



The Narrowboat, Reading
Fuller Smith & Turner plc

Noise Impact Assessment

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Project Particulars

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1 Introduction

- 1.1 Proposals are in place to temporarily convert the existing Narrowboat public house, located at Blakes Lock, Reading, RG1 3EQ, into a cooking training facility. The works include provision of new, temporary air-conditioning equipment. This report presents an assessment of the noise emission from new building services plant associated with the conversion.
- 1.2 An external noise survey has been conducted at the site, and the measurement data have been used to establish the prevailing ambient and background noise levels affecting the site and neighbouring noise-sensitive properties. This data has then been used to assess the noise impact in accordance with Reading Borough Council's anticipated requirements.
- 1.3 Chapter 2 of this report presents the acoustic requirements, Chapter 3 describes the external noise survey, and the assessment of plant noise emission to neighbouring properties is presented in Chapter 4. Conclusions have been provided in Chapter 5.
- 1.4 The full measurement data are available on request. Definitions of some of the terminology used throughout the report have been included in Appendix A.

2 Criteria

2.1 Overview

- 2.1.1 When assessing the impact of noise emission from new building services plant associated with the proposed development, and noise intrusion into the proposed development, consideration has been given to local planning policy and available good practice guidance. A list of the documents that have been consulted is provided below:

Local Policy

- Reading Borough Council, *Local Plan* (adopted November 2019)

Good Practice Guidance

- British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

- 2.1.2 Summaries of the guidance considered relevant to the proposals are presented within this Chapter.

2.2 Reading Borough Council Local Plan

- 2.2.1 Noise is addressed in Policy EN17 of the *Local Plan*, with explanatory text.

- 2.2.2 Policy EN17 of the Local Plan is as follows:

“EN17: Noise Generating Equipment

Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.*

** The noise source specific level is the measured noise level, as opposed to the rating level, which is the specific level with correction factors included. ”*

- 2.2.3 The supporting text expands on the reasoning for the above requirement, which is to control “background creep”. This is a phenomenon whereby incremental new developments would otherwise marginally increase the background sound level. Controlling the specific noise level to be 10 dBA below the existing background is intended to prevent background creep.

- 2.2.4 The language used in the policy follows that used in British Standard 4142, the relevant parts of which are presented overleaf, for information.

2.3 British Standard 4142

- 2.3.1 British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* presents a methodology for comparing the noise level of the new source (the *specific sound level*) with that of the existing background noise level in the area in the absence of the new source (the *background sound level*), and establishing the likely impact of the noise.
- 2.3.2 The methodology requires consideration to be given to all aspects of the assessment process, and accounts for unusual acoustic features such as tonal, impulsive, or intermittent characteristics of the noise by the addition of various corrections to the specific sound level. The corrected *specific sound level* is the *rating level*.
- 2.3.3 The *background sound level* is then arithmetically subtracted from the *rating level*. The greater the positive difference between the *rating level* and the *background sound level*, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a “significant adverse” impact, depending upon the context.
 - A difference of around +5 dB or more is likely to be an indication of an “adverse impact”, depending upon the context.
 - Where the *rating level* does not exceed the *background sound level*, this is an indication of a “low impact”, depending upon the context.
- 2.3.4 The requirements of Policy EN17 require a specific sound source to be controlled, with no consideration of corrections to arrive at a rating level.

3 External noise survey

3.1 Site description

- 3.1.1 The site is located in Reading, RG1 3EQ, and is situated on Blakes Lock. To the north of the site is Gas Works Road, which separates the Narrowboat from The Meridian residential development. Directly to the south of the site is the River Kennet, which separates the Narrowboat from other residential developments. Directly to the east is the Riverside Museum, with residents located slightly farther away on the nearby Kenavon Drive.
- 3.1.2 The main source of noise affecting the site and neighbouring properties was observed to be road traffic noise from Kenavon Drive.
- 3.1.3 Noise at the site from existing building services was generally imperceptible against the road traffic noise, although may become more audible during lulls in traffic flows. There is a lot of existing plant on the site and surrounding properties, some of which was understood to be operating during the survey.

