Assessment of the Emission of Noise from the External Plant and Air Handling Equipment Associated with the Drive-through Takeaway Located Within the Former Crown Motors Site on Waterloo Road in Huddersfield

Report Prepared for:

Mr. G. Brown
G Brown & Co
Lauren House 37[A]
Wakefield Road
Tandem
Huddersfield
HD5 0AN

Report Prepared By:

Robert Smith

Report Reference: DRUK/ACC/RS/GBFCMSHDTTA/3103

Date: 1st June 2023

✉ ***Druk*** Limited, 87 St Albans Road, Halifax, HX3 0ND
☎ 07917 727 901
rsmith@druklimited.co.uk
www.druklimited.co.uk
Registered in England: 06380955

Contents

1.0 Summary

Planning permission has been granted permitting the conversion of the former Crown Motors site on Waterloo Road in Waterloo, Huddersfield to form a new drive through food takeaway business. The permission was granted subject to the application of a number of planning conditions, one of which required the evaluation of the existing noise climate in the vicinity of the takeaway business combined with an assessment of effect the likely noise emissions from the food takeaway business may have on the nearby residential dwellings.

In compliance with the planning permission, Druk Limited was commissioned to undertake an assessment of the existing noise climate in the vicinity of the takeaway food business and assess the likely noise emissions from the business. The assessment of the emission of noise from the business will be undertaken in accordance with the procedures detailed within British Standard (BS) 4142: 2014 “Methods for rating and assessing industrial and commercial sound”.

The noise surveys have highlighted that the existing noise climate in both measurement positions on Waterloo Road was regarded as being characteristic of an urban type environment that was dominated by road traffic on both the A642 and Waterloo Road itself. During the measurement periods both roads remained busy, although the A642 was consistently busier. The majority of the vehicles on both roads comprised private cars, although light and some heavy goods vehicles and buses were also noted during the period.

As the emission of noise from the new noise sources associated with the food takeaway business could be considered as new noise sources of a commercial nature, all the assessments will be undertaken according to the principles contained within British Standard (BS) 4142:2014 "Methods for Rating and Assessing Industrial and Commercial Sound". Applying these principles to the emission of noise from the air handling equipment it has been demonstrated that the calculated rating level at the two nearest noise sensitive locations would be at least 4dB lower than the existing lowest measured background sound level. As such it is suggested that it would be unlikely that the emission of noise from the air handling units would have any adverse impact on the nearby noise sensitive receptors.

Consequently it is suggested that the installation of the external roof mounted air handling equipment, including the indicated attenuation measures relating to the supplementary air supply and extraction equipment, would not affect the existing noise climate in the vicinity of the nearby residential dwellings.

Report Prepared by:

Robert Smith

2.0 Introduction

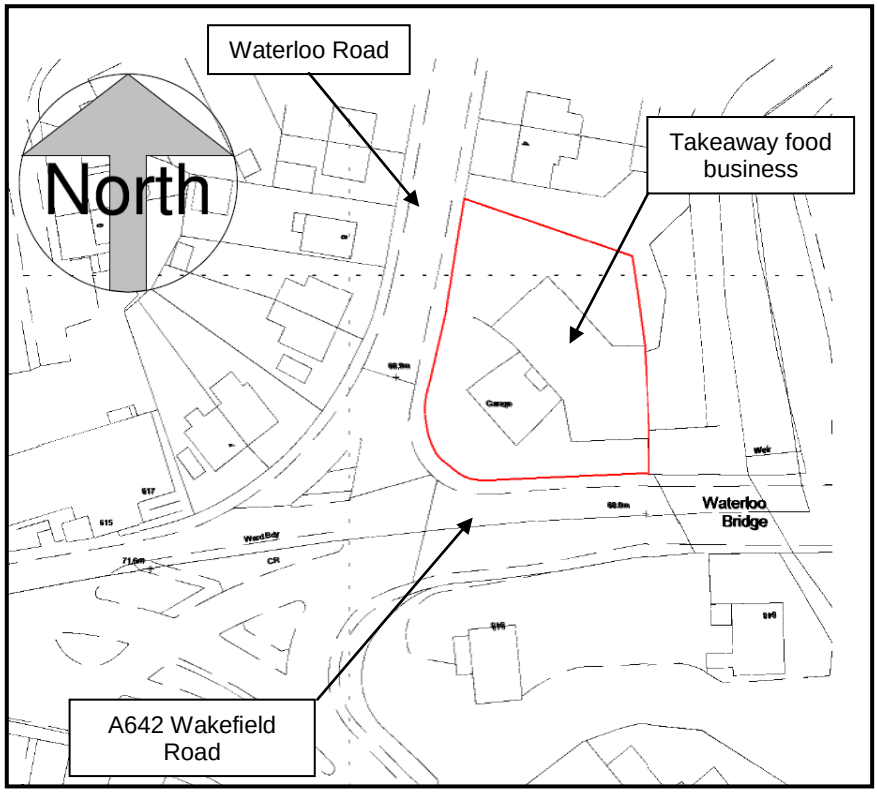
Planning permission has been granted permitting the conversion of the former Crown Motors site on Waterloo Road in Waterloo, Huddersfield to form a new drive through food takeaway business. The permission was granted subject to the application of a number of planning conditions, one of which required the evaluation of the existing noise climate in the vicinity of the takeaway business combined with an assessment of the potential effect that the potential noise emissions from the food takeaway business may have on the nearby residential dwellings.

In compliance with the planning permission, Druk Limited was commissioned to undertake an assessment of the existing noise climate in the vicinity of the takeaway food business and assess the likely noise emissions from the business. The assessment of the emission of noise from the business will be undertaken in accordance with the procedures detailed within British Standard (BS) 4142: 2014 "Methods for rating and assessing industrial and commercial sound".

3.0 Site Description

The permitted food takeaway business is located on the former Crown Motors site on Waterloo Road in Huddersfield (figure 1 below and photograph 1 overleaf). Immediately to the North of the takeaway business is a residential dwelling, number 4 Waterloo Road (photograph 2 overleaf). To the South of the takeaway business is the busy A642 Wakefield Road (photograph 3 overleaf). To the East of the takeaway business is a watercourse and the Gallagher Retail Park beyond (photograph 4 overleaf). To the West of the takeaway business is Waterloo Road and the residential properties beyond (photograph 5 overleaf)

Figure 1. Location of the new food takeaway business

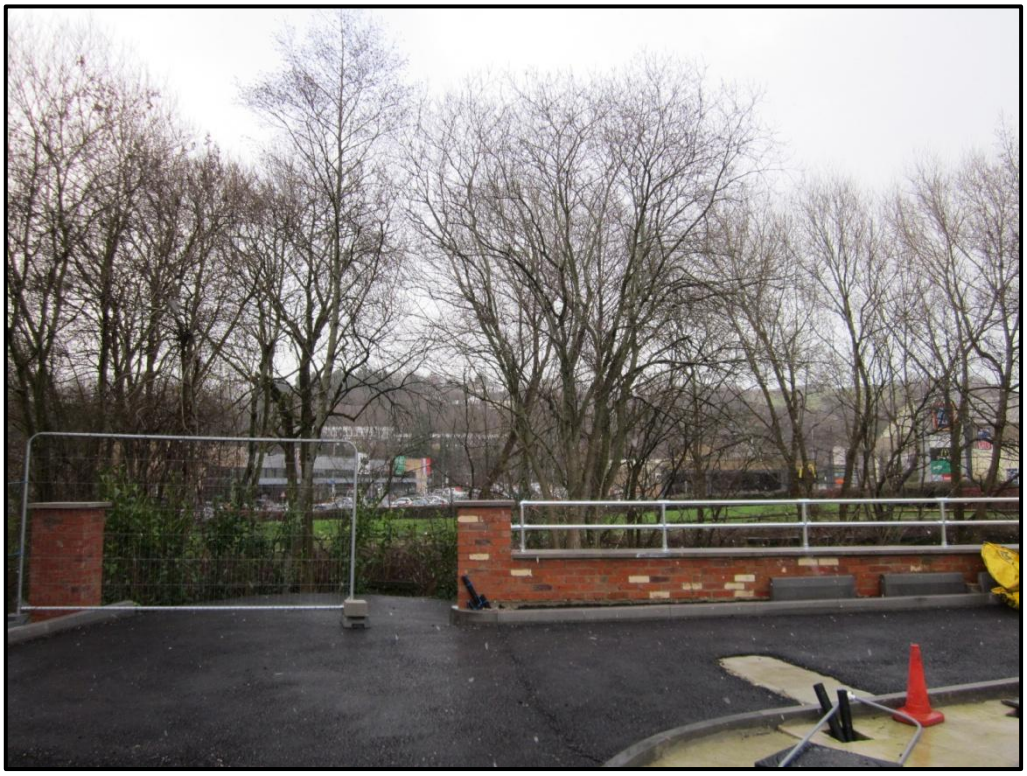


Photograph 1. Location of the new food takeaway business

Photograph 2. Residential dwelling to the North of the new food takeaway business

Photograph 3. A642 Wakefield Road to the South of the new food takeaway business

Photograph 4. Gallagher Retail Park to the East new food takeaway business



Photograph 5. Waterloo Road to the West of the new food takeaway business

4.0 Assessment Criteria

The planning permission for the new takeaway premises contained a number of conditions one of which, condition 7, required an assessment of the noise emissions from the food premises combined with a scheme of how the nearby residents will be protected from noise emission from the care home. The full text of the conditions is reproduced below:

Condition 7

7. Before the development is first brought into use, a noise assessment report by a suitably competent person shall be submitted to and approved in writing by the Local Planning Authority. The report shall include: -

a) an assessment of all of the noise emissions from the proposed development

b) details of existing background and predicted future noise levels at the boundary of 4 Waterloo Road, Waterloo, Huddersfield, HD5 0AH and 5-13 Waterloo Road, Waterloo, Huddersfield, HD5 0AH.

c) a written scheme of how the occupants of the above-mentioned noise sensitive premises will be protected from noise from the proposed development including details of all necessary noise attenuation.

The development shall not be brought into use until all works comprised within the measures specified in the approved report have been carried out in full and such works shall be thereafter retained.

With reference to the potential emission of noise from the permitted food takeaway business it is suggested that the emission of noise from the external elements of the air extraction and supply equipment, serving the food preparation areas, would be considered as representing the most significant potential sources of noise emission. As the emission of noise from the plant associated with the takeaway could be considered as new noise source of a commercial nature, the principles contained within British Standard (BS) 4142:2014 "Methods for Rating and Assessing Industrial and Commercial Sound" would be appropriate in this case.

4.1 BS 4142:2014 "Methods for Rating and Assessing Industrial and Commercial Sound"

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, the current version of the Standard, as with the earlier Standard, also 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 the various parameters, relating to the ambient, background, residual and rating sound levels, have been established, the standard describes a method for comparing data in order to evaluate what impact the specific noise may have on an existing noise climate. As with the earlier version of the standard the current version of the standard continues to apply the difference between the rating and background sound levels as the basis for assessment. However, unlike the earlier version the assessment is now more contextual rather than the more categorical nature of the earlier version of the standard. With reference to the context, the current version of the standard states the following with respect to the assessment of impact:

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

5.0 Assessment Procedure

As per the requirements contained within BS 4142:2014, the assessments detailed in the subsequent sections of this report will be undertaken with respect to the location of the nearest sensitive receptors. With respect to the locations of the nearest noise sensitive receptors these have been specified within planning condition 7, namely the residential premises at 4 and 5 - 13 Waterloo Road.

The planning consent also restricted the hours of trading, condition 5 stating "*The site shall not be open to customers, nor shall there be dispatches of food for delivery to customers, outside the hours of 8am-10:30pm Sun-Thurs, 8am-11pm Fridays and Saturdays*".

