66.8
10/07/2024 04:45	38.4	32.2	61
10/07/2024 05:00	39.6	33.7	55.9
10/07/2024 05:15	39.6	34.8	55
10/07/2024 05:30	38.6	32.1	64.7
10/07/2024 05:45	39.1	34	59.4
10/07/2024 06:00	49	37.8	68.2
10/07/2024 06:15	47.5	38.2	59.4
10/07/2024 06:30	48.3	39.3	62.4
10/07/2024 06:45	49.6	41	65.8
10/07/2024 07:00	48.9	41.1	68.9
10/07/2024 07:15	48.7	42.2	64.8
10/07/2024 07:30	48.4	41.7	67.6
10/07/2024 07:45	49	41.5	71.2
10/07/2024 08:00	48.6	41	73.2
10/07/2024 08:15	49.5	42.2	68.9
10/07/2024 08:30	52	43.1	67.3
10/07/2024 08:45	51.1	42.2	70.3
10/07/2024 09:00	55.3	41.6	80.3
10/07/2024 09:15	50.2	42.1	66.9
10/07/2024 09:30	50.1	41.6	70.9
10/07/2024 09:45	49.5	41	63.7
10/07/2024 10:00	49.4	41.9	70.3
10/07/2024 10:15	48.9	42.9	64.9
10/07/2024 10:30	49.8	42.7	71.6
10/07/2024 10:45	49.1	42.8	62.2
10/07/2024 11:00	48.5	42.3	67.5
10/07/2024 11:15	54.1	43.3	78.6
10/07/2024 11:30	50.1	43.8	69.2
10/07/2024 11:45	48.8	41.7	62.6
10/07/2024 12:00	49.3	41.9	66.2
10/07/2024 12:15	48.9	43.3	67.3
10/07/2024 12:30	49.6	43.6	67.5
10/07/2024 12:45	52.1	45.3	77.1
10/07/2024 13:00	49.8	44.9	65
10/07/2024 13:15	50.1	45.2	66.5
10/07/2024 13:30	52.2	46.3	70.7
10/07/2024 13:45	51.7	45.1	71.7
10/07/2024 14:00	51.5	45.6	77.4
10/07/2024 14:15	49.7	44.4	73.8
10/07/2024 14:30	50.9	45.4	72.4
10/07/2024 14:45	49.8	43.4	65.3
10/07/2024 15:00	46.3	41.1	61.1
10/07/2024 15:15	45.8	41.4	61.3
10/07/2024 15:30	46.3	40.8	62.6
10/07/2024 15:45	47	40.9	65.5
10/07/2024 16:00	47.5	40.2	70.8
10/07/2024 16:15	48	40	74.1
10/07/2024 16:30	48.8	41.7	68.8
10/07/2024 16:45	45.4	39.9	69.4
10/07/2024 17:00	52	40	78.8
10/07/2024 17:15	52.3	41.1	76.8
10/07/2024 17:30	50.2	40.7	77.3
10/07/2024 17:45	47	40.1	67.9
10/07/2024 18:00	54.2	38.8	77.9
10/07/2024 18:15	47	39.8	68
10/07/2024 18:30	42.8	38.9	59.9
10/07/2024 18:45	46	37.9	65.4
10/07/2024 19:00	45.4	38.2	73.7
10/07/2024 19:15	49.6	38.5	68.4
10/07/2024 19:30	41.7	37.4	63.4