3.2 Measurement methodology

- 3.2.1 Continuous, unattended noise level measurements were conducted at a single position towards the south-west corner of the site (overlooking the River Kennet). The microphone was positioned c. 2m above the local ground level, and is considered to have been placed in a reasonable approximation of free-field conditions.
- 3.2.2 The measurement position was chosen to yield noise level results that can be considered representative of those affecting nearby noise-sensitive receivers. It is shown on the satellite image in Figure 3-1.

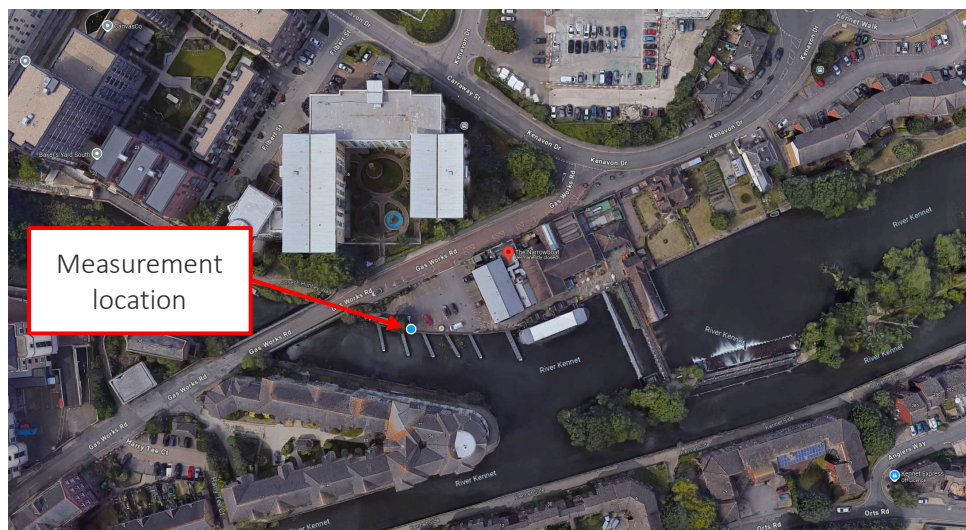


Figure 3-1: Satellite image showing noise measurement location (satellite image courtesy of Google)

- 3.2.3 Statistical and spectral octave-band data were recorded in 15-minute samples between 11:35 on Friday 8th and 15:05 on Tuesday 12th November 2024. The “fast” (125ms) time constant was used.
- 3.2.4 Measurements were undertaken in accordance with the procedures advised within British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* and British Standard 7445-1:2003 *Description and measurement of environmental noise*.
- 3.2.5 A Rion NL-52 Class 1 sound level meter (serial number: 00620864) was used to carry out the measurements.
- 3.2.6 The calibration of the sound level meter and associated microphone was checked prior to and on completion of the survey in accordance with recommended practice. No significant drift in calibration occurred during the survey. The accuracy of the calibrator can be traced to National Physical Laboratory Standards.

3.3 Weather

- 3.3.1 Weather conditions throughout the survey¹ are believed to have been dry with average windspeeds of approximately ≤ 5 m/s. The weather conditions are considered to have had minimal impact on the measurements.

3.4 Results

- 3.4.1 Full measurement data are available in digital format on request. A summary of the key data is presented in this report.
- 3.4.2 A graph showing the noise level history is presented in Figure 3-2.