In order to evaluate the existing local noise climate in the vicinity of the takeaway food premises, noise surveys to evaluate the current noise climate in the vicinity of the identified noise sensitive receptors were conducted. In the noise sensitive locations measurements of he existing background (L_{A90}) and residual (L_{Aeq}) sound levels were made during the mid morning (10:00 - 12:00 hours), mid afternoon (14:00 - 16:00 hours) and late evening (20:00 - 22:00 hours) periods. Measurements were made during a

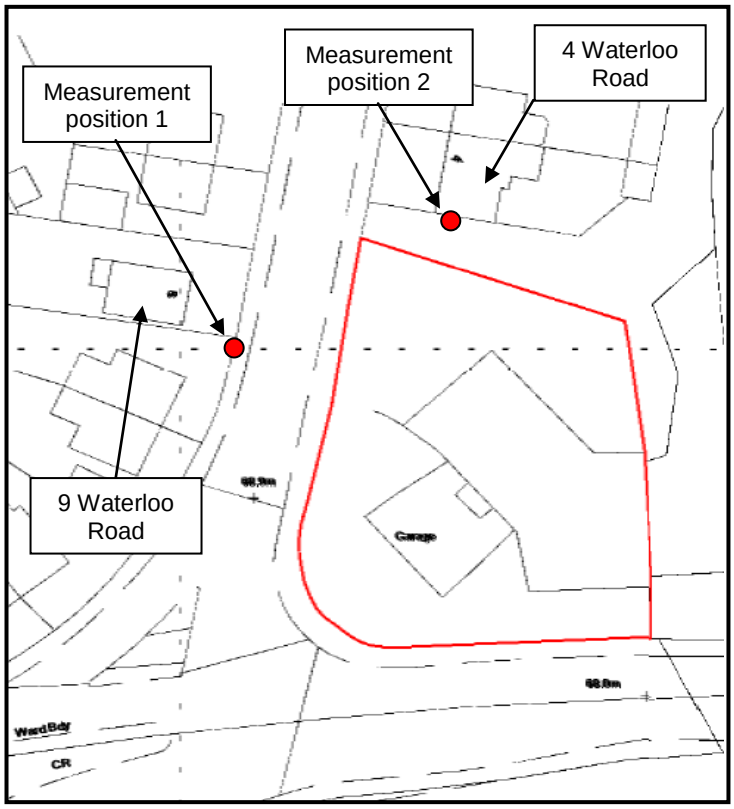
typical weekday and on a Sunday. These periods were selected as they arguably represent the quietest parts of a 'normal' weekday combined with a Sunday, with the late evening measurements again being made at a time which is typically quiet and would correspond with the latest opening times of the takeaway premises. Consequently comparisons made with levels obtained from these periods may be regarded as stringent criteria with reference to the subsequent assessments.

With reference to the measurement of the existing background (L_{A90}) sound levels, it is worth noting that BS 4142:2014 states at section 8.1 "...*the objective is not simply to ascertain a lowest measured background sound level*". The Standard continues at section 8.1.4 "...*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 reference to the measured background sound levels, there is nothing to suggest that these were not representative of the prevailing sound levels during the assessment periods. Additionally, where the lowest background sound level is adopted, this offers a degree of 'protection', that the employed measured levels would be sufficient to cover any variations in the background sound level at the measurement positions.

5.1 Survey Times and Personnel

Noise surveys to evaluate the background and residual sound levels were made between 14:00 - 16:00 and 20:00 - 22:00 hours on Monday 16th January, between 10:00 - 12:00 hours on Tuesday 17th January and between 10:00 - 12:00, 14:00 - 16:00 and 20:00 - 22:00 hours on Sunday 22nd January. With reference to the day time measurements of the existing sound levels, at no time during the measurement periods was any noise from construction noise at the takeaway food premises audible in the measurement locations and therefore made no contribution to the measured sound levels. The background and residual sound levels were obtained from two positions, just outside number 7 Waterloo Road and adjacent to the gable of 4 Waterloo Road. These positions were selected as they represented a compromise between getting as close to the nearest noise sensitive receptor positions as possible whilst remaining on land that was accessible to Druk Limited and was not in private ownership. The measurement positions are detailed on figure 2 overleaf.

Figure 2. Approximate location of the background and residual noise measurement positions



5.2 Weather

During the course of the background and residual sound level measurement surveys, the following weather conditions prevailed:

Monday 16th January 2023

All surfaces were dry, the sky was clear, the temperature ranged between - approximately 3 - 0°C, the barometric pressure ranged between approximately 970 - 980mbar and the wind speed was less than 0.3m/s.

Tuesday 17th January 2023

All surfaces were dry, cloud cover was approximately 10%, the temperature was approximately 1°C, the barometric pressure was approximately 980 mbar and the wind speed was approximately 0.8m/s.

Sunday 22nd January 2023

All surfaces were damp, cloud cover was 100%, the temperature ranged between - approximately 0 - 3°C, the barometric pressure ranged between approximately 1020 - 1024mbar and the wind speed was less than 0.3m/s.

5.3 Equipment

All the measurements detailed within this report were obtained using the equipment detailed in table 1 below.

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.

Table 1. Equipment used during the existing noise climate measurements

Equipment description	Manufacturer	Model number	Serial number
Sound level meter	Norsonic AS	Nor 140	1402738
Microphone pre-amplifier	Norsonic AS	Nor 1209	12075
Microphone	Norsonic AS	Nor 1225	72843
Acoustic calibrator	Norsonic AS	Nor 1251	31522
Sound level meter	NTI Audio	XL2-TA	A2A-10232-E
Microphone pre-amplifier	NTI Audio	MA220	5537
Microphone	NTI Audio	M2230	8636

5.4 Measurement of Background and Residual Sound Levels

With reference to the measurements of the background and residual sound levels, BS 4142:2014 does not specify a particular time period over which measurements should be made. Despite this, at subclause 8.1.3 the following is stated "*Ensure the measurement time interval is sufficient to obtain a representative value of the background sound level for the period of interest.* It is suggested that the measurement duration should be not normally be less than 15 minutes in total. With this in mind, the adopted measurement duration for all of the surveys was 2 hours, comprising 24 consecutive 5 minute measurements in each location.

In both the measurement positions the sound level meters were tripod mounted such that the microphones were approximately 1.3 metres above ground level and positioned such that it was at least 2 metres from any large and potentially reflecting surfaces and the fast time weighting was engaged.

6.0 Noise Survey Results

A qualitative description of the existing noise climate throughout the various measurement periods is contained in the following paragraphs. As the noise climate was of essentially the same character, although the overall levels varied a little, in both locations, the following comments may be regarded as being applicable to both locations.

6.1 Qualitative Assessment, 16th January 2023

In essence, the existing noise climate in both measurement positions was regarded as being characteristic of an urban type environment that was dominated by road traffic on both the A642 and Waterloo Road itself. During the measurement periods both roads remained busy, although the A642 was consistently busier. The majority of the vehicles on both roads comprised private cars, although light and some heavy goods vehicles and buses were also noted during the period. In most cases the road vehicles appeared to be abiding by the speed limits, however on occasion cars were observed travelling at speeds that exceeded the speed limit.

Additional noise sources included the sound of pedestrians talking as they walked along Waterloo Road and some noise, including DIY type noise, from the surrounding houses.

6.2 Qualitative Assessment, 17th January 2023

The noise climate in both of the measurement positions was very similar to that which was experienced the p[previous day, with both roads remaining relatively busy throughout the measurement period. Again private cars were the dominant class of vehicle but buses were also well represented.

Additional contributory noise sources included the sound of pedestrians talking as they walked along Waterloo Road and some noise from the surrounding houses

6.3 Qualitative Assessment, 22nd January 2023

Again the noise climate was very similar to that which was experienced during the previous noise measurements surveys and was again dominated by road traffic on the A642 and Waterloo Road. Private cars were the dominant class of vehicle but buses were also well represented. In general the measured noise levels were a little lower than was the case during the weekday. The exception to this general rule occurred between 15:35 - 15:45 when a large group of young men were observed travelling at speed along Waterloo Road on motorcycles and quad bikes. After waiting for a short time at the traffic light controlled junction with Waterloo and Wakefield Roads, whilst constantly revving their engines, they finally pulled away. The whole episode was accompanied by a considerable mount of engine revving while the motorcycles and quad bikes were stationary.

Additional contributory noise sources included the sound of pedestrians talking as they walked along Waterloo Road and some noise from the surrounding houses

6.4 Basic Results

By virtue of the significant amounts of measured noise data collected from the two measurement locations during the noise survey, tables 2 - 13 and graphs 1 - 6 overleaf contain summaries of the noise data from the various measurement positions. Full measured noise data are presented in tabular form in Appendix 1.

Table 2. Measured noise level summary, position 1, Monday 16th January 2023, 14:00 - 16:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	1.03	2.15	1.32	1.17
Mean (log)	71	86	75	59
Modal value	71	84	75	59

Table 3. Measured noise level summary, position 1, Monday 16th January 2023, 20:00 - 22:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	2.32	3.61	2.11	1.97
Mean (log)	66	84	67	48
Modal value	65	84	68	46

Table 4. Measured noise level summary, position 1, Tuesday 17th January 2023, 10:00 - 12:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	1.10	1.95	1.69	1.41
Mean (log)	70	84	74	58
Modal value	70	82	74	59

Table 5. Measured noise level summary, position 1, Sunday 22nd January 2023, 10:00 - 12:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	1.10	1.76	1.26	1.84
Mean (log)	72	86	76	58
Modal value	72	86	77	60

Table 6. Measured noise level summary, position 1, Sunday 22nd January 2023, 14:00 - 16:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	2.48	4.93	2.30	1.67
Mean (log)	73	92	76	59
Modal value	70	84	74	59

Table 7. Measured noise level summary, position 1, Sunday 22nd January 2023, 20:00 - 22:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	3.04	3.60	3.11	2.67
Mean (log)	65	83	67	45
Modal value	66	83	68	45

Table 8. Measured noise level summary, position 2, Monday 16th January 2023, 14:00 - 16:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	0.91	3.14	0.82	1.61
Mean (log)	61	76	64	57
Modal value	61	73	64	56

Table 9. Measured noise level summary, position 2, Monday 16th January 2023, 20:00 - 22:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	1.49	2.81	1.36	1.46
Mean (log)	58	72	61	47
Modal value	58	70	62	47

Table 10. Measured noise level summary, position 2, Tuesday 17th January 2023, 10:00 - 12:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	0.83	1.80	0.92	0.93
Mean (log)	61	73	64	55
Modal value	61	72	64	55

Table 11. Measured noise level summary, position 2, Sunday 22nd January 2023, 10:00 - 12:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	0.59	2.99	0.66	1.05
Mean (log)	61	72	64	55
Modal value	61	69	64	55

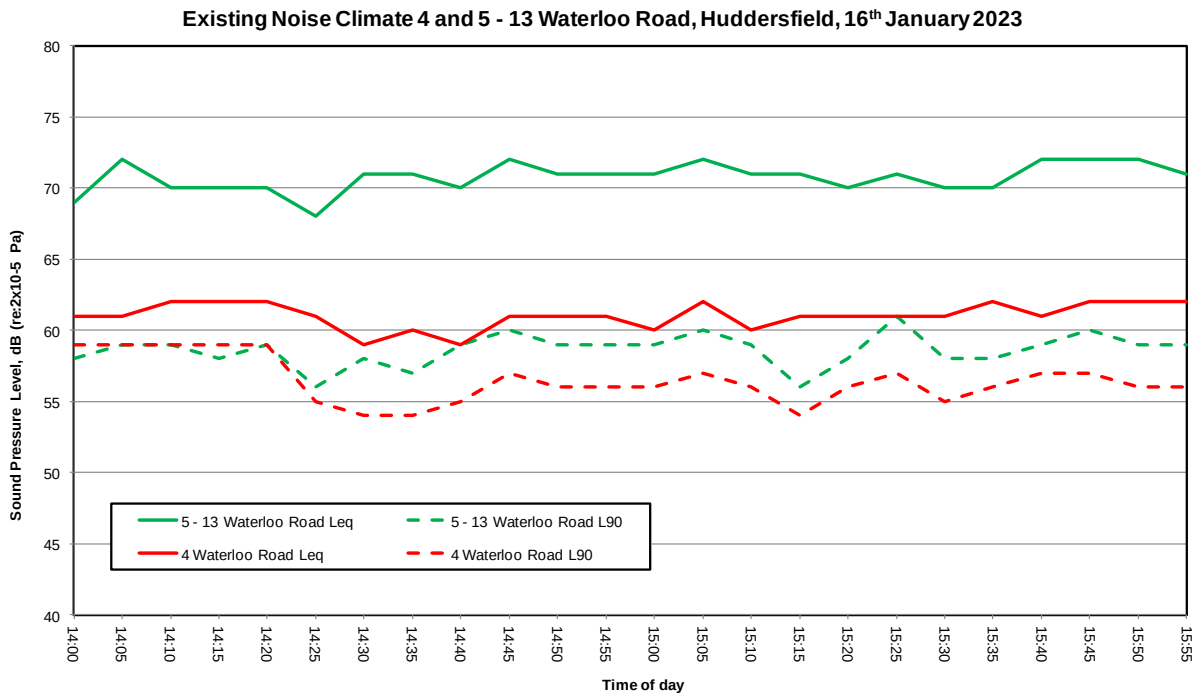
Table 12. Measured noise level summary, position 2, Sunday 22nd January 2023, 14:00 - 16:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	3.25	6.48	3.36	1.31
Mean (log)	64	80	67	55
Modal value	60	69	63	54