10/07/2024 19:45	44.6	39.7	56
10/07/2024 20:00	45.7	40.2	60.2
10/07/2024 20:15	44.7	39.6	71.2
10/07/2024 20:30	43.5	38.6	55.1
10/07/2024 20:45	41.4	37.3	59.1
10/07/2024 21:00	44.1	37.6	65.2
10/07/2024 21:15	40.1	36.7	49.9
10/07/2024 21:30	40.8	37.1	57.8
10/07/2024 21:45	48	36	83.5
10/07/2024 22:00	41.5	36.2	74.2
10/07/2024 22:15	40	36.1	59.2
10/07/2024 22:30	40.1	36	53.2
10/07/2024 22:45	36.5	33.1	52.2
10/07/2024 23:00	38.5	33.6	64.2
10/07/2024 23:15	38.1	33	59.2
10/07/2024 23:30	36.9	32.3	48.1
10/07/2024 23:45	37.6	32.2	49.2
11/07/2024 00:00	36.1	31.2	50.9
11/07/2024 00:15	33.5	30	54.9
11/07/2024 00:30	34.6	30.4	53.9
11/07/2024 00:45	35	29.7	49.2
11/07/2024 01:00	34	29.4	46.4
11/07/2024 01:15	38	29.4	58.3
11/07/2024 01:30	32.2	29.1	51.4
11/07/2024 01:45	31.6	29.1	43
11/07/2024 02:00	31.6	28.3	46.2
11/07/2024 02:15	31.5	28.3	47.7
11/07/2024 02:30	30.4	27.7	44.1
11/07/2024 02:45	30.6	27.8	46.7
11/07/2024 03:00	29.8	27.4	45
11/07/2024 03:15	30.2	27.5	45.5
11/07/2024 03:30	28.7	27	52.4
11/07/2024 03:45	37.7	26.9	62.2
11/07/2024 04:00	50.7	28.6	70
11/07/2024 04:15	54.7	29	67.4
11/07/2024 04:30	60.1	52.5	72.8
11/07/2024 04:45	52.8	32.2	68.5
11/07/2024 05:00	42.8	32.5	57.8
11/07/2024 05:15	43	32.3	65.5
11/07/2024 05:30	42.5	33.8	59.9
11/07/2024 05:45	46.9	34.7	67.7
11/07/2024 06:00	50.6	38.8	66.8
11/07/2024 06:15	52.1	40.8	76.2
11/07/2024 06:30	52	39.9	74.5
11/07/2024 06:45	50.4	39.6	64.5
11/07/2024 07:00	50.1	39.6	68.9
11/07/2024 07:15	50.2	39.3	67.8
11/07/2024 07:30	51.7	40.8	67.7
11/07/2024 07:45	50	40.4	65.3
11/07/2024 08:00	49.2	39.1	62.7
11/07/2024 08:15	47.4	36.9	69.2
11/07/2024 08:30	48	38	74.5
11/07/2024 08:45	48.5	41.3	66.6
11/07/2024 09:00	54	41.6	78
11/07/2024 09:15	52.7	42.9	70.8
11/07/2024 09:30	52.8	41.6	69.3
11/07/2024 09:45	52.5	42.2	71.6
11/07/2024 10:00	51.9	41.7	69.8
11/07/2024 10:15	52	43	73.8
11/07/2024 10:30	52.8	44	72.7
11/07/2024 10:45	52.1	44.1	70.5
11/07/2024 11:00	53.8	45.8	69.2
11/07/2024 11:15	51.8	45.2	65.2
11/07/2024 11:30	51.9	44.2	74.1
11/07/2024 11:45	59.8	43.3	86.1
11/07/2024 12:00	51.2	42.5	69.4
11/07/2024 12:15	50.7	42.5	65.2
11/07/2024 12:30	50.6	43	68.3
11/07/2024 12:45	50.4	43	65.3
11/07/2024 13:00	52.4	44.3	77
11/07/2024 13:15	50.8	44	65.3