¹ <https://www.timeanddate.com/weather/uk/reading/historic?month=11&year=2024>

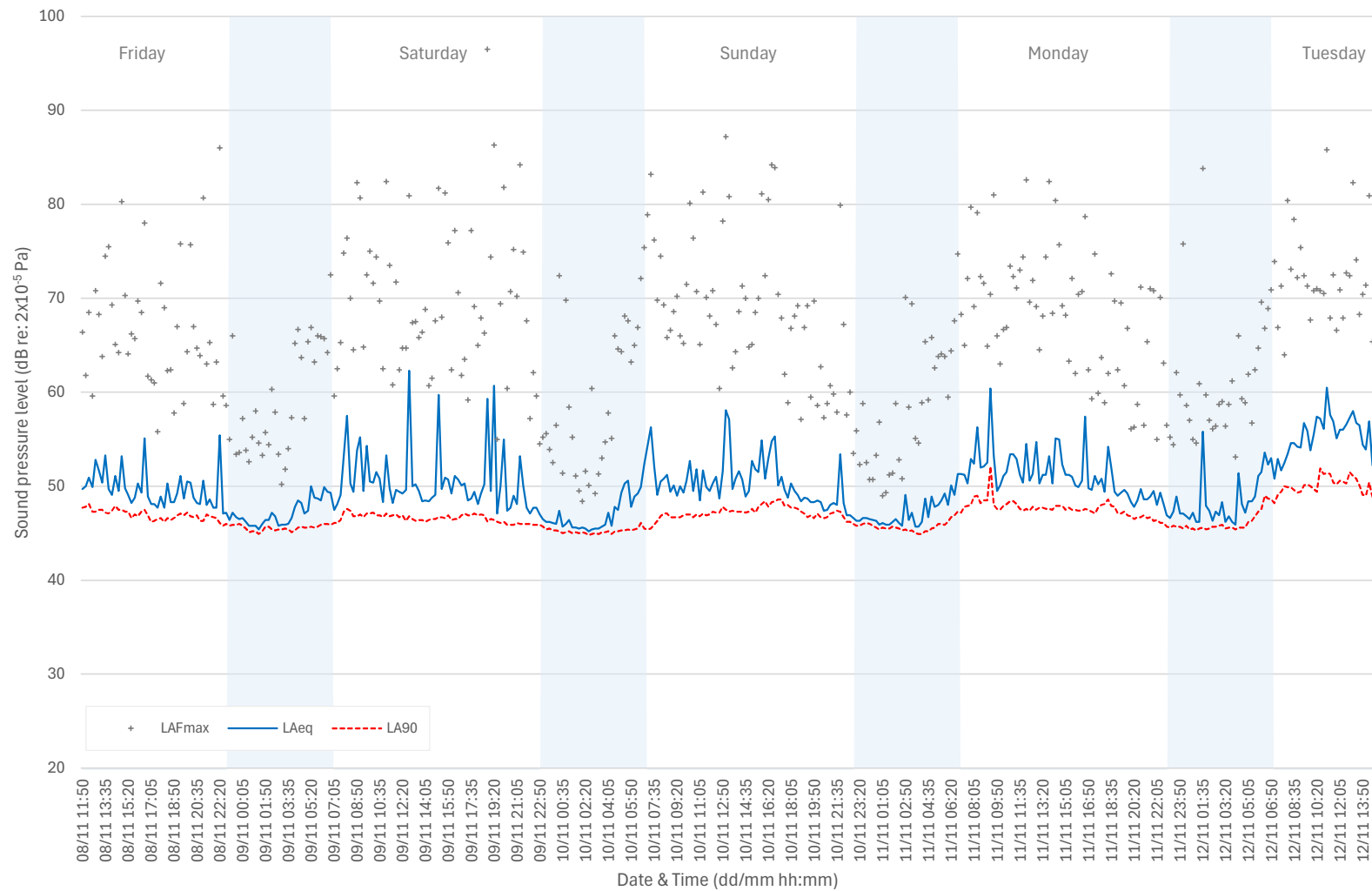


Figure 3-2: Measured noise level history

- 3.4.3 Based on the measured data, the lowest background sound levels expected to occur at the nearest noise-sensitive properties are presented in Table 3-1. The standard times for day and night are presented, along with the expected opening times of the facility; noting that new plant associated with the development is not normally expected to operate outside of these hours.

Time	Lowest background sound levels
Daytime (07:00-23:00)	45 dB $L_{A90,15min}$
Night-time (23:00-07:00)	45 dB $L_{A90,15min}$
Typical facility opening times (08:00 – 18:00)	46 dB $L_{A90,15min}$

Table 3-1: Lowest background sound levels obtained during the survey

- 3.4.4 Noise levels can be seen to have generally followed a diurnal pattern, falling to the lowest levels overnight and rising to the highest levels during the day. This is typical for sites that are exposed to road traffic noise.
- 3.4.5 There is no obvious flattening out of the noise levels, as may be expected if dominated by constant building services noise, or similar. The noise level history accords with the subjective impressions of the various sources of noise observed during the periods of attendance.