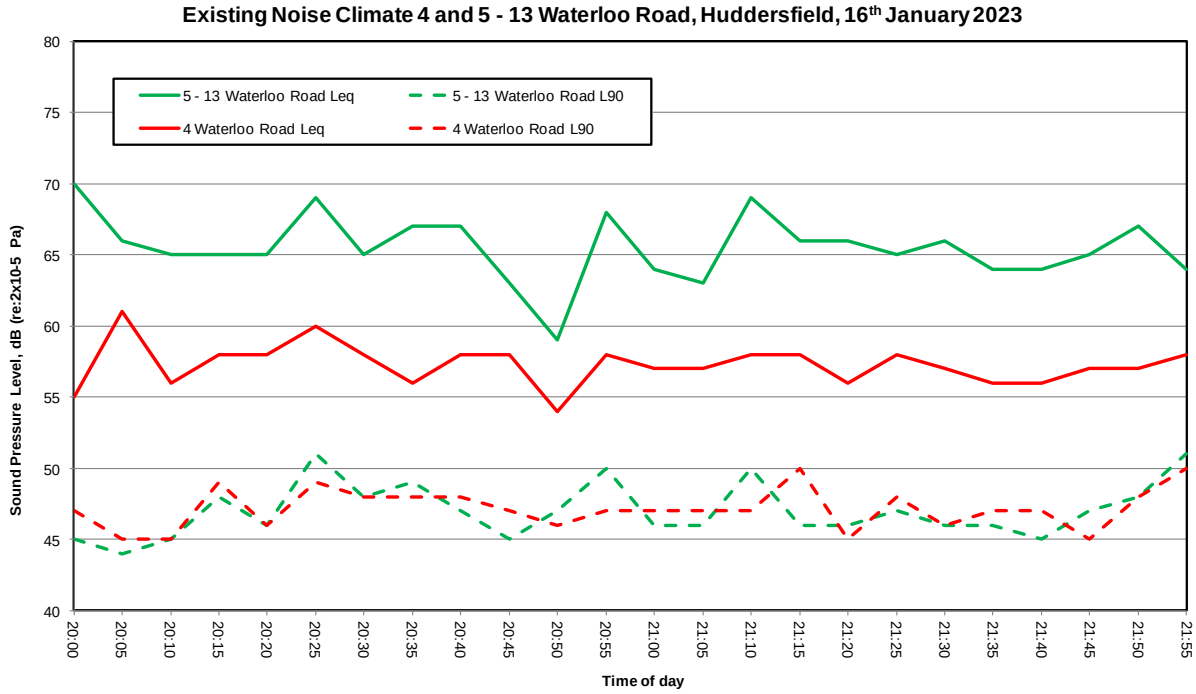
Table 13. Measured noise level summary, position 2, Sunday 22nd January 2023, 20:00 - 22:00 hours

	$L_{Aeq, 5\ mins}$	$L_{Amax, 5\ mins}$	$L_{A10, 5\ mins}$	$L_{A90, 5\ mins}$
Standard deviation	1.77	2.45	1.88	2.57
Mean (log)	56	69	60	46
Modal value	55	67	61	43

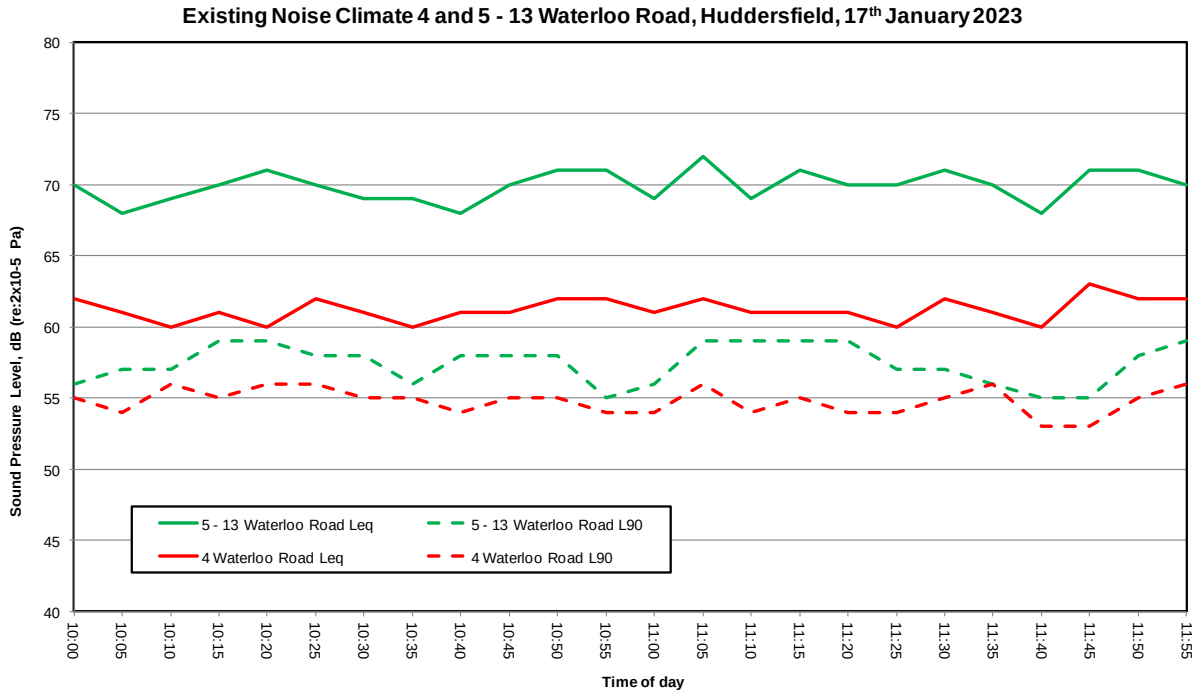
Graph 1. Existing noise climate comparisons, 14:00 - 16:00 hours, Monday 16th January 2023



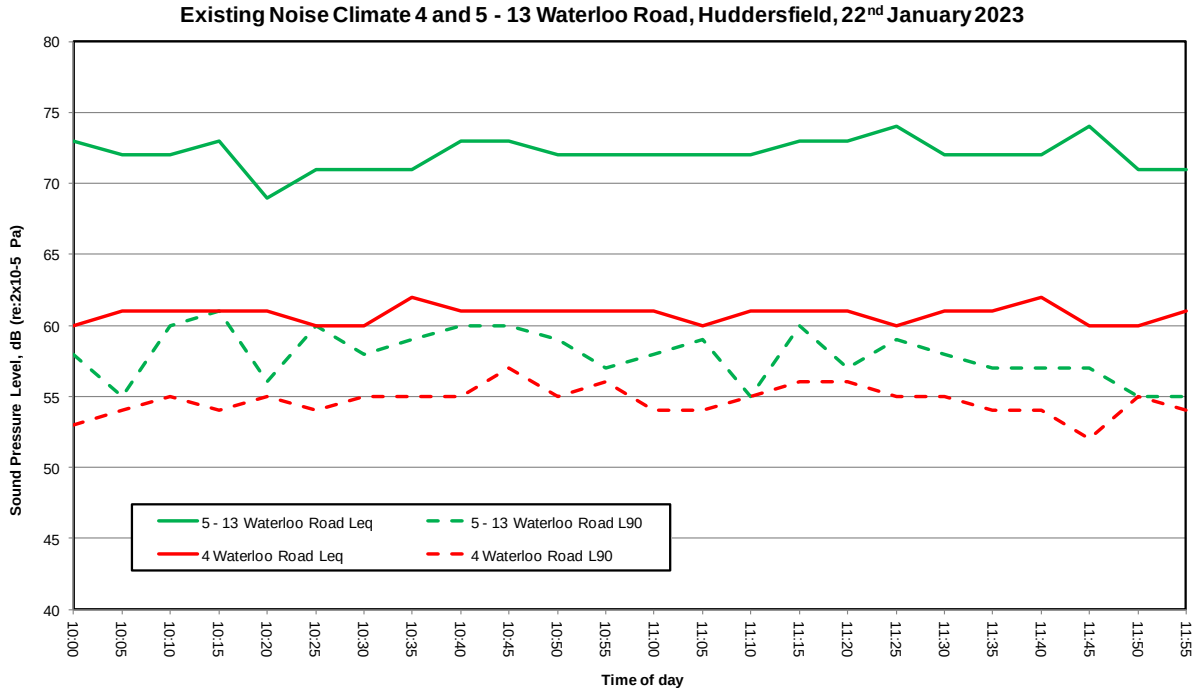
Graph 2. Existing noise climate comparisons, 20:00 - 22:00 hours, Monday 16th January 2023



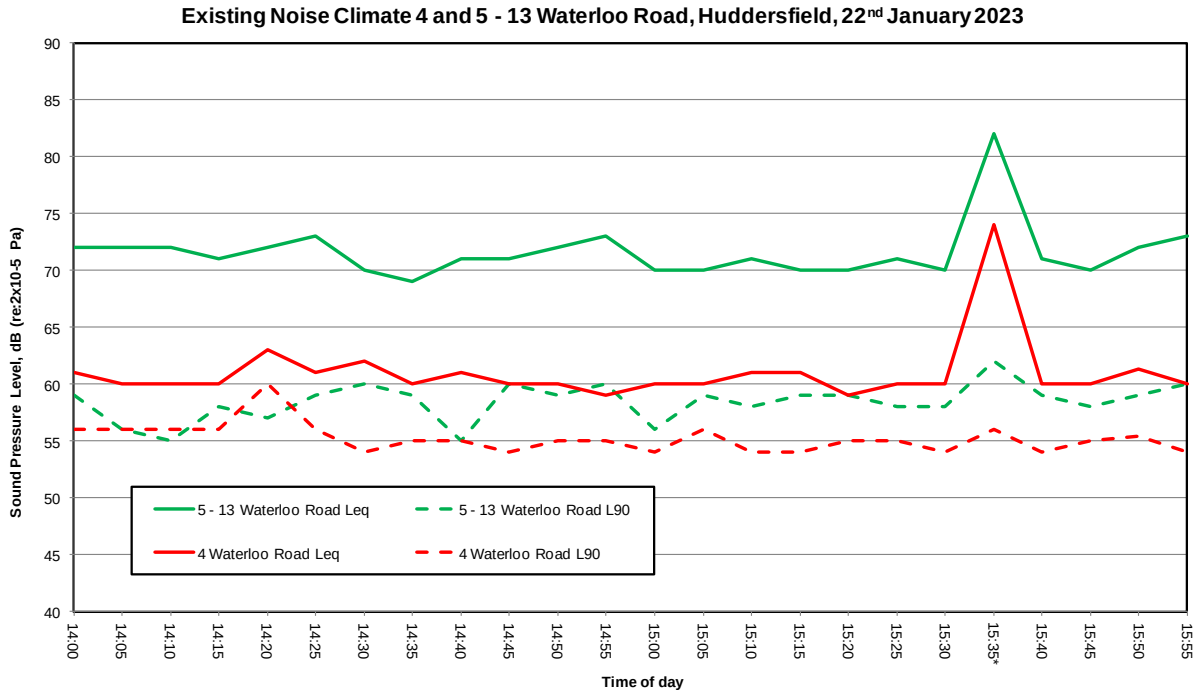
Graph 3. Existing noise climate comparisons, 10:00 - 12:00 hours, Tuesday 17th January 2023



