Assessment of the Existing Noise Climate in the Vicinity of the Proposed Air Source Heat Pumps at 77 Latham Lane, Gomersal, Cleckheaton

Report Prepared for:

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1.0 Summary

Planning permission is being to sought to permit the installation of air source heat pumps (ASHPs) on the Northern elevation of the new residential dwelling located at 77 Latham Lane in Gomersal. Bearing in mind the proximity of the new dwelling and so the heat pumps serving it to the adjacent dwelling at 79 Latham Lane, Kirklees Council have requested that a noise assessment be undertaken to evaluate what effect the emission of sound from the proposed air source heat pump may have on the existing noise climate.

Initial assessments of the heating, both space and water, requirements for the new dwelling have indicated that it is likely that two 12kW ASHPs would be required to provide the necessary heat inputs for the dwelling, based on a worst case winter conditions assessment. With this in mind, an assessment of the likely sound emission from the proposed ASHPs will be undertaken.

The assessments of the existing noise climate in the vicinity of 77 Lathom Lane indicated that it was characteristic of a sub-urban environment, subject to noise contributions primarily from road traffic and general neighbourhood noise. A desk top assessment to evaluate the potential sound emission from the proposed ASHPs at the nearest noise sensitive location was also conducted. The results of the assessment indicated that the calculated sound emission level from the ASHPs would be below the lowest measured L_{Aeq} and L_{A90} levels from the existing noise climate surveys. It should however be remembered that the evaluation was based on the continuous and simultaneous operation of the ASHPs which is unlikely in all but the very coldest conditions.

Using the calculated sound emission levels from the desktop evaluation, an assessment of the likely effect that this may have on the nearest noise sensitive location was undertaken employing the provisions contained within BS 4142:2014. The '*initial*' assessment indicated that the excess of the rating level over the background sound level at the reception point would range between -5 to -12dB, suggesting that there would be '*little likelihood of adverse impact*' resulting from the operation of the ASHPs according to BS 4142:2014. Taking the context of the BS 4142:2014 assessment into account including the environment in which they would be located, the assessments indicated that it is unlikely that the emission of sound from the ASHPs would be reliably discernible above the existing noise climate. As such it is anticipated that the operation of the ASHPs would result in '*little likelihood of adverse impact*' on the existing noise climate in the vicinity of the nearest noise sensitive location during the day or night time periods.

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2.0 Introduction

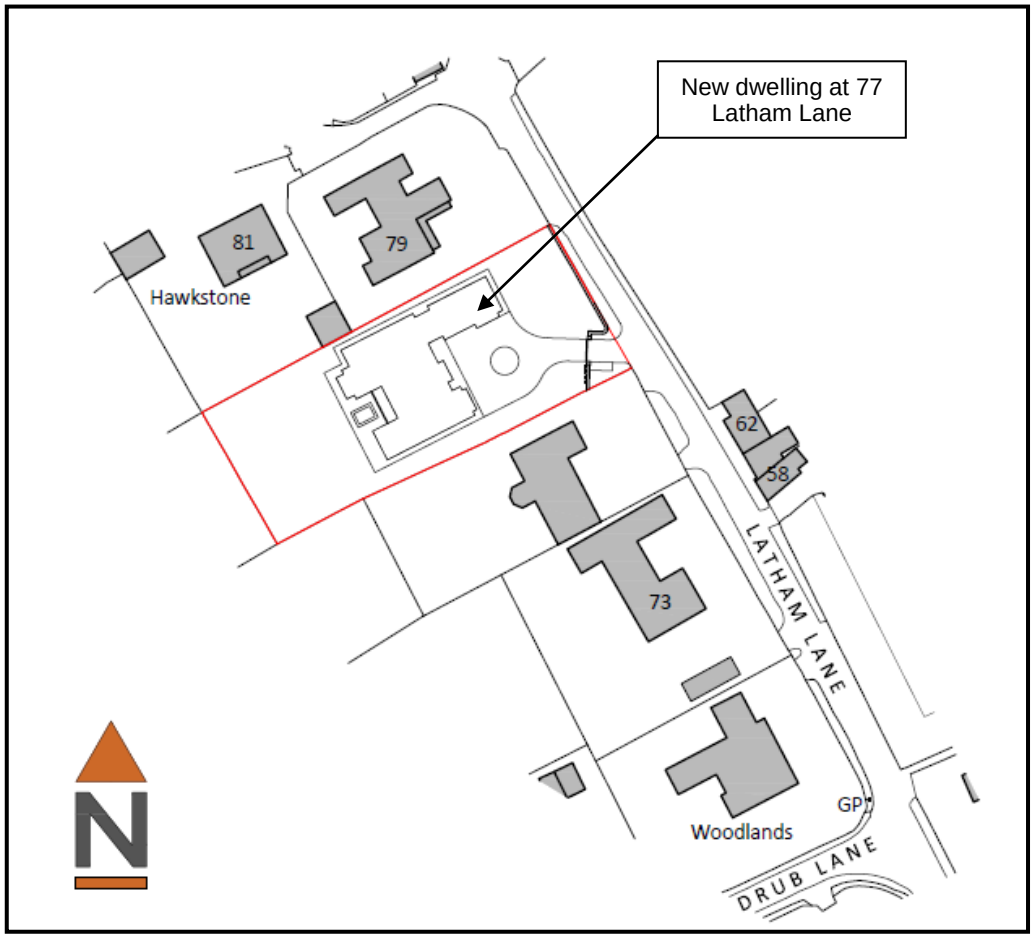
Planning permission is being to sought to permit the installation of air source heat pumps (ASHPs) on the Northern elevation of the new residential dwelling located at 77 Latham Lane in Gomersal. Bearing in mind the proximity of the new dwelling and so the heat pumps serving it to the adjacent dwelling at 79 Latham Lane, Kirklees Council have requested that a noise assessment be undertaken to evaluate what effect the emission of sound from the proposed ASHPs may have on the existing noise climate.