11/07/2024 13:30	51.2	41.4	71.2
11/07/2024 13:45	53.9	43.2	87.8
11/07/2024 14:00	50.2	40.8	68.3
11/07/2024 14:15	50.7	42.2	66.2
11/07/2024 14:30	50.9	43.3	69.5
11/07/2024 14:45	49.8	37.5	69.9
11/07/2024 15:00	48.7	36.6	66.7
11/07/2024 15:15	47.3	36.6	64.2
11/07/2024 15:30	46.3	36.6	77.1
11/07/2024 15:45	48.2	37.5	73.6
11/07/2024 16:00	51.6	36.2	77
11/07/2024 16:15	47.1	35.6	65
11/07/2024 16:30	59.6	37.3	95
11/07/2024 16:45	48.4	36.9	64.9
11/07/2024 17:00	49.2	34.9	73.2
11/07/2024 17:15	51.4	34.4	75.2
11/07/2024 17:30	55.9	36.5	78.1
11/07/2024 17:45	49.3	35.8	77.1
11/07/2024 18:00	46.6	35	69.2
11/07/2024 18:15	47.1	35.2	69
11/07/2024 18:30	44.1	33.8	67.4
11/07/2024 18:45	46.1	34.7	68.9
11/07/2024 19:00	44.3	34.5	63.8
11/07/2024 19:15	45.4	33.9	64.5
11/07/2024 19:30	47.9	36.6	69.1
11/07/2024 19:45	47.9	38.2	73.8
11/07/2024 20:00	46.1	38.1	66.9
11/07/2024 20:15	45	38	60.8
11/07/2024 20:30	53.5	36.6	71.4
11/07/2024 20:45	49.6	39.1	66.1
11/07/2024 21:00	53.6	37.7	73.8
11/07/2024 21:15	50.5	38.2	70.1
11/07/2024 21:30	52.8	36.7	69.3
11/07/2024 21:45	52.3	38.6	70.7
11/07/2024 22:00	56.2	38.3	74.3
11/07/2024 22:15	54.4	37.3	71.6
11/07/2024 22:30	61.7	37.6	88.6
11/07/2024 22:45	52.8	37.7	72.7
11/07/2024 23:00	49.6	39.1	70.4
11/07/2024 23:15	54	38.1	70.5
11/07/2024 23:30	50.9	37	71.3
11/07/2024 23:45	41.5	35	58.5
12/07/2024 00:00	49.3	32.7	69.3
12/07/2024 00:15	35.8	31.3	53.3
12/07/2024 00:30	36.1	29.7	52.9
12/07/2024 00:45	37.8	31.8	58.1
12/07/2024 01:00	36.1	31.1	51.8
12/07/2024 01:15	36.7	30.9	52.9
12/07/2024 01:30	33.4	30	47.4
12/07/2024 01:45	35.6	29.6	54.3
12/07/2024 02:00	35.3	30.5	50.2
12/07/2024 02:15	43.8	33.1	65.5
12/07/2024 02:30	42.5	30.7	63.6
12/07/2024 02:45	32.4	28.4	50.5
12/07/2024 03:00	32.6	28.5	46
12/07/2024 03:15	31.3	27.2	45.5
12/07/2024 03:30	32	28.3	49.4
12/07/2024 03:45	47.7	31	74.2
12/07/2024 04:00	33.7	29.8	46.9
12/07/2024 04:15	46.2	29.6	68.1
12/07/2024 04:30	43.7	32	61.5
12/07/2024 04:45	42.2	29	54.3
12/07/2024 05:00	42	31.6	54.8
12/07/2024 05:15	45.6	33	60.9
12/07/2024 05:30	44.2	32.8	54.8
12/07/2024 05:45	41.3	33.9	58
12/07/2024 06:00	44.1	35	70.8
12/07/2024 06:15	45.9	36.7	59.9
12/07/2024 06:30	44.6	37.2	63.7
12/07/2024 06:45	43.1	37.5	64.5
12/07/2024 07:00	48.8	38.3	68.8

12/07/2024 07:15	46.3	37.1	62.1
12/07/2024 07:30	48.4	38.2	67.5
12/07/2024 07:45	46.3	38.4	65.7
12/07/2024 08:00	47.3	39.4	63.9
12/07/2024 08:15	50.7	39	72.3
12/07/2024 08:30	47.3	40	68
12/07/2024 08:45	48.3	40.1	67.8
12/07/2024 09:00	52.2	40.2	68.7
12/07/2024 09:15	50.3	40	70.1
12/07/2024 09:30	52.3	40.4	71.6
12/07/2024 09:45	52.6	39.8	69.9
12/07/2024 10:00	55.2	39.2	71.8

Appendix 3 - SQA statement

My name is Marcus Richardson. I have a BEng (Hons) in Mechanical Engineering and am a Member of the Institute of Acoustics. I have over 20 years' experience in private sector acoustics consultancy, encompassing transportation, environmental and construction noise and vibration, architectural and building acoustics, including providing expert evidence. I am a founding director of ARM Environment Ltd (2007), an ANC member company.

I have worked on projects of all sizes, including major infrastructure projects, from inception through planning, to detailed design and construction and been responsible for noise impact assessments contributing to Environmental Impact Assessments for several rail schemes (including High Speed Two, London – West Midlands) and mixed-use developments. I was engaged by Network Rail for several years in the management and delivery of noise and vibration related aspects of the Thameslink Programme and also provided technical and policy support to the cross-industry Noise Policy Working Group.

I have worked with contractors, developers, architects and their design teams in the development of numerous commercial, residential, industrial and education schemes, ensuring the adoption of best practice in acoustics design and discharge of planning and statutory obligations.

I have contributed to Defra research studies into human response to vibration in residential environments and noise nuisance from windfarms, as well as producing papers and articles for presentation and publication in various journals (Proceedings of the Institute of Acoustics, International Workshop on Railway Noise, Acoustics Bulletin).