Graph 4. Existing noise climate comparisons, 10:00 - 12:00 hours, Sunday 22nd January 2023

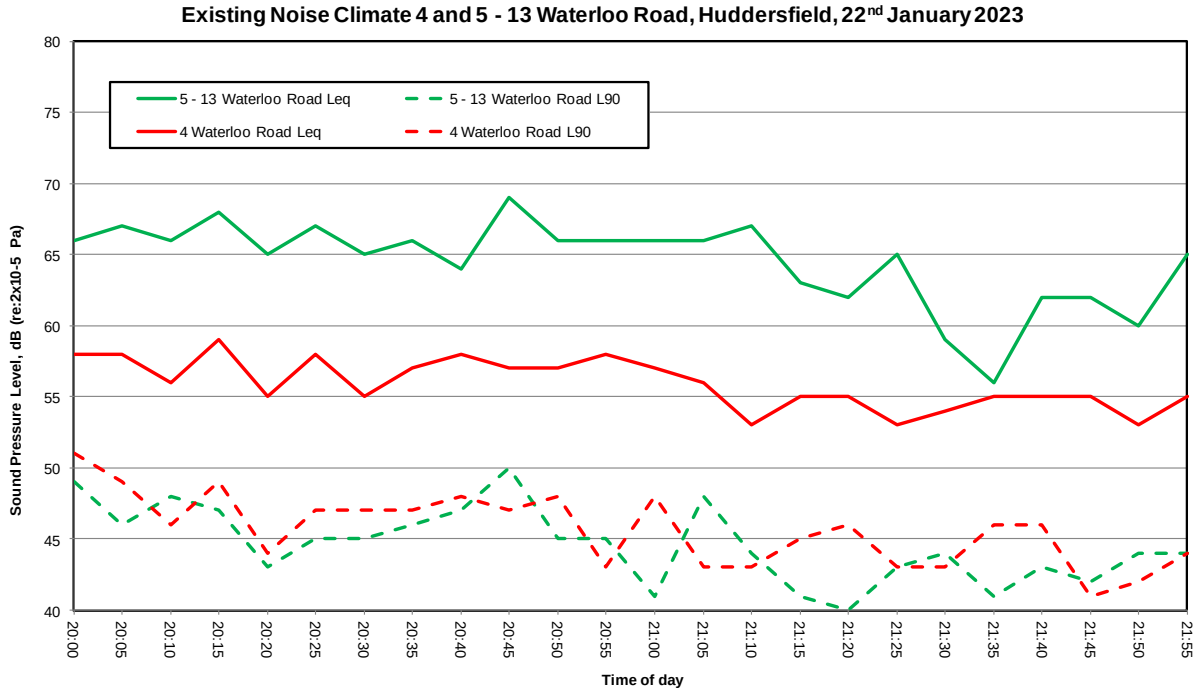


Graph 5. Existing noise climate comparisons, 14:00 - 16:00 hours, Sunday 22nd January 2023



* Group of motorcyclists on waterloo Road

Graph 6. Existing noise climate comparisons, 20:00 - 22:00 hours, Sunday 22nd January 2023



The sound levels presented in the above tables and graphs indicate that the existing noise climate in position 2 was consistently around 8 - 10dB lower the existing noise climate in position 1. It is also clear from the tables and graphs that the late evening noise climate was rather more variable than was the noise climate from earlier in the day. This feature was related to the relatively constant flow of traffic during the daytime period and the reduction in traffic volume during the evening period.

7.0 Assessment of the Sound Emission from the External Plant

With reference to the proposed new drive through food takeaway business it is likely that the principal potential noise sources, that could affect the existing noise climate of the nearby noise sensitive premises, would be the external roof mounted extraction plant and equipment associated with the preparation of food. In this respect it is understood that the proposed food business would be provided with two extraction systems, one serving the takeaway preparation kitchen and the other serving the takeaway service kitchens.

7.1 Assessment of Noise Source Levels - Takeaway Preparation Kitchen Extraction

During February the takeaway preparation kitchen extraction unit serving the preparation kitchen was installed and commissioned and as such it was possible to obtain direct measurements of the emission of noise from this unit. It is understood that the extraction system would normally operate at a medium duty setting and would tend to be used during the earlier part of the day, typically from opening time until around the mid to late afternoon, depending on the level of trade. Despite the fact that this unit would typically be operated at a medium duty setting, for the purposes of the noise source assessment the extraction fan control was manually overridden to ensure that the extraction fan was operating at close to its maximum duty. This course of action

ensured that the obtained noise source level measurements represented a worst case acoustically.

During the course of the survey, measurements were made to evaluate the:

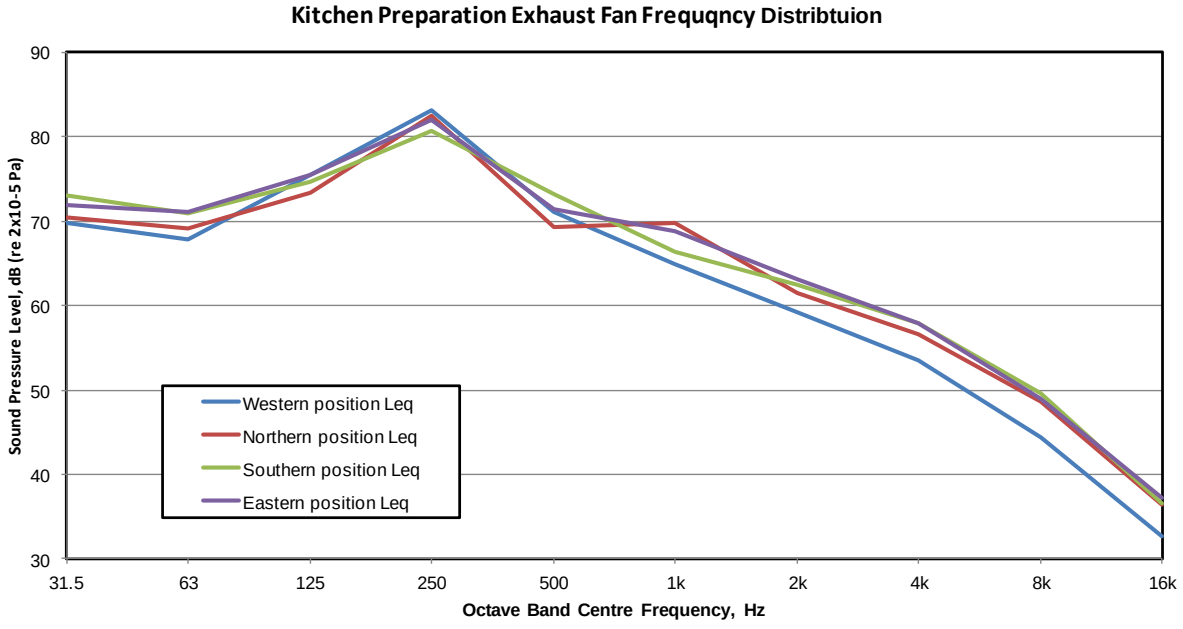
- The potential directionality of the emission of noise from the extraction fan
- The frequency characteristics of the fan noise emission.

Starting with the assessment of the directionality of noise emission from the extraction fan, measurements were made at a reference distance, 1 metre, in the four orthogonal measurements positions corresponding with the North, South, East and Westerly potions around the fans. In each measurement position the fan was running at close to maximum duty, the sound level meter was hand held at a distance of one metre from the vertical axis of the fan and in line with the main air flow, the measurement time interval was 2 minutes in each measurement location and the fast time weighting was engaged. A summary of the background corrected noise emission results is reproduced in table 14 below and the octave band noise emission characteristics of the extraction fan measurements are summarised in graph 7 below. Full data are presented in Appendix 2.

Table 14. Directionality of fan noise emission, background corrected noise levels

Measurement location	**Overall, dB $L_{Aeq,\ 2\ minute}$**
To the North of the extraction fan, L_{Aeq}	76
To the South of the extraction fan, L_{Aeq}	75
To the East of the extraction fan, L_{Aeq}	76
To the West of the extraction fan, L_{Aeq}	76

Graph 7. Octave band frequency, fan noise emission data



As can be seen from table 14, the emission of noise from the fans was relatively uniform and did not display any particular directionality. The results presented with graph 7 above highlight that the octave band noise emission from the fan was very similar in the four orthogonal directions and was generally broadband in nature, suggesting that the fan noise emission was relatively stable.

As a consequence and for the purposes of the subsequent calculations undertaken within a later section of this report, the mean octave band sound emission levels detailed in table 15 below will be used in these subsequent calculations.

Table 15. Takeaway preparation kitchen system, mean fan noise emission level

OBCF, Hz*	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8K**	**Overall, L_{Aeq}, dB**
Main preparation kitchen extraction fan, L_p dB	71	70	75	82	71	68	62	57	48	**76**

* Octave Band Centre Frequency

7.2 Assessment of Noise Source Levels - Takeaway Service Kitchens Extraction/Supply

In addition to the extraction fan serving the takeaway preparation kitchen, further air extraction and supply equipment will be provided to the takeaway service kitchen area associated with the in person food takeaway order kitchen and fryers. Both items will be provided with one extraction and one supply fan, resulting in the provision of two further supply and extraction systems. These systems will also terminate externally on the roof.

As the equipment was in the process of being fabricated and had not be installed or commissioned, it was not possible to make direct measurements of the noise emission from either of the systems. Consequently, the likely noise emission from the two extraction and supply fans will be calculated from information provided by the designers and suppliers.

A schematic diagram of the proposed installation is reproduced in figure 3 overleaf. The schematic highlights that the extraction and supply equipment will be described as supply air 1 and 2 and extract air 1 and 2. The two units will be of slightly different design and airflow volumes, with the in-duct sound power levels (L_w) for the two systems being as detailed in table 16 below.