With reference to the potential emission of sound from the emission of sound from the proposed ASHPs, Druk Limited was commissioned to undertake an assessment of the existing noise climate in the vicinity of the nearest noise sensitive property using the provisions detailed within BS 4142:2014.

3.0 Site Description

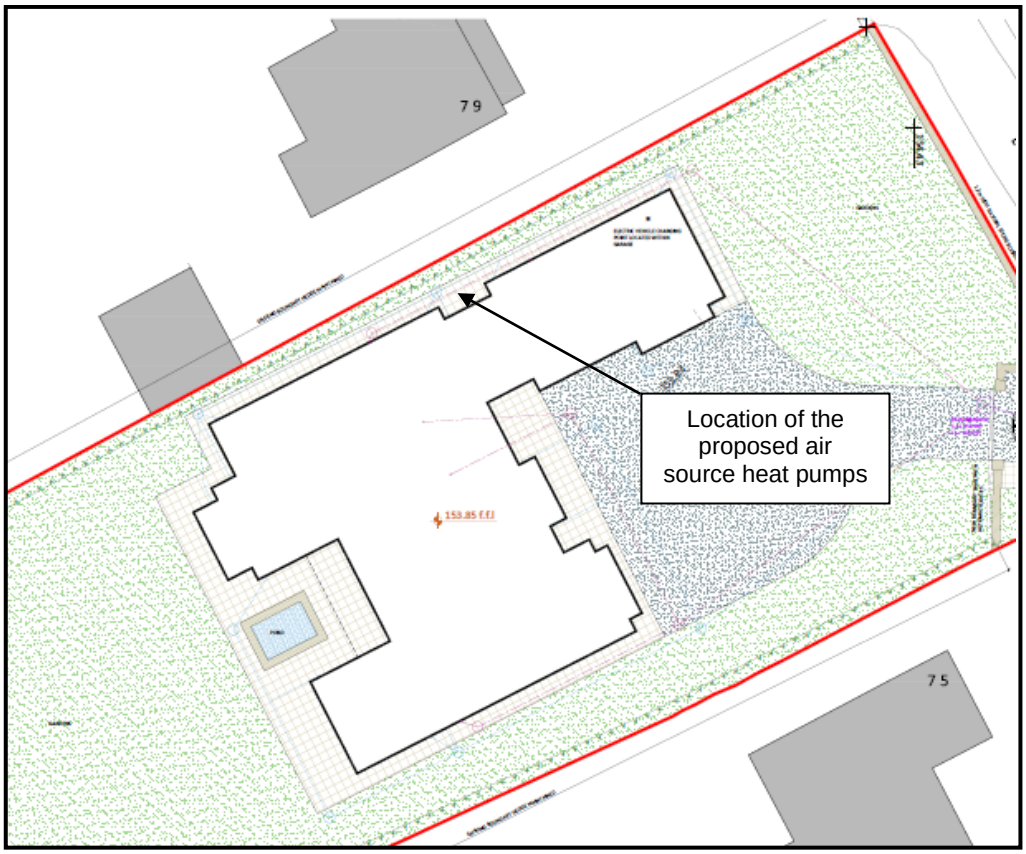
The new dwelling under construction is located at 77 Latham Lane in Gomersal, Cleckheaton, in which position it is located between the existing dwellings at 75 Lathom Lane (to the South of the new dwelling) and 79 Latham Lane (to the North of the new dwelling) as detailed in figure 1 below.

Figure 1. Location of the new dwelling at 77 Latham Lane and its proximity to the existing dwellings



The proposed ASHPs would be located in a small recess on the Northern elevation of the new dwelling (figure 2 and photograph 1 below). In this position the proposed heat pump would be approximately 10 metres from the Southern gable of the existing dwelling at 79 Latham Lane.

Figure 1. Location of the proposed air source heat pump, 77 Latham Lane



Photograph 2. Location of the proposed air source heat pump

4.0 Assessment Criteria

The assessment of the potential sound emission from the proposed ASHPs will be undertaken in accordance with the guidance contained within the West Yorkshire "Planning Consultation Guidance - Noise and Vibration" issued in May 2016. Where appropriate further reference will be made to the principles detailed within British Standard (BS) 8233:2014 “Guidance on sound insulation and noise reduction for buildings” and British Standard (BS) 4142:2014 + A1:2019 "Method for rating and assessing industrial and commercial sound".

4.1 West Yorkshire, Planning Consultation Guidance - Noise and Vibration

This document, henceforth referred to as the WYPCG, was formulated and issued by the five West Yorkshire Local Authorities in order to provide additional guidance to Planners, Environmental Health Departments and applicants on the aspects of noise and vibration issues pertinent to the determination of land use planning considerations. The intention of the document is to permit a determination of what effect, if any, the noise climate in the immediate vicinity of a proposed development may have on that development.

With regard to proposed new residential developments the guidance document attempts to expand on the guidance contained within the Noise Policy Statement for England (NPSE) document (originally released in 2010). The NPSE document provided guidance on 'acceptable' noise levels with particular reference to residential developments, and this was framed with reference to avoiding "significant adverse" impacts on health and quality of life and where necessary minimising such "adverse" impacts on health and quality of life.

Section 4.0 of the WYPCG contains guidance on the categorisation of noise sources and lists potential noise sources as falling within a number of categories. Further to the list of noise sources, section 4.2 of the WYPCG details situations in which proposed development may contain sources of noise that have the potential to have a detrimental effect upon the existing noise climate of nearby noise sensitive locations. In this situation the WYPCG defines noise sensitive as "*places where the building’s occupiers may be resting, sleeping or studying*" and includes premises such as: offices, hotels, hospitals, nursing homes and schools. With reference to the proposed heat pump the most relevant situation contained within the WYPCG would be the emission of sound from "*internal and external*" plant.