4 Plant noise emission to neighbouring properties

4.1 Plant noise emission limits

- 4.1.1 The planning requirement is to achieve plant noise specific levels at least 10 dBA below the existing background levels at nearby Noise Sensitive Receivers (NSRs).
- 4.1.2 In order to represent a worst-case scenario, the lowest background sound levels obtained during the survey have been used to derive the following specific plant noise emission limits. These apply at a position in proximity to nearby noise-sensitive properties, in a theoretical free-field:

Time	Plant noise emission limits at nearest NSRs
Daytime (07:00-23:00)	35 dB L_{Ar}
Night-time (23:00-07:00)	35 dB L_{Ar}
Typical facility opening times (08:00 – 18:00)	36 dB L_{Ar}

Table 4-1: Plant noise emission limits at nearest NSRs, based on measurement data

- 4.1.3 As new equipment is only expected to operate between 8am and 6pm, the specific noise limit relevant to the proposals would therefore be 36 dB L_{Ar} . The other limits are presented for completeness only and do not affect the plant noise emission assessment, although it is worth noting that there is only 1 dB variance in the lowest measured background sound levels at all times.

4.2 Plant proposals

- 4.2.1 There will be new air-conditioning equipment comprising internal FCUs, which are expected to be very quiet within the space, and imperceptible when observed outside the premises. The FCUs will be served by inverters installed on the existing roof of the property, adjacent to the existing bar ventilation system. The air-conditioning will be 4 No. Panasonic's PACi NX Series, rated at 14. kW each and the outdoor units will be model number U-140PZ3E5.
- 4.2.2 The outdoor units are quoted by the manufacturer as emitting a sound pressure level of 56 dB L_{pA} when measured at a distance of 1m in front of the unit (per unit).
- 4.2.3 Ventilation will be provided by separate supply and extract fans, to be located internally with the premises, and ducted to outside via new louvres in the facades. The supply fan will be a S&P unit, model TCBTx2 560. The extract fan will be a Systemair unit, model MUB 062 560. The manufacturer noise data is shown below:

Unit	Linear sound power levels in octave-band centre frequencies (dB)							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
TCBTx2 560	50	85	87	88	91	85	78	73
MUB 062 560	77	86	83	81	79	75	73	67

Table 4-2: Manufacturer provided sound power levels (in-duct, atmosphere side), (dB ref: 10^{-12} W)

- 4.2.4 In-duct attenuators (“silencers”) will be provided to both the supply and extract system. The atmosphere side attenuators are currently shown as c. 1100mm long on the supply system, and c. 1300mm on the extract system. The specification for these are still to be determined, but the following have been assumed, based on satisfying the requirements of the Local Authority:

Unit	Sound insertion losses assumed for the silencers (dB)							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Supply	7	11	22	33	29	22	20	15
Extract	8	13	26	39	34	26	23	18

Table 4-3: Assumed sound insertion losses for the new atmosphere-side silencers (dB)

- 4.2.5 Alternative attenuator specifications are expected to be viable, and should be reviewed during the next design stage.
- 4.2.6 The location of the proposed plant is shown in Figure 4-1.