Table 16. Takeaway Service Kitchens extraction and supply systems, in-duct sound power levels (manufacturer supplied data)

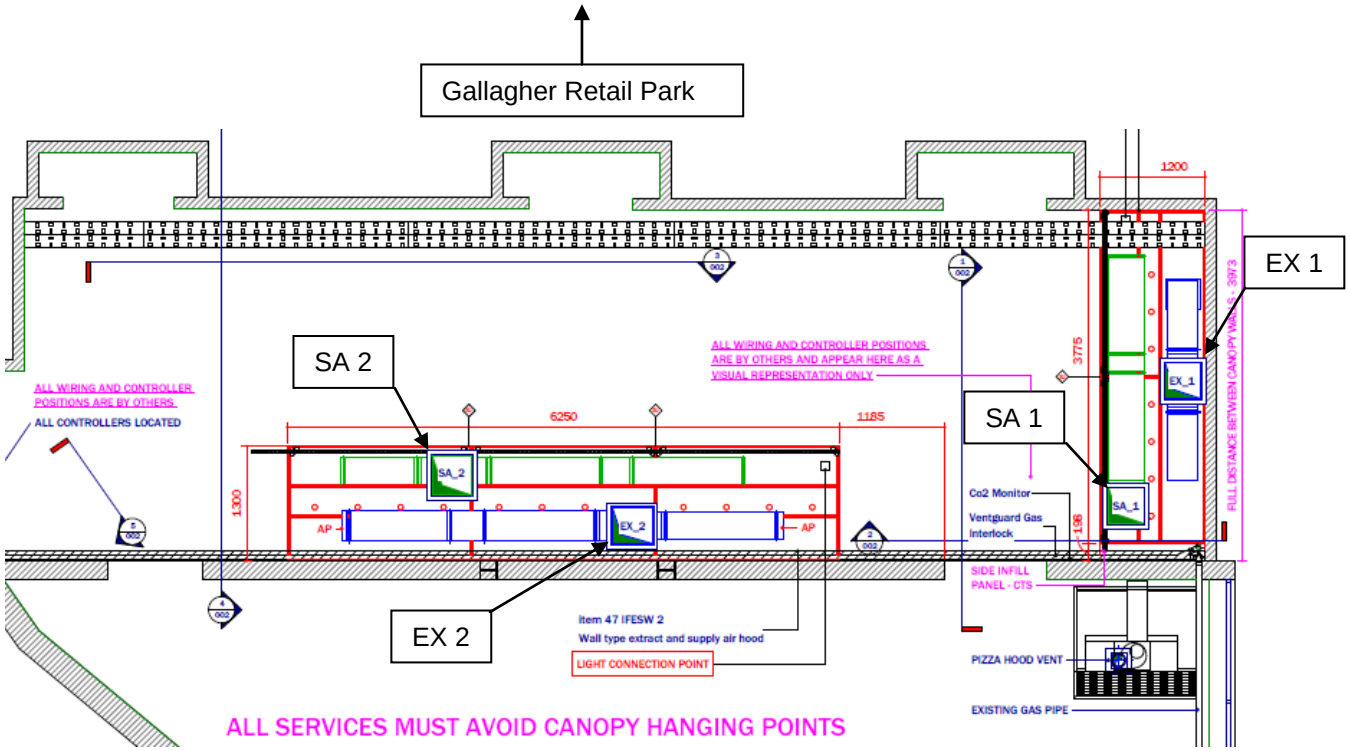
OBCF, Hz*	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8K**	**Overall, L_w dB**
Supply air 1, in-duct L_w	67	62	68	67	65	64	62	57	**74**
Supply air 2, in-duct L_w	70	64	72	69	68	67	65	62	**77**
Extarct air 1, in-duct L_w	63	72	70	68	61	60	58	55	**76**
Extract air 2, in-duct L_w	67	74	74	73	66	65	63	64	**74**

As can be seen from the published data, summarised in table 16 above, the noise emission from both the supply and extraction fans is relatively broadband in character and does not appeal to possess any tonal qualities. In addition, both the additional supply and extraction equipment will be provided with 1250mm long straight through silencers mounted within the ductwork. The noise attenuation characteristics of these straight through silencers are detailed in table 17 below.

Table 17. In duct straight through silencer attenuation, dB

OBCF, Hz*	63	125	250	500	1k	2k	4k	8K
1250mm long in-duct silencer - attenuation, dB	-9	-14	-18	-28	-28	-20	-18	-15

Figure 3. Location of the supplementary roof mounted supply and extraction equipment



8.0 Assessment of the Resulting Sound Levels

The potential sound levels that may prevail at the noise sensitive locations on Waterloo Road, resulting from the operation of the external air handling equipment associated with the takeaway food premises, will be assessed with reference to the separation distances between the noise source and the reception points. The closest of the potential reception points to the takeaway food premises would be numbers 4 and 7 Waterloo Road. The approximate separation distances between the roof mounted supply and extraction equipment and these noise sensitive locations would be as stated in table 18 below. As these premises are the closest to the food takeaway business they may be regarded as the worst case acoustically with reference to the potential resulting noise levels. Consequently, the potential noise levels at all other locations would tend to be lower than those that may prevail at 4 and 7 waterloo Road.

Table 18. Approximate separation distances between the noise source and reception points

Reception points	Approximate distance from main extraction unit, m	Approximate distance from SA1 and EX1 units, m	Approximate distance from SA2 and EX2 units, m
4 Waterloo Road	24	38	42
7 Waterloo Road	35	46	50

Starting with the emission of noise from the takeaway preparation kitchen extraction fan, the measured noise levels presented in table 15 above are sound pressure levels. Therefore the resulting sound levels at the reception points will be assessed according to normal propagation convention. In this case the extraction fan will be considered as a point source and the reduction in sound levels will be based on a 6dB reduction per doubling of distance. With this in mind the resulting sound levels at the nearest receptor points, 4 and 7 Waterloo Road, would be as detailed in table 19 below. For the purposes of comparison, table 19 also contains the lowest measured L_{Aeq} and L_{A90} levels from the daytime element of the noise surveys. The measured noise levels from the daytime element of the existing noise climate surveys have been used as it is anticipated that the takeaway preparation kitchen and so the extraction fan, will not be in use beyond the mid to potentially later afternoon period. Full calculation data may be found within Appendix 2.

Table 19. Calculated noise levels arising from the operation of the takeaway preparation kitchen extraction fan

Reception points	Calculated fan noise, dB	Lowest measured L_{Aeq}, dB	Lowest measured L_{A90}, dB
4 Waterloo Road	48	59	52
7 Waterloo Road	45	68	55

As can be seen from table 19 above, the calculated noise levels arising from the operation of the takeaway preparation kitchen extraction fan would be below both the lowest measured L_{Aeq} and L_{A90} levels at the two respective noise receptor locations. As such it is suggested that the emission of noise from the main preparation extraction fan should not be regarded as having a negative impact on the existing noise climate at these two noise sensitive locations.

Turning now to the operation of the takeaway service kitchen extraction and supply fans, direct measurements of the fan noise emission were not possible therefore use will be made on the in-duct sound power levels provided by the suppliers. The in-duct sound power level is then corrected according to the following principles:

- Straight duct losses. As sound passes along the duct, it loses a small amount of energy. The degree of loss depends on the duct profile, be this circular or rectangular, its cross-sectional dimensions and its length.
- Losses due to bends. Bends cause a small loss and this depends again on the duct profile and cross-sectional dimensions, as well as the type of bend be they radiused or mitred.

- Losses due to branches. In this case a proportion of the available sound energy will be split between branches and take-offs, related to the relative cross-sectional areas of each branch.
- Other losses, such as silencers, plenums, filters, etc.
- End reflection. As the sound waves pass along a smooth regular duct shape, it hits a sudden change as it leaves the duct and enters an open space. This causes some of the energy, mainly low frequency, to reflect back up the system and is an effective loss to the sound entering the open area, in this case the room or the outside world. The amount of reflection is mainly related to the cross-sectional shape and dimensions of the termination.
- Loses due to the inclusion of any attenuators into the duct work.

The 'corrections' to the in-duct sound power level detailed above would be applicable to the EX 1 and 2 and SA 1 and 2 extract and supply air, respectively, equipment mounted on the roof of the takeaway food premises. By applying these 'corrections' combined with normal sound propagation once the air flow leaves the external termination on the roof, the likely sound pressure levels at the two nearest noise sensitive premises can be calculated. For the purposes of the calculations it has been assumed that both the SA/EX1 and 2 systems will be operating simultaneously, which may not always be the case, so presenting a worst case acoustically.

The calculated resulting sound pressure levels at both 4 and 7 Waterloo Road are summarised in table 20 below. As before these calculated levels are presented alongside the lowest measured L_{Aeq} and L_{A90} levels from the noise surveys. However, the operation of these units may continue until later in the day, therefore the comparisons will be made with the levels obtained from the late evening elements of the existing noise climate noise surveys. Full calculation data may be found within Appendix 2.

Table 20. Calculated noise levels arising from the operation of the SA/EX 1 and 2 systems

Reception points	Calculated fan noise, dB	Lowest measured L_{Aeq}, dB	Lowest measured L_{A90}, dB
4 Waterloo Road	17	56	41
7 Waterloo Road	16	56	40

The calculations summarised in table 20 above suggest that the resulting noise from the operation of the supply and extraction systems serving the takeaway service kitchens would be below the existing lowest measured sound levels obtained from the existing noise surveys. Once again it is suggested that the emission of noise from the supplementary supply and extraction systems should not be regarded as having a negative impact on the existing noise climate at these two noise sensitive locations.

9.0 BS 4142:2014 Assessment

The calculated resulting sound levels relating to the operation of either the takeaway preparation kitchen or the takeaway service kitchen extraction and supply systems, suggest that the potential noise transmission from the takeaway preparation kitchen extraction fan is likely to be the more significant potential new noise source. With this in mind an assessment according with the principles contained within BS 4142:2014 will be undertaken with respect to this potential noise source.

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*". Despite this the background sound levels obtained from between 10:00 - 12:00 hours on Sunday 22nd January will be used for both the noise sensitive locations at 4 and 7 Waterloo Road. In both cases the lowest measured L_{A90} values of 52dB with respect to 4 Waterloo Road and 55dB with respect to 7 Waterloo Road, were obtained between 11:45 - 11:50 hours and 11:50 - 12:00 hours on Sunday 22nd January 2023 for 4 and 7 Waterloo Road respectively.

In order to define the overall rating level reference must be paid to the character correction categories detailed within BS 4142:2014. The emission of noise from the takeaway preparation kitchen's extraction unit is, as the results in table 15 above suggest, broadband in nature. It is also unlikely that the emission of noise from the unit will be intermittent as it is anticipated that it will be operational for the duration of food preparation activity in the main kitchen. Finally, as the calculations in table 19 indicate that the likely resulting sound level from the operation of the extraction fan would be lower than the existing noise climate levels, it is suggest that the operation of the unit may not be "*readily distinctive against the residual acoustic environment*". Consequently, no acoustic character corrections would be applied to the specific sound level.

With reference to the supplementary extraction and supply equipment, systems EX 1 and 2 and SA 1 and 2 respectively, as the calculated resulting noise levels detailed in table 20 above are so much lower than the existing noise climate levels, no BS 4142;2014 assessment will be undertaken for these units.

Assessments according with the scheme contained within BS 4142:2014 will be undertaken for the two nearest noise sensitive receptors at 4 and 7 Waterloo Road with reference to the emission of sound from the main kitchen extraction system.
The results of the BS 4142:2014 assessments for the takeaway preparation kitchen are summarised in tables 21 and 22 overleaf.

Table 21, BS4142: 2014 assessment, takeaway preparation kitchen extraction fan, with reference to 4 Waterloo Road

	*L*p, dB
Calculated specific sound level at noise sensitive location, L_{Aeq}	48
Lowest measured background sound level, L_{A90}	52
Acoustic feature corrections	0
Rating level	48
Excess of rating over background level	- 4
Assessment result: indicates that the specific sound source would have a low impact, depending on context	
Uncertainty of measurement:	see comments below

Table 22, BS4142: 2014 assessment, takeaway preparation kitchen extraction fan, with reference to 4 Waterloo Road

	*L*p, dB
Calculated specific sound level at noise sensitive location, L_{Aeq}	45
Lowest measured background sound level, L_{A90}	55
Acoustic feature corrections	0
Rating level	45
Excess of rating over background level	- 10
Assessment result: indicates that the specific sound source would have a low impact, depending on context	
Uncertainty of measurement:	see comments below

As can be seen form the above assessment, the excess of the rating level over the background sound level would be -4 and -10dB for 4 and 7 Waterloo Road respectively. According to the assessment of impacts discussed at section 11 of BS 4142:2014, it states that "*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*".

An integral and essential part of the BS 4142:2014 assessment procedure is the requirement to consider the 'context' of the situation in conjunction with the overall rating levels and this requirement is emphasised in the assessment categories detailed in the British Standard. Consequently, the assessment outcome must be considered in the light of the 'context' of the calculated noise emission from the air handling plant.

Although the introduction of the air handling units would represent a new source of essentially commercial noise, it can be seen from the assessments of the existing noise climate that this is higher than the calculated specific sound level at the receptor

locations. Consequently, as the calculated rating level is at least -4dB lower than the lowest background sound level at the nearest of the noise sensitive locations, it is suggested that it would be unlikely that the emission of noise from the air handling units would have any adverse impact on the noise climate on either of the receptor locations.

It should also be borne in mind that the principal contributor to the existing noise climate is road traffic on both the busy Wakefield and Waterloo Roads. The relative steadiness of the daytime noise climate would tend to suggest that the noise from road traffic would effectively mask noise contributions for other noise sources.