Where the potential for noise disturbance exists, the WYPCG suggests that a "*noise impact assessment should be carried out at the façade of the closest noise sensitive premises to demonstrate that a Comparative Criterion has been met*". In this case the Comparative Criteria are as detailed below:

Recommended Maximum sound levels should be based upon a Comparative Criterion:

- The Rating Level (calculated in accordance to BS 4142: 2014) is at least 10 dB below the existing Ambient noise level (L_{Aeq});
- The Rating Level (calculated in accordance to BS 4142: 2014) is at least 0 - 5* dB below the exiting Background noise level (L_{A90});

- Between the hours of 19:00 and 07:00, the maximum noise levels (L_{AFmax}) from the guidance document shall not exceed the L_{A90} by more than 10 dB; however, where the existing background noise level is 45 dB L_{A90} or less, the maximum noise levels shall not exceed 60 dB L_{AFmax}.

Assessment methodology and evaluation shall normally follow the guidance in BS 4142: 2014, 'Method for Rating and Assessing Industrial and Commercial Sound'.

** Subject to (1) the type of development; (2) the type of noise source, (3) the proposed distance of the noise source to existing noise sensitive properties; (4) the orientation of the proposed development; (5) the sensitivity of the existing noise sensitive properties; (6) the overall context; (7) the time of day; (8) existing background noise levels.*

The above comparative criteria reference the Ambient and Background sound levels, both of which should be evaluated in accordance to BS 4142: 2014. Here BS 4142;2014 refers to the Ambient sound levels as being "*equivalent continuous A weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far; at the assessment location over a given time interval, T*". This includes any contribution made by the sound source in question, which in this case would be the emission of sound from the proposed air source heat pump. The Background sound level is defined in BS 4142:2014 as being "*A weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F, and quoted to the nearest whole number of decibels".* The residual sound excludes any contribution made by the sound in question.

It is anticipated that as the above statement sugegsts '*Recommended Maximum sound levels should be based upon a Comparative Criterion',* indicating the adoption of a '*criterion*', that any comparison is undertaken assuming the adoption of one criterion. As the specification for the ASHPs has yet to be finalised, it is suggested that the comparative criterion used in the following assessment should be based on the second criterion listed above, namely, "*the Rating Level (calculated in accordance to BS 4142: 2014) is at least 0 - 5* dB below the exiting Background noise level (L_{A90})*".

4.2 <u>BS 4142:2014 "Methods For Rating and Assessing Industrial and Commercial Noise"</u>

British Standard (BS) 4142:2014 was published at the end of October 2014 and replaced the earlier 1997 version of the standard. The current version of BS4142 is similar to the earlier version inasmuch as it provides a method for the determination of rating levels with respect to the emission of noise from industrial and commercial facilities, as well as an evaluation of the ambient, background and residual sound levels. However the current version contains a number of additional features and extensions of scope with the aim of making it a more flexible procedure. The extension of scope means that the Standard now encompasses methods for the assessment of sound that is industrial or commercial in nature, including:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises: and;

- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial sites.

Notwithstanding the extension of the scope of the Standard, the Standard also makes it clear that a number of situations would be outside the scope of the assessment procedure. Here, the Standard describes the following as being beyond its scope:

- Recreational activities, including all forms of motorsport;
- Music and other entertainment;
- Shooting grounds;
- Construction and demolition;
- Domestic animals;
- People:
- Public address systems for speech, and;
- Other sources falling within the scopes of other standards or guidance.

It is also stated that "*the determination of noise amounting to a nuisance is beyond the scope of this British Standard*".

Regarding the assessment procedure and in particular the requirements of the adopted comparison criterion, the current version of the Standard provides a method for 'correcting' the specific sound to take account of any acoustic features that are audible at the assessment position. Unlike the earlier version the current version of the standard provides a sliding scale of corrections of up to +6dB in the case of tonal components and up to +9dB for impulses. A further +3dB correction is also available for situations where:

- the emission of sound has characteristics that are neither tonal or impulsive; and/or
- the emission of sound is intermittent or has discernible on/off characteristics.

The determination of the presence of tonal or impulsive features can be assessed using either subjective or reference determination methods. Once established the resulting sound level is referred to within the Standard as the Rating Level and it is this Rating Level that will be used to formulate the comparison criterion with respect to the emission of sound from the proposed air source heat pump.

5.0 Existing Noise Climate Assessments

Key to understanding what effect the emission of sound from the proposed ASHPs may have on the existing local noise climate, is the collection of data relating to the existing local noise climate in the immediate vicinity of the proposed units. The assessment of the potential emission of sound from the ASHPs would require the adoption of a reference or baseline condition, against which any sound emission from the ASHPs may be evaluated. The baseline or background noise climate will be defined as the local noise climate that prevails in the absence of any contribution from the operation of the ASHPs. Subsequent assessments will then be based on a comparison with the existing background noise climate. Indeed, the establishment of the existing

background noise climate is a pre-requisite for any assessment conducted in accordance with the provisions of BS 4142:2014. In addition the collection of data relating to the emission of sound from the condenser units will also be required.

In pursuance of both of the above aims, surveys to establish the baseline existing noise climate and the noise climate including the emission of sound from the condenser units were conducted.

5.1 Survey Times and Personnel

Measurements to establish the existing background noise climate in the vicinity of the nearest noise sensitive premises were conducted between 21:30 - 22:30 hours on the 11th July 2024, between 02:30 – 03:00 hours on the 13th July 2024, between 09:45 - 10:15 hours and 16:45 - 17:45 hours on the 15th July 2024. These periods were selected as they included the very early morning mid morning and afternoon periods and the mid evening periods. With reference to the very early morning mid morning and mid evening periods, these are frequently regarded as being the quietest periods during a typical day. Consequently the measurements made during these periods could be regarded as the lowest existing noise levels during the day and so representing the most stringent criteria for the subsequent assessments.

All measurements were fully attended for the duration and the surveys and were conducted by Mr. R Smith of Druk Limited.

5.2 Weather

During the course of the noise climate assessments the following weather conditions prevailed:

11th July 2024

All surfaces were dry, cloud cover was 100%, the temperature was approximately 13°C, the barometric pressure was approximately 1001mbar and the average wind speed was less than 0.3m/s.

13th July 2024

All surfaces were dry, the sky was overcast, the temperature was approximately 12°C, the barometric pressure was approximately 987mbar and the average wind speed was less than 0.3m/s.