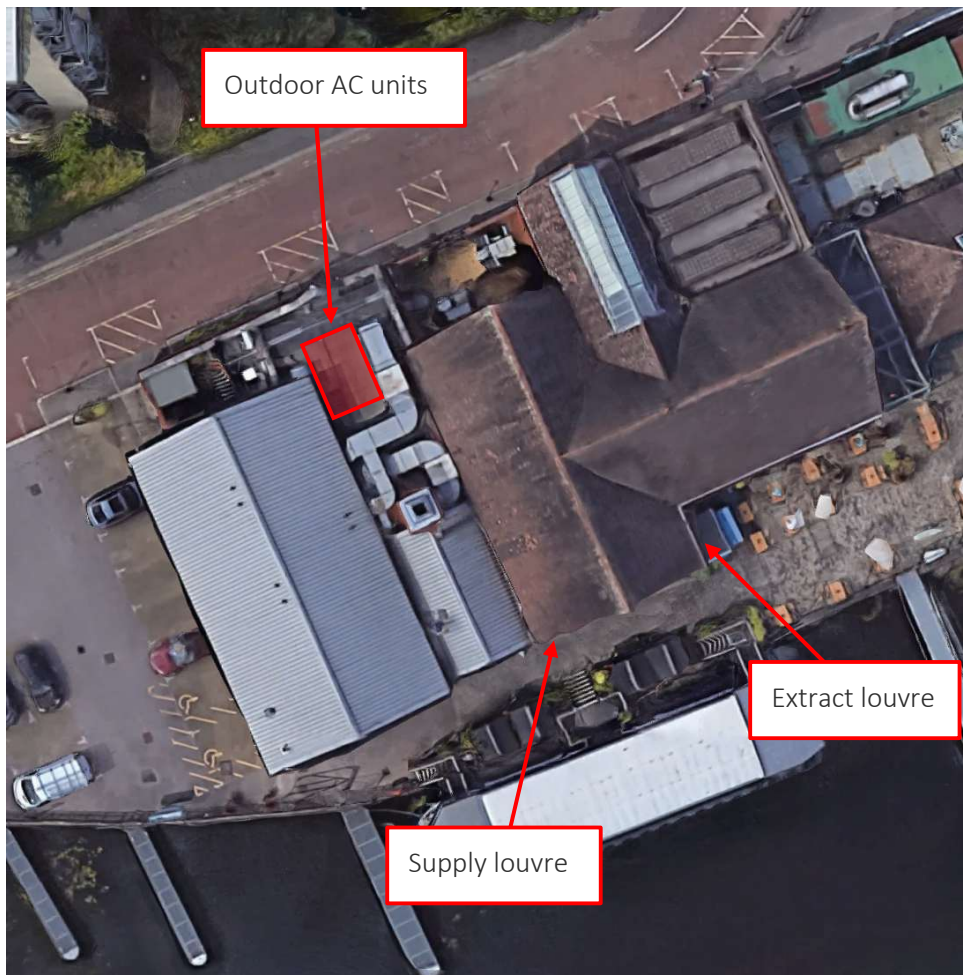


Figure 4-1: Proposed location of plant (satellite image courtesy of Google)

4.3 Nearest noise-sensitive receivers

- 4.3.1 The nearest noise-sensitive receivers to the proposed plant will be The Meridian residential block to the north of the site, the residential block on Kenavon Drive, and the residential blocks across the River Kennet. Other neighbouring noise-sensitive properties are father away, or will be acoustically screened from the new plant; noise emission to these other noise-sensitive properties will be less than calculated for the two residential blocks considered. The residential blocks considered within this assessment are highlighted in Figure 4-2.