9.1 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 the quietest parts of the day and the week, particularly with reference to the measurements made on the Sunday. 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 takeaway food premises.

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 was to utilise the lowest measured value with respect to the background sound levels. The use of the lowest measured background sound levels would ensure that the subsequent assessments were worst case assessments.

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.

10.0 Conclusion

The noise surveys have highlighted that the existing noise climate in both measurement positions on Waterloo Road was regarded as being characteristic of an urban type environment that was dominated by road traffic on both the A642 and Waterloo Road itself. During the measurement periods both roads remained busy, although the A642 was consistently busier. The majority of the vehicles on both roads comprised private cars, although light and some heavy goods vehicles and buses were also noted during the period.

As the emission of noise from the new noise sources associated with the food takeaway business could be considered as new noise sources of a commercial nature, all the assessments will be undertaken according to the principles contained within British Standard (BS) 4142:2014 "Methods for Rating and Assessing Industrial and

Commercial Sound". Applying these principles to the emission of noise from the air handling equipment it has been demonstrated that the calculated rating level at the two nearest noise sensitive locations would be at least 4dB lower than the existing lowest measured background sound level. As such it is suggested that it would be unlikely that the emission of noise from the air handling units would have any adverse impact on the nearby noise sensitive receptors.

Consequently it is suggested that the installation of the external roof mounted air handling equipment, including the indicated attenuation measures relating to the supplementary air supply and extraction equipment, would not affect the existing noise climate in the vicinity of the nearby residential dwellings.

Appendix 1. Existing Noise Climate Survey Results

Position 1. Monday, 16th January 2023

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
14:00	69	82	73	58
14:05	72	87	75	59
14:10	70	86	74	59
14:15	70	85	74	58
14:20	70	86	73	59
14:25	68	86	70	56
14:30	71	84	75	58
14:35	71	87	75	57
14:40	70	83	74	59
14:45	72	84	76	60
14:50	71	85	75	59
14:55	71	84	75	59
15:00	71	83	75	59
15:05	72	92	76	60
15:10	71	86	75	59
15:15	71	86	74	56
15:20	70	84	73	58
15:25	71	87	75	61
15:30	70	84	74	58
15:35	70	84	74	58
15:40	72	84	76	59
15:45	72	88	75	60
15:50	72	83	76	59
15:55	71	83	74	59

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
20:00	70	92	68	45
20:05	66	83	67	44
20:10	65	80	66	45
20:15	65	84	66	48
20:20	65	84	65	46
20:25	69	86	70	51
20:30	65	83	68	48
20:35	67	82	68	49
20:40	67	85	68	47
20:45	63	80	65	45
20:50	59	71	63	47
20:55	68	84	70	50
21:00	64	85	64	46
21:05	63	82	64	46
21:10	69	84	71	50
21:15	66	81	69	46
21:20	66	83	68	46
21:25	65	81	67	47
21:30	66	82	68	46
21:35	64	84	64	46
21:40	64	82	66	45
21:45	65	84	67	47
21:50	67	82	69	48
21:55	64	78	67	51

Position 1. Tuesday, 17th January 2023

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
10:00	70	85	74	56
10:05	68	80	71	57
10:10	69	83	73	57
10:15	70	82	74	59
10:20	71	87	74	59
10:25	70	82	75	58
10:30	69	81	72	58
10:35	69	81	72	56
10:40	68	82	71	58
10:45	70	81	74	58
10:50	71	85	75	58
10:55	71	84	74	55
11:00	69	86	73	56
11:05	72	85	76	59
11:10	69	83	72	59
11:15	71	87	74	59
11:20	70	84	73	59
11:25	70	84	74	57
11:30	71	86	74	57
11:35	70	83	74	56
11:40	68	82	70	55
11:45	71	82	70	55
11:50	71	84	76	58
11:55	70	83	75	59

Position 1. Sunday, 22nd January 2023

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
10:00	73	86	77	58
10:05	72	86	77	55
10:10	72	84	76	60
10:15	73	83	77	61
10:20	69	82	73	56
10:25	71	84	75	60
10:30	71	86	74	58
10:35	71	84	75	59
10:40	73	86	77	60
10:45	73	86	77	60
10:50	72	88	76	59
10:55	72	85	77	57
11:00	72	86	77	58
11:05	72	87	76	59
11:10	72	85	77	55
11:15	73	87	76	60
11:20	73	84	78	57
11:25	74	87	77	59
11:30	72	84	76	58
11:35	72	85	76	57
11:40	72	85	76	57
11:45	74	90	78	57
11:50	71	83	74	55
11:55	71	85	75	55

Position 1. Sunday, 22nd January 2023

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
14:00	72	85	76	59
14:05	72	93	74	56
14:10	72	84	76	55
14:15	71	91	73	58
14:20	72	86	76	57
14:25	73	89	75	59
14:30	70	84	73	60
14:35	69	82	71	59
14:40	71	85	75	55
14:45	71	84	75	60
14:50	72	86	76	59
14:55	73	89	76	60
15:00	70	82	74	56
15:05	70	82	74	59
15:10	71	85	75	58
15:15	70	81	74	59
15:20	70	86	75	59
15:25	71	86	74	58
15:30	70	84	74	58
15:35*	82	105	84	62
15:40	71	84	75	59
15:45	70	83	74	58
15:50	72	85	76	59
15:55	73	87	77	60

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
20:00	66	84	67	49
20:05	67	86	68	46
20:10	66	80	70	48
20:15	68	83	71	47
20:20	65	83	64	43
20:25	67	84	69	45
20:30	65	83	65	45
20:35	66	83	68	46
20:40	64	80	66	47
20:45	69	87	72	50
20:50	66	84	68	45
20:55	66	83	66	45
21:00	66	85	66	41
21:05	66	84	68	48
21:10	67	84	70	44
21:15	63	82	64	41
21:20	62	80	63	40
21:25	65	81	66	43
21:30	59	75	62	44
21:35	56	71	60	41
21:40	62	82	62	43
21:45	62	77	65	42
21:50	60	78	62	44
21:55	65	83	65	44

* Group of young motorcyclists

Position 2. Monday, 16th January 2023

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
14:00	61	71	63	59
14:05	61	71	63	59
14:10	62	75	64	59
14:15	62	75	64	59
14:20	62	77	64	59
14:25	61	82	63	55
14:30	59	73	62	54
14:35	60	73	63	54
14:40	59	72	62	55
14:45	61	80	64	57
14:50	61	73	64	56
14:55	61	75	64	56
15:00	60	72	63	56
15:05	62	73	65	57
15:10	60	71	63	56
15:15	61	73	64	54
15:20	61	75	64	56
15:25	61	72	64	57
15:30	61	71	63	55
15:35	62	80	63	56
15:40	61	74	64	57
15:45	62	78	64	57
15:50	62	71	65	56
15:55	62	73	65	56

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
20:00	55	67	59	47
20:05	61	81	62	45
20:10	56	70	60	45
20:15	58	70	62	49
20:20	58	71	61	46
20:25	60	73	64	49
20:30	58	69	62	48
20:35	56	70	60	48
20:40	58	71	62	48
20:45	58	71	61	47
20:50	54	67	58	46
20:55	58	70	61	47
21:00	57	72	61	47
21:05	57	72	59	47
21:10	58	71	62	47
21:15	58	70	61	50
21:20	56	66	60	45
21:25	58	70	62	48
21:30	57	68	62	46
21:35	56	70	59	47
21:40	56	69	60	47
21:45	57	71	60	45
21:50	57	71	61	48
21:55	58	72	62	50

Position 1. Tuesday, 17th January 2023

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
10:00	62	74	65	55
10:05	61	72	65	54
10:10	60	68	63	56
10:15	61	71	64	55
10:20	60	72	63	56
10:25	62	72	65	56
10:30	61	73	63	55
10:35	60	69	63	55
10:40	61	71	64	54
10:45	61	73	64	55
10:50	62	72	65	55
10:55	62	74	65	54
11:00	61	72	64	54
11:05	62	74	64	56
11:10	61	73	64	54
11:15	61	72	64	55
11:20	61	71	65	54
11:25	60	71	64	54
11:30	62	75	65	55
11:35	61	74	65	56
11:40	60	71	64	53
11:45	63	71	64	53
11:50	62	76	67	55
11:55	62	73	65	56

Position 1. Sunday, 22nd January 2023

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
10:00	60	70	63	53
10:05	61	69	64	54
10:10	61	70	64	55
10:15	61	77	64	54
10:20	61	69	64	55
10:25	60	68	63	54
10:30	60	69	63	55
10:35	62	75	65	55
10:40	61	76	63	55
10:45	61	69	63	57
10:50	61	69	64	55
10:55	61	71	65	56
11:00	61	71	64	54
11:05	60	68	63	54
11:10	61	70	64	55
11:15	61	70	64	56
11:20	61	69	64	56
11:25	60	70	64	55
11:30	61	69	64	55
11:35	61	73	64	54
11:40	62	78	65	54
11:45	60	67	63	52
11:50	60	68	63	55
11:55	61	72	64	54

Position 1. Sunday, 22nd January 2023

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
14:00	61	70	64	56
14:05	60	68	63	56
14:10	60	67	63	56
14:15	60	69	63	56
14:20	63	67	65	60
14:25	61	71	64	56
14:30	62	80	63	54
14:35	60	68	64	55
14:40	61	74	63	55
14:45	60	70	63	54
14:50	60	71	62	55
14:55	59	68	62	55
15:00	60	69	64	54
15:05	60	68	63	56
15:10	61	69	64	54
15:15	61	78	63	54
15:20	59	70	62	55
15:25	60	73	62	55
15:30	60	72	63	54
15:35*	74	90	79	56
15:40	60	69	63	54
15:45	60	70	62	55
15:50	61	70	63	55
15:55	60	69	62	54

Time	$L_{Aeq\ 5\ mins}$	$L_{Amax,\ 5\ mins}$	$L_{A10,\ 5\ mins}$	$L_{A90,\ 5\ mins}$
20:00	58	72	61	51
20:05	58	72	62	49
20:10	56	69	61	46
20:15	59	73	63	49
20:20	55	67	59	44
20:25	58	71	62	47
20:30	55	67	59	47
20:35	57	69	62	47
20:40	58	71	62	48
20:45	57	68	61	47
20:50	57	70	61	48
20:55	58	73	61	43
21:00	57	68	61	48
21:05	56	71	59	43
21:10	53	66	56	43
21:15	55	66	60	45
21:20	55	69	58	46
21:25	53	64	57	43
21:30	54	67	58	43
21:35	55	66	59	46
21:40	55	67	59	46
21:45	55	68	60	41
21:50	53	67	57	42
21:55	55	70	58	44

* Group of young motorcyclists

Appendix 2. Calculation Results

Former Crown Motors - Harvey's Drive Through												
Prep kitchen extraction system noise emission calculations.												
23rd February 2023												
Octave Band Centre Frequency, Hz.		**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{Aeq}		**56**	65	63	55	54	52	54	47	38	27	14
L_{90}		**54**	62	59	52	52	50	51	45	36	25	13
Exhaust fan measurement, West position												
L_{eq}		**76**	71	69	76	83	71	65	59	54	45	33
Exhaust fan measurement, North position												
L_{eq}		**76**	72	70	74	83	69	70	62	57	49	37
Exhaust fan measurement, South position												
L_{eq}		**75**	74	72	75	81	73	67	63	58	50	37
Exhaust fan measurement, East position												
L_{eq}		**76**	73	72	76	82	72	69	63	58	49	37
Background corrected fan measurement, West position												
Western position L_{eq}		**76**	70	68	76	83	71	65	59	53	44	33
Background corrected fan measurement, North position												
Northern position L_{eq}		**76**	71	69	73	82	69	70	62	57	49	36
Background corrected fan measurement, South position												
Southern position L_{eq}		**75**	73	71	75	81	73	66	62	58	50	37
Background corrected fan measurement, East position												
Eastern position L_{eq}		**76**	72	71	75	82	71	69	63	58	49	37
Average of background corrected readings, L_{Aeq}		**76**	71	70	75	82	71	68	62	57	48	36