15th July 2024

Surfaces were initially dry but became damp after a brief and light rain shower between 17:10 - 17:23 hours, cloud cover ranged between 10 - 100%, the temperature ranged between approximately 17 - 19°C, the barometric pressure ranged between 988 - 991mbar and the average wind speed was around 0.5m/s.

5.3 Equipment

The measurements of the existing background noise climate were conducted using the equipment detailed in table 1 below.

Table 1. Equipment used during the existing noise climate surveys

Equipment description	Manufacturer	Model number	Serial number
Sound level meter	NTI Audio	XL2-TA	A2A-10232-E0
Microphone pre-amplifier	NTI Audio	MA220	5537
Microphone	NTI Audio	M2230	8636
Acoustic calibrator	Norsonic AS	Nor 1251	31522
Microphone weather protection enclosures	NTI Audio	WP30	-

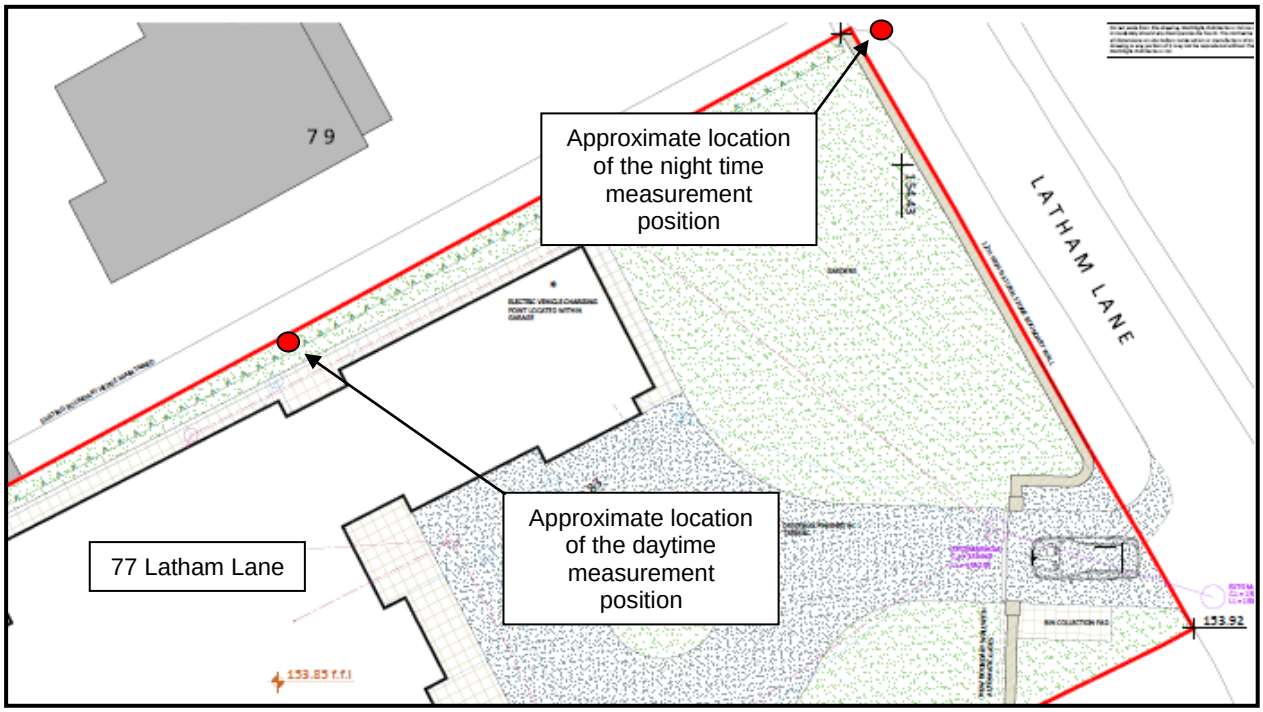
All the equipment used is calibrated by a UKAS accredited calibration laboratory and the calibration certificates are available on request. The sound level meter was field calibrated before and after the noise measurements, during which time no significant deviation in the calibrated level was observed.

5.4 Measurement Procedure

The closest of the existing residential premises to the proposed location of the ASHPs would be number 79 Latham Lane and in particular the Southern gable of this dwelling. However, as Druk Limited have no rights of access to private land, it was not possible to make measurements within the curtilage of this dwelling. Consequently, the daytime measurements were obtained from a position that was on the boundary of the 77 and 79 Latham Lane but within the curtilage of 77 Latham Lane.

The night time measurements were made in a position outside the boundary of the neighbouring property at 79 Latham Lane but in Latham Lane itself. This position was adopted during the night time as the site hoardings surrounding 77 Latham Lane included a large steel gate which was rather noisy in operation. As such the decision was made to obtain the existing noise climate measurements from outside the site boundary, so as to minimise any possible disturbance to the neighbours during the early hours. Despite this, it is suggested that the obtained sound levels from this position would be representative of the noise climate in the daytime measurement position. The approximate location of the measurement positions are detailed on figure 2 overleaf.

Figure 2. Approximate locations of the measurement positions



During the course of the measurement surveys, with the exception of the very early morning period, the sound level meter was tripod mounted on the boundary of 77 and 79 Latham Lane. In this position the microphone was approximately 2.5 metres from any large reflecting surfaces and approximately 1.3 metres above ground level.

In all cases the measurement time interval was 5 minutes and the overall measurement duration for each measurement period was either 60 or 30 minutes. The mid morning period was reduced to 30 minutes so as to coincide with the contractors' break, so elimination any noise contribution to the existing noise climate measurements resulting from construction activity. During the course of the measurements, data relating to the L_{eq}, L_{max}, L_{10} and L_{90} parameters were collected. All measurements were made with the 'fast' time weighting engaged, the microphone was mounted within the weather protection enclosure and connected to the sound level meter via an extension cable. The measurements were attended for the duration of the surveys and the all the measurements were made by Mr. R. Smith of Druk Limited.