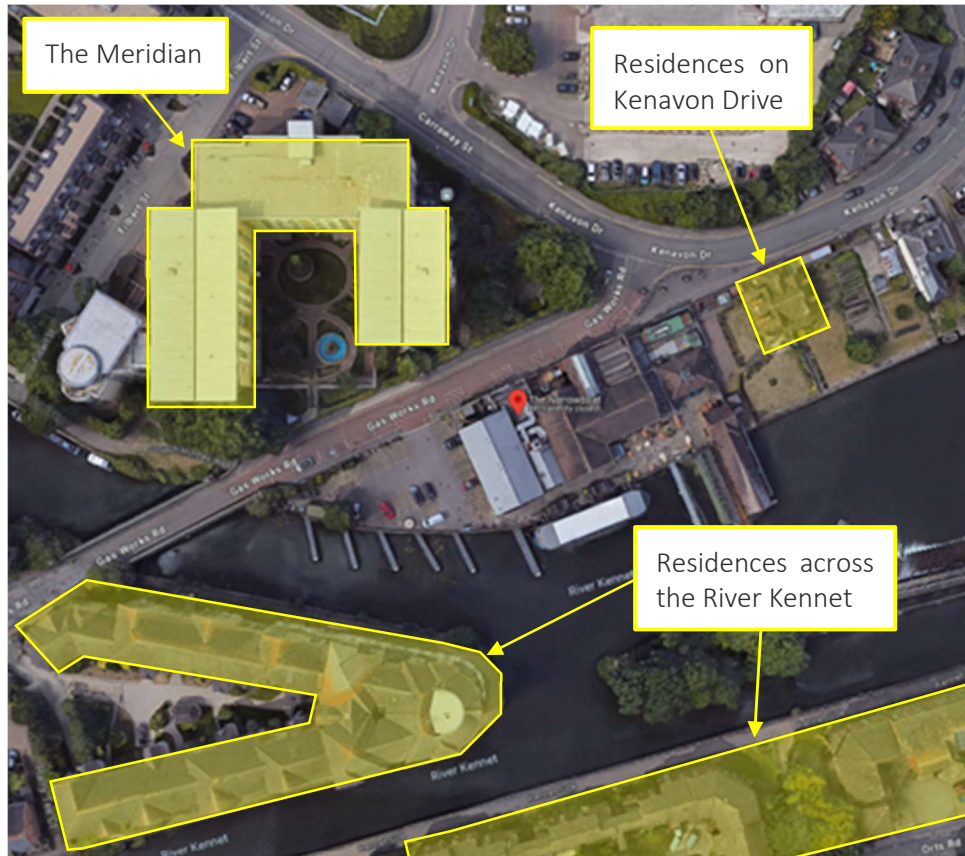


Figure 4-2: Satellite image showing nearest noise-sensitive receivers (source: Google Earth)

- 4.3.2 The distance between the plant and the assessment location is varies between 20m and 80m, depending on which piece of equipment and which receiver. This equates to between 26 dB and 38 dB of distance attenuation, based on point-source propagation, and relative to a distance of 1m from the source.
- ### 4.4 Calculation methodology
- 4.4.1 The calculation of the specific sound level for the nearest noise-sensitive receiver has been carried out in accordance with the general calculation methodology outlined in ISO 9613-2:2024, as per typical industry practice.
- 4.4.2 Calculations have been made for each of the following means of attenuation, where considered to be relevant (shown overleaf):

- **Geometric divergence** – which describes the reduction in sound pressure level as the distance from the source increases. The relative distances are such that noise owing to distance will reduce following a point-source propagation model.
- **Acoustic screening** – some noise-sensitive receivers will be screened from some plant. This has been accounted for in the calculations, as per the guidance in ISO 9613-2:2024.
- **In-duct attenuators** – sound insertion losses as assumed in Table 4-3. No other duct losses have been included within the calculation (bend losses, end reflection losses etc), which means the results are worst-case.

4.4.3 The guidance in BS 4142 requires that decibel corrections be added to the specific sound level if the noise contains unusual acoustic characteristics. The corrected sound level is known as the rating level. The following characteristics have been considered:

- **Tonality** – Noise from the proposed outdoor air-conditioning units will typically be airflow noise, which is broadband in character (i.e. distributed over a wide frequency range), and therefore not expected to contain tonal qualities. Noise from the proposed kitchen supply and extract system is, however, expected to contain “just perceptible” tonal qualities, therefore a +2 dB correction has been applied to the specific sound level.
- **Impulsivity** – When properly maintained, noise from the proposed equipment is not expected to exhibit impulsive characteristics, therefore this correction has not been applied.
- **Intermittency** – The duty of each individual outdoor air-conditioning units will adjust depending on the cooling/heating duty requested by the occupants, and the duty of the kitchen supply and extract system will adjust depending on the kitchen’s operation. The equipment is, however, expected to operate with gradual stop/starts, so it is unlikely that an intermittent characteristic would be experienced at the neighbouring properties. However, a precautionary +3 dB correction has been included.
- **Other** – The unit is not expected to emit any other characteristics that would be readily distinctive against the existing acoustic environment, therefore no correction has been applied.

4.4.4 The BS 4142 rating level will therefore be 5 dB higher than the specific sound level at the nearest noise-sensitive receiver.

4.4.5 Note that the BS4142 rating levels have been calculated for information only, and are not required for satisfying the Local Authority requirements.

4.5 Predicted noise levels

- 4.5.1 The specific sound levels of the all the proposed new plant in operation at the assessment locations are presented in Table 4-4 below, along with the associated BS4242 rating levels. These are all calculated for the typical facility opening times (08:00 – 18:00).

Lowest background sound level	Noise limit	Receiver	Specific sound level	Rating level	BS 4142 assessment of impact
46 dB $L_{A90,15min}$	36 dB $L_{Aeq,Tr}$	The Meridian	36 dB $L_{Aeq,Tr}$	41 dB $L_{Ar,Tr}$	Low
46 dB $L_{A90,15min}$	36 dB $L_{Aeq,Tr}$	Residences across the River Kennet	28 dB $L_{Aeq,Tr}$	33 dB $L_{Ar,Tr}$	Low
46 dB $L_{A90,15min}$	36 dB $L_{Aeq,Tr}$	Residences on Kenavon Drive	19 dB $L_{Aeq,Tr}$	24 dB $L_{Ar,Tr}$	Low

Table 4-4: Predicted plant noise levels at the assessment location

- 4.5.2 The results demonstrate that the noise emission limits (specific levels 10 dBA below the underlying background sound levels) will be satisfied with all new plant in operation.
- 4.5.3 Furthermore, and for information only, the proposed plant is expected to have a “low impact” on the neighbouring properties, based on the guidance presented in BS 4142.