Fan noise transmission calculations												
Octave Band Centre Frequency, Hz.		**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
Average of background corrected exhaust readings, L_{Aeq}		**76**	71	70	75	82	71	68	62	57	48	36
4 Waterloo Road												
Gable distance from exhaust fan on roof, m	24											
Distance attenuation (20log(1/24))	-28											
L_p of exhaust fan at gable of 4 Waterloo Road		**48**	44	42	47	55	44	40	34	29	21	8
Lowest measured daytime L_{90}, dB, Sunday 22nd January @ 11:45		**52**	61	59	52	49	47	49	44	35	23	12
Difference, dB			17	16	5	-5	3	8	10	6	2	4

7 Waterloo Road												
Gable distance from exhaust fan on roof, m	35											
Distance attenuation (20log(1/35))	-31											
L_p of exhaust fan at front elevation of 7 Waterloo Road		**45**	41	39	44	51	41	37	31	26	17	5
Lowest measured daytime L_{90}, dB, Sunday 22nd January @ 10:05		**55**	63	62	58	53	49	52	49	40	31	17
Difference, dB			22	23	14	1	8	15	18	14	13	12

Extract air calculations (EX1), 4 Waterloo Road

Duct Losses											
Source Levels			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
In-duct Sound Power Level			**76**	64	74	73	72	71	67	64	68
Straight Duct Losses			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Length	1.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	420	mm									
Duct Height (rectangular)	420	mm									
Straight Duct Loss			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	0	mm									
Duct Height (rectangular)	0	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Straight Duct Losses			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Losses Due to Bends			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	r										
Duct Diameter (circular)	420	n/a									
Duct Width Across (rectangular)	420	mm									
Loss Due to Bend			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	m										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	0	mm									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Losses Due to Bends			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Losses Due to Branches			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	c			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Loss due to Branches			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Other Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Silencer, 1250mm straight through			-	9	14	18	28	28	20	18	15
			-								
			-								
			-								
Total Other Losses			-	9	14	18	28	28	20	18	15

End Reflection Loss			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	500	mm									
Duct Height (rectangular)	500	mm									
Duct Effective Diameter	565	mm									
End Reflection Loss			-	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0

Sound In the Room			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**53**	46.8	55.8	53.5	42.8	40.7	43.7	42.7	49.7
Room Length	0.0	m									
Room Width	0.0	m									
Room Height	0.0	m									
Room Volume	0	m3									
Room Surface Area	0	m2									
Reverberation Time			-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Absorption			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Absorption Coefficient			-	#####	#####	#####	#####	#####	#####	#####	#####
Room Constant			-	#####	#####	#####	#####	#####	#####	#####	#####
Critical Distance			-	#####	#####	#####	#####	#####	#####	#####	#####
Termination Shape (Circ,C or Rect, R)	r										
Term Pos (Middle, M, Edge, E or Corner, C)	M										
Termination Diameter (circular)	0	n/a									
Termination Width (rectangular)	600	mm									
Termination Height (rectangular)	600	mm									
Termination Area	0.36	m2									
Distance to Listener	11.0	m									
On-Axis Directivity Correction (Yes, Y or No, N)	Y		-	3.0	5.0	7.0	7.0	8.0	9.0	9.0	9.0
Level in the Room			***#####***	#####	#####	#####	#####	#####	#####	#####	#####
Design Criterion	NR	30	-	59	48	40	34	30	27	25	23
Additional attenuation required			-	#####	#####	#####	#####	#####	#####	#####	#####

Sound in the Atmosphere			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**53**	47	56	54	43	41	44	43	50
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Duct Effective Diameter	678	mm									
Angle to Receiver	0	deg									
Distance to Receiver	38.0	m									
Directivity			-	0	0	0	0	0	0	0	0
Distance Correction			-	32	32	32	32	32	32	32	32
Level at Houses			**10**	4	13	11	0	-2	1	0	7

Extract air calculations (EX2), 4 Waterloo Road

Duct Losses											
Source Levels			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
In-duct Sound Power Level			**80**	69	76	78	76	76	72	69	68
Straight Duct Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Length	1.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	470	mm									
Duct Height (rectangular)	470	mm									
Straight Duct Loss			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	0	mm									
Duct Height (rectangular)	0	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Straight Duct Losses			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Losses Due to Bends			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	r										
Duct Diameter (circular)	470	n/a									
Duct Width Across (rectangular)	470	mm									
Loss Due to Bend			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	m										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	0	mm									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Losses Due to Bends			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Losses Due to Branches			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	c			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Loss due to Branches			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Other Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Silencer, 1250mm straight through			-	9	14	18	28	28	20	18	15
			-								
			-								
			-								
Total Other Losses			-	9	14	18	28	28	20	18	15

End Reflection Loss			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	500	mm									
Duct Height (rectangular)	500	mm									
Duct Effective Diameter	565	mm									
End Reflection Loss			-	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0

Sound In the Room			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**56**	51.8	57.8	58.5	46.8	45.7	48.7	47.7	49.7
Room Length	0.0	m									
Room Width	0.0	m									
Room Height	0.0	m									
Room Volume	0	m3									
Room Surface Area	0	m2									
Reverberation Time			-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Absorption			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Absorption Coefficient			-	#####	#####	#####	#####	#####	#####	#####	#####
Room Constant			-	#####	#####	#####	#####	#####	#####	#####	#####
Critical Distance			-	#####	#####	#####	#####	#####	#####	#####	#####
Termination Shape (Circ,C or Rect, R)	r										
Term Pos (Middle, M, Edge, E or Corner, C)	M										
Termination Diameter (circular)	0	n/a									
Termination Width (rectangular)	600	mm									
Termination Height (rectangular)	600	mm									
Termination Area	0.36	m2									
Distance to Listener	11.0	m									
On-Axis Directivity Correction (Yes, Y or No, N)	Y		-	3.0	5.0	7.0	7.0	8.0	9.0	9.0	9.0
Level in the Room			***#####***	#####	#####	#####	#####	#####	#####	#####	#####
Design Criterion	NR	30	-	59	48	40	34	30	27	25	23
Additional attenuation required			-	#####	#####	#####	#####	#####	#####	#####	#####

Sound in the Atmosphere			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**56**	52	58	59	47	46	49	48	50
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Duct Effective Diameter	678	mm									
Angle to Receiver	0	deg									
Distance to Receiver	43.0	m									
Directivity			-	0	0	0	0	0	0	0	0
Distance Correction			-	33	33	33	33	33	33	33	33
Level at Houses			**13**	8	14	15	3	2	5	4	6

Extract air calculations (EX1), 7 Waterloo Road

Duct Losses											
Source Levels			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
In-duct Sound Power Level			**76**	64	74	73	72	71	67	64	68
Straight Duct Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Length	1.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	420	mm									
Duct Height (rectangular)	420	mm									
Straight Duct Loss			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	0	mm									
Duct Height (rectangular)	0	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Straight Duct Losses			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Losses Due to Bends			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	r										
Duct Diameter (circular)	420	n/a									
Duct Width Across (rectangular)	420	mm									
Loss Due to Bend			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	m										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	0	mm									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Losses Due to Bends			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Losses Due to Branches			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	c			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Loss due to Branches			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Other Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Silencer, 1250mm straight through			-	9	14	18	28	28	20	18	15
			-								
			-								
			-								
Total Other Losses			-	9	14	18	28	28	20	18	15

End Reflection Loss			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	500	mm									
Duct Height (rectangular)	500	mm									
Duct Effective Diameter	565	mm									
End Reflection Loss			-	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0

Sound In the Room			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**53**	46.8	55.8	53.5	42.8	40.7	43.7	42.7	49.7
Room Length	0.0	m									
Room Width	0.0	m									
Room Height	0.0	m									
Room Volume	0	m3									
Room Surface Area	0	m2									
Reverberation Time			-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Absorption			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Absorption Coefficient			-	#####	#####	#####	#####	#####	#####	#####	#####
Room Constant			-	#####	#####	#####	#####	#####	#####	#####	#####
Critical Distance			-	#####	#####	#####	#####	#####	#####	#####	#####
Termination Shape (Circ,C or Rect, R)	r										
Term Pos (Middle, M, Edge, E or Corner, C)	M										
Termination Diameter (circular)	0	n/a									
Termination Width (rectangular)	600	mm									
Termination Height (rectangular)	600	mm									
Termination Area	0.36	m2									
Distance to Listener	11.0	m									
On-Axis Directivity Correction (Yes, Y or No, N)	Y		-	3.0	5.0	7.0	7.0	8.0	9.0	9.0	9.0
Level in the Room			***#####***	#####	#####	#####	#####	#####	#####	#####	#####
Design Criterion	NR	30	-	59	48	40	34	30	27	25	23
Additional attenuation required			-	#####	#####	#####	#####	#####	#####	#####	#####

Sound in the Atmosphere			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**53**	47	56	54	43	41	44	43	50
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Duct Effective Diameter	678	mm									
Angle to Receiver	0	deg									
Distance to Receiver	46.0	m									
Directivity			-	0	0	0	0	0	0	0	0
Distance Correction			-	33	33	33	33	33	33	33	33
Level at Houses			**8**	3	11	9	-1	-4	-1	-2	5

Extract air calculations (EX2), 7 Waterloo Road

Duct Losses											
Source Levels			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
In-duct Sound Power Level			**80**	69	76	78	76	76	72	69	68
Straight Duct Losses			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Length	1.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	470	mm									
Duct Height (rectangular)	470	mm									
Straight Duct Loss			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	0	mm									
Duct Height (rectangular)	0	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Straight Duct Losses			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Losses Due to Bends			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	r										
Duct Diameter (circular)	470	n/a									
Duct Width Across (rectangular)	470	mm									
Loss Due to Bend			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	m										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	0	mm									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Losses Due to Bends			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Losses Due to Branches			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	c			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Loss due to Branches			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Other Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Silencer, 1250mm straight through			-	9	14	18	28	28	20	18	15
			-								
			-								
			-								
Total Other Losses			-	9	14	18	28	28	20	18	15

End Reflection Loss			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	500	mm									
Duct Height (rectangular)	500	mm									
Duct Effective Diameter	565	mm									
End Reflection Loss			-	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0

Sound In the Room			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**56**	51.8	57.8	58.5	46.8	45.7	48.7	47.7	49.7
Room Length	0.0	m									
Room Width	0.0	m									
Room Height	0.0	m									
Room Volume	0	m3									
Room Surface Area	0	m2									
Reverberation Time			-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Absorption			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Absorption Coefficient			-	#####	#####	#####	#####	#####	#####	#####	#####
Room Constant			-	#####	#####	#####	#####	#####	#####	#####	#####
Critical Distance			-	#####	#####	#####	#####	#####	#####	#####	#####
Termination Shape (Circ,C or Rect, R)	r										
Term Pos (Middle, M, Edge, E or Corner, C)	M										
Termination Diameter (circular)	0	n/a									
Termination Width (rectangular)	600	mm									
Termination Height (rectangular)	600	mm									
Termination Area	0.36	m2									
Distance to Listener	11.0	m									
On-Axis Directivity Correction (Yes, Y or No, N)	Y		-	3.0	5.0	7.0	7.0	8.0	9.0	9.0	9.0
Level in the Room			***#####***	#####	#####	#####	#####	#####	#####	#####	#####
Design Criterion	NR	30	-	59	48	40	34	30	27	25	23
Additional attenuation required			-	#####	#####	#####	#####	#####	#####	#####	#####

Sound in the Atmosphere			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**56**	52	58	59	47	46	49	48	50
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Duct Effective Diameter	678	mm									
Angle to Receiver	0	deg									
Distance to Receiver	50.0	m									
Directivity			-	0	0	0	0	0	0	0	0
Distance Correction			-	34	34	34	34	34	34	34	34
Level at Houses			**11**	7	13	14	2	1	4	3	5