6.0 Existing Noise Climate Assessment, Comments and Results

The existing noise climate in the vicinity of 77 Latham Lane and the surrounding residential dwellings was characteristic of a sub-urban environment, subject to noise contributions primarily from road traffic and general neighbourhood noise. As the noise climate during both the day and night time periods was very similar, the following paragraphs contain brief qualitative descriptions of the existing general noise climate noted during the survey periods.

6.1 Qualitative Assessment

The principal contributor to the existing noise climate during both the daytime and night time periods was road traffic noise and this ranged from an omnipresent but distant lower frequency sound, believed to emanate from both the M62 and A651 some 450 and 200 metres respectively to the North East of the measurement position. Some additional road traffic noise was audible from vehicles on the local roads including Lathom Lane itself, although very few vehicles were observed travelling along Latham Lane during the noise surveys.

The next most prevalent contributor to the existing noise climate was that which emanated from the surrounding properties. In general this comprises mainly voices and the sound of garden power tools including lawn mowers being used. This was most noticeable during the measurements made between 16:45 - 17:45 hours on the 15th July 2024, when a lawn mower was in use for approximately 50% of the survey period.

Additional contributors to the noise climate noted during the noise surveys included birdsong, the occasional overflight of aircraft and during the night time survey the sound of wildlife in the surrounding undergrowth. At no time was any construction noise recorded during the noise surveys.

6.2 Noise Survey Basic Results

By virtue of the significant amounts of measured noise data collected during the measurement periods, tables 2 - 5 below and overleaf and graph 1 overleaf contain summaries of the noise data from the existing noise climate measurement surveys. With reference to the data presented within graph 1, the measurement durations have for the sake of presentational purposes, been presented on the same horizontal axis. Full measured noise data are presented in tabular form in Appendix 1.

Table 2. Summary data, 21:30 - 22:30 hours, Thursday 11th July 2024

	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Standard deviation	3.29	8.07	2.83	1.21
Mean (log)	45	65	45	39
Modal value	40	54	44	38
Minimum value	40	46	41	37

Table 3. Summary data, 02:30 - 03:00 hours, Saturday 13th July 2024

	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Standard deviation	1.47	6.16	1.03	0.63
Mean (log)	43	58	45	39
Modal value	43	50	44	39
Minimum value	42	49	44	38

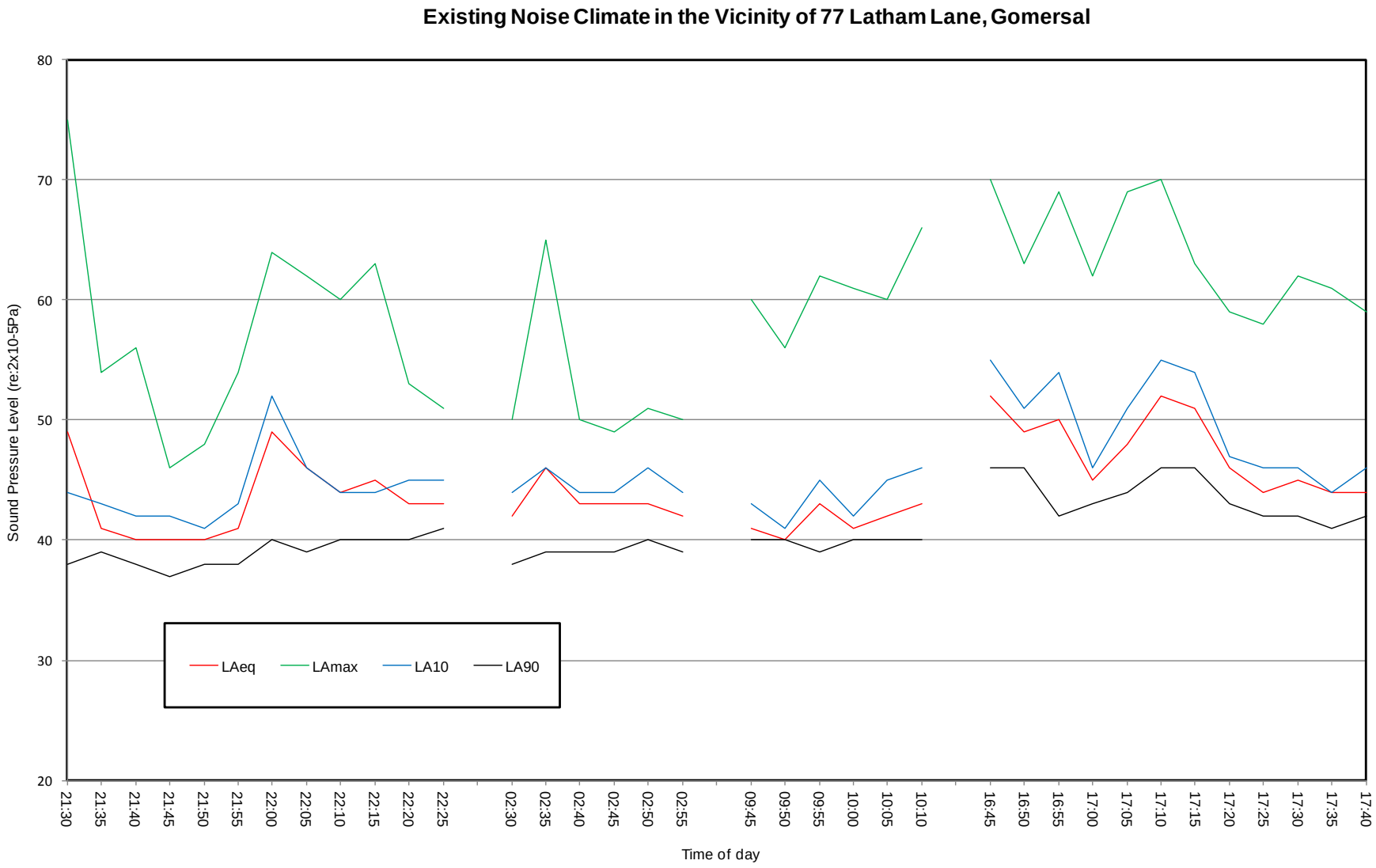
Table 4. Summary data, 09:45 - 10:15 hours, Monday 15th July 2024