5 Conclusions

- 5.1 A noise emission assessment has been undertaken of proposed new building services plant associated with the redevelopment of the Narrowboat public house into a temporary cooking training facility.
- 5.2 An external noise survey has been conducted at the site, and the measurement data have been used in conjunction with planning guidance from Reading Borough Council to establish noise emission limits at nearby neighbouring properties.
- 5.3 Noise emission from the selected plant has been calculated to assessment locations in proximity to neighbouring noise-sensitive properties.
- 5.4 The results demonstrate that the noise emission limits (specific levels 10 dBA below the underlying background sound levels) will be satisfied with all new plant in operation.
- 5.5 Furthermore, and for information only, the proposed plant is expected to have a “low impact” on the neighbouring properties, based on the guidance presented in BS 4142.

Appendix A - Terminology

This appendix provides an explanation of some of the terms used in this report.

A-weighting L_A or L_{pA} , L_{WA}	Within its operating limits a precision measurement microphone measures all frequencies the same so the output it produces does not reflect what we would actually hear. The A-weighting is an electronic filter that matches the response of a sound level meter to that of the human ear. When A-weighted the Sound Pressure Level L_p becomes L_{pA} (or L_A) and the Sound Power Level L_W becomes L_{WA} .
L_p	<i>The instantaneous sound pressure level (L_p)</i>
L_{pA} (or L_A)	<i>The A-weighted instantaneous sound pressure level (L_{pA} or L_A). This is the root mean square size of the pressure fluctuations in the air. This level can fluctuate wildly even for seemingly steady sounds. To make sound level meters easier to read the values on the display are smoothed or damped out. This is effectively done by taking a rolling average of the previous 0.125s (FAST time constant) or the previous 1s (SLOW time constant).</i>
L_{AF} , L_{AS}	The letters F or S are added to the subscripts in the notation to indicate when the FAST or SLOW time constant has been used. These are often omitted but it is good practice to include them.
L_{max}	<i>The maximum instantaneous sound pressure level (L_{max}),</i>
L_{Amax}	<i>The A-weighted maximum instantaneous sound pressure level (L_{Amax})</i>
L_{AFmax}	<i>The A-weighted maximum instantaneous sound pressure level with a FAST time constant (L_{AFmax}).</i>
$L_{N,T}$	<i>The percentage exceedance sound pressure level ($L_{N,T}$),</i>
$L_{AN,T}$ $L_{AFN,T}$ N = %age value, 0-100 T = measurement time eg. L_{A90} , L_{A10} , L_{AF90} , 5 min	<i>The A-weighted percentage exceedance sound pressure level ($L_{AN,T}$), the A-weighted percentage exceedance sound pressure level with a FAST time constant ($L_{AFN,T}$). This is the sound pressure level exceeded for $N\%$ of time period T. e.g. If an A-weighted level of x dB is exceeded for a total of 6 minutes within one hour, the level will have been above x dB for 10% of the measurement period. This is written as $L_{A10,1hr} = x$ dB. L_{A0} (the level exceeded for 0 % of the time) is equivalent to the L_{Amax} and L_{A100} (the level exceeded for 100 % of the time) is equivalent to the L_{Amin}. It is good practice to include the letter which identifies the time constant used as this can make a significant difference to the value.</i>
$L_{eq,T}$	<i>The equivalent continuous sound pressure level over period T ($L_{eq,T}$),</i>
$L_{Aeq,T}$ T = measurement time eg. $L_{Aeq,5min}$	<i>The A-weighted equivalent continuous sound pressure level over period T ($L_{Aeq,T}$). This is effectively the average sound pressure level over a given period. As the decibel is a logarithmic quantity the L_{eq} is not a simple arithmetic mean value. The L_{eq} is calculated from the raw sound pressure data. It is not appropriate to include a reference to the FAST and SLOW time constants in the notation.</i>