Supply air calculations (SA1), 4 Waterloo Road

Duct Losses											
Source Levels			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
In-duct Sound Power Level			**71**	67	62	68	67	65	64	62	57
Straight Duct Losses			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Length	1.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	420	mm									
Duct Height (rectangular)	420	mm									
Straight Duct Loss			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	0	mm									
Duct Height (rectangular)	0	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Straight Duct Losses			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Losses Due to Bends			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	r										
Duct Diameter (circular)	420	n/a									
Duct Width Across (rectangular)	420	mm									
Loss Due to Bend			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	m										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	0	mm									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Losses Due to Bends			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Losses Due to Branches			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	c			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Loss due to Branches			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Other Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Silencer, 1250mm straight through			-	9	14	18	28	28	20	18	15
			-								
			-								
			-								
Total Other Losses			-	9	14	18	28	28	20	18	15

End Reflection Loss			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	500	mm									
Duct Height (rectangular)	500	mm									
Duct Effective Diameter	565	mm									
End Reflection Loss			-	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0

Sound In the Room			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**47**	49.8	43.8	48.5	37.8	34.7	40.7	40.7	38.7
Room Length	0.0	m									
Room Width	0.0	m									
Room Height	0.0	m									
Room Volume	0	m3									
Room Surface Area	0	m2									
Reverberation Time			-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Absorption			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Absorption Coefficient			-	#####	#####	#####	#####	#####	#####	#####	#####
Room Constant			-	#####	#####	#####	#####	#####	#####	#####	#####
Critical Distance			-	#####	#####	#####	#####	#####	#####	#####	#####
Termination Shape (Circ,C or Rect, R)	r										
Term Pos (Middle, M, Edge, E or Corner, C)	M										
Termination Diameter (circular)	0	n/a									
Termination Width (rectangular)	600	mm									
Termination Height (rectangular)	600	mm									
Termination Area	0.36	m2									
Distance to Listener	11.0	m									
On-Axis Directivity Correction (Yes, Y or No, N)	Y		-	3.0	5.0	7.0	7.0	8.0	9.0	9.0	9.0
Level in the Room			***#####***	#####	#####	#####	#####	#####	#####	#####	#####
Design Criterion	NR	30	-	59	48	40	34	30	27	25	23
Additional attenuation required			-	#####	#####	#####	#####	#####	#####	#####	#####

Sound in the Atmosphere			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**47**	50	44	49	38	35	41	41	39
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Duct Effective Diameter	678	mm									
Angle to Receiver	0	deg									
Distance to Receiver	38.0	m									
Directivity			-	0	0	0	0	0	0	0	0
Distance Correction			-	32	32	32	32	32	32	32	32
Level at Houses			**5**	7	1	6	-5	-8	-2	-2	-4

Supply air calculations (SA2), 4 Waterloo Road

Duct Losses											
Source Levels			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
In-duct Sound Power Level			**80**	70	68	74	73	75	74	71	67
Straight Duct Losses			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Length	1.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	470	mm									
Duct Height (rectangular)	470	mm									
Straight Duct Loss			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	0	mm									
Duct Height (rectangular)	0	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Straight Duct Losses			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Losses Due to Bends			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	470	mm									
Loss Due to Bend			-	0.0	0.0	0.1	0.3	1.0	2.0	3.0	3.0
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	m										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	0	mm									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Losses Due to Bends			-	0.0	0.0	0.1	0.3	1.0	2.0	3.0	3.0
Losses Due to Branches			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	c			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Loss due to Branches			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Other Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Silencer, 1250mm straight through			-	9	14	18	28	28	20	18	15
			-								
			-								
			-								
Total Other Losses			-	9	14	18	28	28	20	18	15

End Reflection Loss			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	500	mm									
Duct Height (rectangular)	500	mm									
Duct Effective Diameter	565	mm									
End Reflection Loss			-	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0

Sound In the Room			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**57**	52.9	49.8	54.8	44.5	45.7	51.7	49.7	48.7
Room Length	0.0	m									
Room Width	0.0	m									
Room Height	0.0	m									
Room Volume	0	m3									
Room Surface Area	0	m2									
Reverberation Time			-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Absorption			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Absorption Coefficient			-	#####	#####	#####	#####	#####	#####	#####	#####
Room Constant			-	#####	#####	#####	#####	#####	#####	#####	#####
Critical Distance			-	#####	#####	#####	#####	#####	#####	#####	#####
Termination Shape (Circ,C or Rect, R)	r										
Term Pos (Middle, M, Edge, E or Corner, C)	M										
Termination Diameter (circular)	0	n/a									
Termination Width (rectangular)	600	mm									
Termination Height (rectangular)	600	mm									
Termination Area	0.36	m2									
Distance to Listener	11.0	m									
On-Axis Directivity Correction (Yes, Y or No, N)	Y		-	3.0	5.0	7.0	7.0	8.0	9.0	9.0	9.0
Level in the Room			***#####***	#####	#####	#####	#####	#####	#####	#####	#####
Design Criterion	NR	30	-	59	48	40	34	30	27	25	23
Additional attenuation required			-	#####	#####	#####	#####	#####	#####	#####	#####

Sound in the Atmosphere			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**57**	53	50	55	44	46	52	50	49
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Duct Effective Diameter	678	mm									
Angle to Receiver	0	deg									
Distance to Receiver	43.0	m									
Directivity			-	0	0	0	0	0	0	0	0
Distance Correction			-	33	33	33	33	33	33	33	33
Level at Houses			**13**	9	6	11	1	2	8	6	5

Supply air calculations (SA1), 7 Waterloo Road

Duct Losses											
Source Levels			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
In-duct Sound Power Level			**71**	67	62	68	67	65	64	62	57
Straight Duct Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Length	1.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	420	mm									
Duct Height (rectangular)	420	mm									
Straight Duct Loss			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	0	mm									
Duct Height (rectangular)	0	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Straight Duct Losses			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Losses Due to Bends			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	r										
Duct Diameter (circular)	420	n/a									
Duct Width Across (rectangular)	420	mm									
Loss Due to Bend			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	m										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	0	mm									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Losses Due to Bends			-	0.0	0.1	0.3	1.0	2.0	3.0	3.0	3.0
Losses Due to Branches			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	c			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Loss due to Branches			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Other Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Silencer, 1250mm straight through			-	9	14	18	28	28	20	18	15
			-								
			-								
			-								
Total Other Losses			-	9	14	18	28	28	20	18	15

End Reflection Loss			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	500	mm									
Duct Height (rectangular)	500	mm									
Duct Effective Diameter	565	mm									
End Reflection Loss			-	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0

Sound In the Room			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**47**	49.8	43.8	48.5	37.8	34.7	40.7	40.7	38.7
Room Length	0.0	m									
Room Width	0.0	m									
Room Height	0.0	m									
Room Volume	0	m3									
Room Surface Area	0	m2									
Reverberation Time			-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Absorption			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Absorption Coefficient			-	#####	#####	#####	#####	#####	#####	#####	#####
Room Constant			-	#####	#####	#####	#####	#####	#####	#####	#####
Critical Distance			-	#####	#####	#####	#####	#####	#####	#####	#####
Termination Shape (Circ,C or Rect, R)	r										
Term Pos (Middle, M, Edge, E or Corner, C)	M										
Termination Diameter (circular)	0	n/a									
Termination Width (rectangular)	600	mm									
Termination Height (rectangular)	600	mm									
Termination Area	0.36	m2									
Distance to Listener	11.0	m									
On-Axis Directivity Correction (Yes, Y or No, N)	Y		-	3.0	5.0	7.0	7.0	8.0	9.0	9.0	9.0
Level in the Room			***#####***	#####	#####	#####	#####	#####	#####	#####	#####
Design Criterion	NR	30	-	59	48	40	34	30	27	25	23
Additional attenuation required			-	#####	#####	#####	#####	#####	#####	#####	#####

Sound in the Atmosphere			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**47**	50	44	49	38	35	41	41	39
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Duct Effective Diameter	678	mm									
Angle to Receiver	0	deg									
Distance to Receiver	46.0	m									
Directivity			-	0	0	0	0	0	0	0	0
Distance Correction			-	33	33	33	33	33	33	33	33
Level at Houses			**3**	6	-1	4	-6	-10	-4	-4	-6

Supply air calculations (SA2), 7 Waterloo Road

Duct Losses											
Source Levels			**dB(A)**	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
In-duct Sound Power Level			**80**	70	68	74	73	75	74	71	67
Straight Duct Losses			**dB(A)**	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Length	1.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	470	mm									
Duct Height (rectangular)	470	mm									
Straight Duct Loss			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	r										
Length	0.0	m									
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	0	mm									
Duct Height (rectangular)	0	mm									
Straight Duct Loss			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Straight Duct Losses			-	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Losses Due to Bends			**dB(A)**	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	470	mm									
Loss Due to Bend			-	0.0	0.0	0.1	0.3	1.0	2.0	3.0	3.0
Shape (Circ,C or Rect, R)	r										
Type (Mitred, M or Radius, R)	m										
Duct Diameter (circular)	0	n/a									
Duct Width Across (rectangular)	0	mm									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shape (Circ,C or Rect, R)	C										
Type (Mitred, M or Radius, R)	R										
Duct Diameter (circular)	0	mm									
Duct Width Across (rectangular)	0	n/a									
Loss Due to Bend			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Losses Due to Bends			-	0.0	0.0	0.1	0.3	1.0	2.0	3.0	3.0
Losses Due to Branches			**dB(A)**	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	c			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Required Branch (Main, M or Take-Off, T)	M										
Main Branch Shape (Circ,C or Rect, R)	C			Take-Off Branch Shape (Circ,C or Rect, R)							
Main Branch Diameter (circular)	0	mm		Take-Off Branch Diameter (circular)						0	
Main Branch Width (rectangular)	0	n/a		Take-Off Branch Width (rectangular)						0	
Main Branch Height (rectangular)	0	n/a		Take-Off Branch Height (rectangular)						0	
Main Branch Area	0.00	m2		Take-Off Branch Area						0.00	m2
Loss due to Branch			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Loss due to Branches			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Other Losses			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Silencer, 1250mm straight through			-	9	14	18	28	28	20	18	15
			-								
			-								
			-								
Total Other Losses			-	9	14	18	28	28	20	18	15

End Reflection Loss			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	500	mm									
Duct Height (rectangular)	500	mm									
Duct Effective Diameter	565	mm									
End Reflection Loss			-	8.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0

Sound In the Room			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**57**	52.9	49.8	54.8	44.5	45.7	51.7	49.7	48.7
Room Length	0.0	m									
Room Width	0.0	m									
Room Height	0.0	m									
Room Volume	0	m3									
Room Surface Area	0	m2									
Reverberation Time			-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total Absorption			-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Absorption Coefficient			-	#####	#####	#####	#####	#####	#####	#####	#####
Room Constant			-	#####	#####	#####	#####	#####	#####	#####	#####
Critical Distance			-	#####	#####	#####	#####	#####	#####	#####	#####
Termination Shape (Circ,C or Rect, R)	r										
Term Pos (Middle, M, Edge, E or Corner, C)	M										
Termination Diameter (circular)	0	n/a									
Termination Width (rectangular)	600	mm									
Termination Height (rectangular)	600	mm									
Termination Area	0.36	m2									
Distance to Listener	11.0	m									
On-Axis Directivity Correction (Yes, Y or No, N)	Y		-	3.0	5.0	7.0	7.0	8.0	9.0	9.0	9.0
Level in the Room			***#####***	#####	#####	#####	#####	#####	#####	#####	#####
Design Criterion	NR	30	-	59	48	40	34	30	27	25	23
Additional attenuation required			-	#####	#####	#####	#####	#####	#####	#####	#####

Sound in the Atmosphere			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Sound Power Leaving System			**57**	53	50	55	44	46	52	50	49
Duct Shape (Circ,C or Rect, R)	r										
Duct Diameter (circular)	0	n/a									
Duct Width (rectangular)	600	mm									
Duct Height (rectangular)	600	mm									
Duct Effective Diameter	678	mm									
Angle to Receiver	0	deg									
Distance to Receiver	50.0	m									
Directivity			-	0	0	0	0	0	0	0	0
Distance Correction			-	34	34	34	34	34	34	34	34
Level at Houses			**12**	8	5	10	-1	1	7	5	4