	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Standard deviation	1.21	3.25	1.97	0.41
Mean (log)	42	62	44	40
Modal value	41	60	45	40
Minimum value	40	56	41	39

Table 5. Summary data, 16:45 - 17:45 hours, Monday 15th July 2024

	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Standard deviation	3.21	4.54	4.17	1.93
Mean (log)	49	66	51	44
Modal value	44	70	46	46
Minimum value	44	58	44	41

Graph 1. Existing noise climate measured noise levels, in the vicinity of 77 Lathom Lane, Gomersal



As can be seen from tables 2 - 5 the measured background noise climate demonstrated some variation in the L_{Aeq}, L_{Amax} and L_{A10} and L_{A90} measurements parameters, but rather less variation in the L_{A90} levels, for three of the measurement periods. Slightly higher overall levels were measured between 16:45 - 17:45 hours on the 15th July and this was related to the prolonged period of petrol lawnmower use in one of the nearby residential dwellings. It is suggested that in the absence of this contributory source, the overall levels would have been similar to those measured during the other survey periods.

7.0 Desk Top Assessment of the ASHP Sound Emission Levels

The initial assessment of the heating, both space and water, requirements for the new dwelling have indicated that it is likely that two 12kW air source heat pumps (ASHPs) of the Vailant VWL 125/6 type would be required to provide the necessary heat inputs. With this in mind an assessment of the likely sound emission from the proposed ASHPs will be undertaken. Reference to the Vailant technical manuals indicates that the sound power level (L_w) of the units under the heating cycle would be 58dB with the sound emission measurements being made along the central axis and at a distance of 1 metre from the units.

In order to evaluate the likely sound level at the nearest noise sensitive location (79 Lathom Lane) a number of assumptions will be employed. Starting with the emission of sound from the ASHPs, the published sound pressure levels will be employed. Therefore the resulting sound levels at the reception points will be assessed according to normal propagation convention. For the purposes of the calculations the following further assumptions have been applied:

- The sound emission from the ASHPs will be based on the units operating in the heating mode.
- It has been assumed that the two units would operate simultaneously. Although this will represent a worst case scenario and would only be likely during the colder months of the year.
- Simultaneous operation of the units would result in the sound emission level increasing by 3dB.
- It is anticipated that during the colder winter months, the units would operate for around 40 - 50% of the day and this would represent a worst case scenario with reference to the calculations.
- Although the ASHPs would not be mounted up against the gable of 77 Lathom Lane, it is likely that a degree of sound reflection from rear wall of 77 Lathom Lane would result.
- During the warmer months of the year when the temperature exceeds 15^{o}C, it is likely that only one unit would operate and this would be to provide hot water rather than space heating.
- The intervening surfaces would be relatively absorbent, so minimising ground reflections.

The above assumptions based on simultaneous operation of the ASHPs would tend to suggest that the subsequent calculations would represent a worst case acoustically.

Applying the stated assumptions relating to the simultaneous operation of the ASHPs during the winter months, the resulting combined noise emission level at 79 Lathom Lane will be assessed. It should however be remembered that although the Southern gable of 79 Lathom Lane is technically the closest part, at 10 metres separation, of the nearest noise sensitive location tothe ASHPs, this gable does not possess any windows or doors (photograph 3 below).

Photograph 3. Southern gable of 79 Lathom Lane

With this in mind it is suggested that this gable would not be particularly noise sensitive. Consequently, it is suggested that the nearest noise sensitive façade of 79 Lathom Lane would be the front elevation which possess windows (photograph 4 overleaf). In this case the front elevation of 79 Lathom Lane would be approximately 2 metres further away from the ASHPs and would also benefit from the direct line of sight between the ASHPs and the front elevation being broken by the corner of the building itself. It is anticipated that this would further attenuate the transmission of sound from the ASHPs, although a conservative 5dB will be assumed for this element.

Photograph 4. Front façade of 79 Lathom Lane

Assuming the front façade of 79 Lathom Lane represents the nearest noise sensitive location, combined with the additional screening provided by the corner of the building, the resulting combined sound emission levels at the reception point is detailed in table 6 below. Full calculations are provided within Appendix 2.

Table 6. Calculated noise levels arising from the simultaneous operation of the ASHPs

Reception point	Calculated overall sound emission level, dB
Front façade of the 79 Lathom Lane	30

As can be seen from table 6 above the calculated overall sound level, assuming the worst case operating conditions, would be below the lowest measured L_{Aeq} and L_{A90} levels from the existing noise climate surveys. It should however be remembered that

the above evaluation is based on the continuous and simultaneous operation of the ASHPs which is unlikely in all but the very coldest conditions.

8.0 BS 4142:2014 Assessment

The calculated resulting sound levels relating to the simultaneous operation of the ASHPs will be assessed with reference to the principles contained within BS 4142:2014.

As previously stated, one feature of BS 4142:2014 relates to the selection of the background noise level and as such the Standard at section 8.1 states "..*the objective is not simply to ascertain a lowest measured background sound level*" and at section 8.1.4 states "..*there is no "single" background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed*". With this in mind it the modal values of the measured background (L_{90}) levels from the various survey periods will be used in the following assessments. In this case it is suggested that the modal values provide a more representative assessment of the background (L_{90}) noise climate than would the mean value.

In order to define the overall rating level reference must be paid to the character correction categories detailed within BS 4142:2014. As stated within section 4.1 above, these corrections may be applied where:

- The emission of sound has characteristics that are either tonal or impulsive; and/or
- The emission of sound is intermittent or has discernible on/off characteristics.
- The emission of sound possess "*characteristics*" that "*are readily distinctive against the residual acoustic environment*".

It must however be remembered that the above character corrections are only to be applied where the indicated features are discernible/audible at the reception point.

The perception of tonality of the specific noise source can attract penalties of between 0dB to +6dB. If a tone is *just perceptible* at the reception point a +2dB penalty can be applied, a penalty of +4dB where it is *clearly perceptible* and a maximum penalty of +6dB can be applied where it is *highly* perceptible. Based on the perception of the emission of sound from ASHP units of a similar type during other assessments, it is suggested that the emission of sound from the units is unlikely to be tonal in nature.

Impulsivity in this context may be regarded as a feature where the sound in question may be regarded as a '*sudden sound*' as perceived at the reception point. This feature relates to the onset of the sound only and not the '*quality*' of the sound in general. As it is common for ASHPs of this type to ramp up and down to their operational duty, rather than activate abruptly, the '*sudden sound*' correction would not be appropriate in this case.

Turning to the possibility that the emission of noise from the ASHPs may be intermittent in nature, this is indeed the possible. Despite this, as the calculated sound level presented in table 6 above would be below the lowest measured L_{A90} value from the surveys, it is suggested that any intermittent sound resulting from the operation of the

ASHPs may not be reliably audible at the suggested reception point. Despite this a very worst case situation where audibility is just possible will be assumed and a +3dB correction will be applied for this element.

Finally, with reference to the question as to whether the resulting sound at the reception point may possess "*characteristics*" that "*are readily distinctive against the residual acoustic environment*". This element is not applied if penalties have been applied in any of the other categories. With reference to the fact that the calculated sound level presented in table 6 above would be below the lowest measured L_{A90} value from the surveys it is suggested that the character correction for situations where the sound possess "*characteristics*" that "*are readily distinctive against the residual acoustic environment*" would not be appropriate in this situation.

Assessments according with the scheme contained within BS 4142:2014 will be undertaken for the assumed noise sensitive receptor location, the front façade of 79 Lathom Lane. For the assessment of sound emission from the proposed ASHPs, BS 4142 requires us to assess the predicted commercial/industrial noise against the *background sound level,* which is the noise climate without development described in terms of the underlying dB L_{A90} index. This gives us the *initial estimate* which must then be considered in terms of *context* to arrive at the final assessment. According to the assessment of impacts discussed at section 11 of BS 4142:2014, it states that "*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*".

The results of the BS 4142:2014 '*initial*' assessments for the early morning, morning, mid afternoon and late evening periods are summarised in table 7 overleaf. With reference to the background sound levels the lowest measured values are also presented, in brackets, within table 7.

As can be seen form the above '*initial*' assessments, the excess of the rating level over the background sound level at the reception point, resulting from the simultaneous operation of the propsoed ASHPs under the heating condition, would range between -5 to -12dB. Consequently the assessment would suggest that there would be '*little likelihood of adverse impact*' according to BS 4142:2014. With reference to the lowest measured values for the background sound level, if applied the *'initial'* assessments would range between -4 to -8dB which again would be regarded as representing '*little likelihood of adverse impact*'.

It should be remembered that the above assessment was made assuming that the ASHPs would operate constantly, which is regarded as being an unlikely scenario. If the more likely scenario of the ASHPs operating for around 50% of the time during the coldest months were adopted, it would be expected that if a source was present for only half the reference time period, in this case 30 minutes, that the resulting sound levels attributable to the operation of that source only would reduce by around 3dB when contrasted with constant operation over the same period.

Turning to the selected comparative criterion from the WYPCG - Noise and Vibration, namely:

- The Rating Level (calculated in accordance to BS 4142: 2014) is at least 0 - 5* dB below the exiting Background noise level (L_{A90});

It can be seen that the assessment would also comply with this requirement, with the worst case assessment of -5dB occurring during the mid evening period which is not typically regarded as one of the more noise sensitive periods of the day. Interestingly, the initial assessments during the very early morning period and the early morning period, typically regarded as more noise sensitive periods of the day, were at -6 and -7dB respectively, even more favourable than the late evening period.

Table 7. BS4142: 2014 assessments

	Very early morning period	Early morning period	Mid afternoon period	Late evening period
	*L*p, dB	*L*p, dB	*L*p, dB	*L*p, dB
Specific sound level, calculated ASHPs sound emission at noise sensitive location, L_{Aeq}	30	30	30	30
Background sound level, L_{A90}, modal value	39 (38)	40 (39)	46 (41)	38 (37)
Acoustic feature corrections	+3	+3	+3	+3
Rating level	33	33	33	33
Excess of rating over background level	- 6	- 7	- 12	- 5
Assessment result:	*Little likelihood of adverse impact*	*Little likelihood of adverse impact*	*Little likelihood of adverse impact*	*Little likelihood of adverse impact*
Uncertainty of measurement:	see comments below	see comments below	see comments below	see comments below

The requirement to consider the "*context*" of the situation in conjunction with the overall rating levels is an essential part of the BS 4142:2014 assessment procedure. Consequently, the assessment outcome must be considered in the light of the '*context*' of the calculated sound emission from the proposed ASHPs and the environment in which they are located.

It is the case that the sound emission from ASHPs is typically lower frequency in nature. With this in mind the qualitative assessments highlighted that the existing noise climate was dominated by lower frequency road traffic noise, emanating from both distant and more local sources. As a result it is suggested that the introduction of the ASHPs into the existing environment would not, irrespective of the assessments presented above, change the overall character of the existing noise climate. This being the case, it is suggested that this would tend to reduce further, any likelihood of an adverse impact from the operation of the ASHPs.

As the most noise sensitive areas of the adjacent residential dwelling would be regarded as the internal spaces, it is the case that open windows would tend to permit more of the external noise to enter the internal spaces. However, as it is very likley that the ASHPs would be most active during the colder months of the year, when typically windows are closed, the potential for disturbance would be further reduced.

As a consequence of the above it is suggested that the emission of sound from the proposed ASHPs would have a low impact on the existing noise climate of the existing residential dwelling during both the daytime and night time periods.

8.1 Discussion of Uncertainty

The assessment procedure contained within BS 4142:2014 requires the assessor to "*Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty*".

Starting with the measurements of the background and residual sound levels, these measurements were made at times that typically represent quieter parts of the day within most environments. This being the case it is suggested that the measured background and residual sound levels were regarded as being representative of the noise climate in the immediate vicinity of the external plant and the adjacent residential dwelling.

Although BS 4142:2014 does not state what would be a representative background sound level, it also does not suggest that it should be lowest measured level, and in this respect practice varies widely. Despite this the approach adopted in this assessment is believed to have presented background sound levels that were representative of the acoustic environment at the measurement times.

The applied source data is obtained from the published data provided by the manufacturers of the units and as such it is assumed to be reliable. Where uncertainty may exist for this, we have mitigated it by assuming that all equipment is running on full load all of the time, which would in our experience would rarely occur, if ever.

Varying meteorological conditions are unlikely to have a significant impact on the assessments as, in general the conditions during the noise measurements accorded with those stated in BS 4142:2014 and so this element may be regarded as being having a minimal effect on the obtained results.

9.0 Conclusion

The assessments of the existing noise climate in the vicinity of 77 Lathom Lane, in the absence of any contribution from the AC condenser units, was characteristic of a sub-urban environment, subject to noise contributions primarily from road traffic and general neighbourhood noise.

A desk top assessment to evaluate the potential sound emission from the proposed ASHPs at the nearest noise sensitive location was undertaken, and this assessment was based on a number of worst case assumptions that would be unlikely to persist in normal use. The results of the assessment indicated that the calculated sound emission level would be below the lowest measured L_{Aeq} and L_{A90} levels from the existing noise climate surveys. It should however be remembered that the evaluation was based on the continuous and simultaneous operation of the ASHPs which is unlikely in all but the very coldest conditions.

Turning to BS 4142:2014 evaluation, the '*initial*' assessment indicated that the excess of the rating level over the background sound level at the reception point would range between -5 to -12dB. Consequently the assessment would suggest that there would be '*little likelihood of adverse impact*' according to BS 4142:2014.

Contextualising the assessment results is an essential part of the BS 4142:2014 assessment procedure. Consequently, the assessment outcome must be considered in the light of the '*context*' of the calculated sound emission from the ASHPs and the environment in which they are located. Taking these considerations into account the assessments indicate that the emission of sound from the ASHPs would be unlikely to be reliably discernible above the existing noise climate and as such would be anticipated to result in '*little likelihood of adverse impact*' on the existing noise climate in the vicinity of the nearest noise sensitive location during the day or night time periods.

Appendix 1. Measured Sound Levels

Existing noise climate, measured levels, 11th July 2024

Measurement start time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
21:30	49	75	44	38
21:35	41	54	43	39
21:40	40	56	42	38
21:45	40	46	42	37
21:50	40	48	41	38
21:55	41	54	43	38
22:00	49	64	52	40
22:05	46	62	46	39
22:10	44	60	44	40
22:15	45	63	44	40
22:20	43	53	45	40
22:25	43	51	45	41
SD	3.29	8.07	2.83	1.21
Mean (log)	45	65	45	39
Mode	40	54	44	38

Existing noise climate, measured levels, 13th July 2024

Measurement start time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
02:30	42	50	44	38
02:35	46	65	46	39
02:40	43	50	44	39
02:45	43	49	44	39
02:50	43	51	46	40
02:55	42	50	44	39
SD	1.47	6.16	1.03	0.63
Mean (log)	43	58	45	39
Mode	43	50	44	39

Existing noise climate, measured levels, 15th July 2024

Measurement start time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
09:45	41	60	43	40
09:50	40	56	41	40
09:55	43	62	45	39
10:00	41	61	42	40
10:05	42	60	45	40
10:10	43	66	46	40
SD	1.21	3.25	1.97	0.41
Mean (log)	42	62	44	40
Mode	41	60	45	40

Existing noise climate, measured levels, 11th July 2024

Measurement start time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
16:45	52	70	55	46
16:50	49	63	51	46
16:55	50	69	54	42
17:00	45	62	46	43
17:05	48	69	51	44
17:10	52	70	55	46
17:15	51	63	54	46
17:20	46	59	47	43
17:25	44	58	46	42
17:30	45	62	46	42
17:35	44	61	44	41
17:40	44	59	46	42
SD	3.21	4.54	4.17	1.93
Mean (log)	52	69	54	47
Mode	44	70	46	46

Appendix 2. Calculations

77 Lathom Lane, Gomersal		
ASHP sound emission		
Calculations to Southern Gable of 79 Lathom Lane		**dB(A)**
Vailant AroTherm Plus		
Individual unit *Lw*, heating (A7 WT34/45) @ 1m		**58**
Number of units	2	
Toatl sound emission		**61**
Distance of units from noise sensistive location, m	10	
Distance correction, dB (hemispherical radiation)		**27.1**
Fence/hedge attenuation (assumed) dB		**0**
Reflection from rear wall, dB		**3**
Resulting sound level, *L* p, at reception - heating (individual operation)		**34**
Resulting sound level, *L* p, at reception - heating (simultaneous operation)		**37**
Mean L_{Aeq} value (dB), very early morning		**43**
Mean L_{Aeq} value (dB), morning		**42**
Mean L_{Aeq} value (dB), mid afternoon		**52**
Mean L_{Aeq} value (dB), mid evening		**45**
Mean L_{90} value (dB), very early morning		**39**
Mean L_{90} value (dB), morning		**40**
Mean L_{90} value (dB), mid afternoon		**47**
Mean L_{90} value (dB), mid evening		**39**
Calculations to Front (Eastern) Façade of 79 Lathom Lane		**dB(A)**
Vailant AroTherm Plus		
Individual unit *Lw*, heating (A7 WT34/45) @ 1m		**58**
Number of units	2	
Toatl sound emission		**61**
Distance of units from noise sensistive location, m	12	
Distance correction, dB (hemispherical radiation)		**28.8**
Fence/hedge attenuation (assumed) dB		**0**
Corner of Building (79) attenuation, dB		**5**
Reflection from rear wall, dB		**3**
Resulting sound level, *L* p, at reception - heating (individual operation)		**27**
Resulting sound level, *L* p, at reception - heating (simultaneous operation)		**30**